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Effectiveness of Video Health Education on Breast Cancer Awareness and Self-Examination in the New Age of Digitalisation: Community-Based Evidence from a Developing Nation

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ABSTRACT

Objective: Developing nations with resource limited settings see a higher proportion of presentation at advanced stages of breast cancer compared to developed nations because of poor public awareness and lack of screening guidelines. This study aimed to assess the impact of a video-based teaching module on breast cancer awareness and self-examination among literate women in a developing country.

Materials and Methods: This quasi-experimental, community-based, intervention study was conducted among literate women of a metropolitan city in a developing country, to evaluate the impact of a video-based teaching module on breast cancer awareness and self-examination. Female school teachers over 25 years old with virtual platform access were included. Simple random sampling was used to select participant schools. The target sample size was 103 based on a reference study. An educational video and questionnaires were validated through expert and volunteer feedback, followed by baseline and follow-up surveys at 6 weeks and 10 weeks after intervention. The Friedman test for overall change in scores and Wilcoxon signed-rank test were used for pairwise comparison between time points.

Results: The survey was completed by 181 participants. Mean (standard deviation) age was 41.79 (9.20) years. Median (interquartile range) cumulative score for the knowledge domain was 18 (14–21), 24 (19–32) and 25 (20–33) at baseline, 6 weeks and 10 weeks respectively with significant differences between each of these time points ($p<0.001$). There was a significant increase in the number of participants with a median score of 3 at 6 and 10 weeks compared to baseline in the attitude domain after intervention. The proportion of study participants with a score of ≥3 points in the practices domain increased from 22% (40/181) at baseline to 41.2% (74/181) at 6 weeks and 49.1% (89/181) at 10 weeks of educational intervention.

Conclusion: A video-based educational intervention may enhance breast cancer knowledge, attitudes, and self-examination practices in educated women with access to electronic media. This may contribute to early breast cancer detection in resource-constrained settings with limited screening options.

Keywords: Breast cancer awareness; screening; early detection; breast self-examination

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KEY POINTS

- Breast cancer awareness and practice of breast self-examination uptake is low amongst literate urban dwellers.
- Digital tools can help provide awareness about breast cancer and teach appropriate technique of breast self-examination.

Introduction

High-income countries have achieved a decrease in mortality from breast cancer, partly attributable to early detection. The scenario in low-income countries differs significantly where advanced stage disease at presentation is common because of lack of awareness and absent or ineffective screening programs (1). The Breast Global Health Initiative has recommended awareness-based early detection as an intervention for improving breast cancer survival in low- and middle-income countries (LMIC) (2). Widespread dissemination of knowledge about symptoms and the importance of breast self-examination (BSE) will promote earlier presentation, thus helping improve disease outcomes. Digitalization and the ubiquitous use of social media have revolutionized access to information. Taking advantage of digital platforms for health education is a promising approach to change attitudes and educate about breast cancer and will also enhance teaching of appropriate techniques of BSE. Hence, we conducted this study to assess the impact of a structured video-based teaching module provided across a virtual platform on the existing knowledge on breast cancer awareness and practices of BSE in a cohort of literate women from a metropolitan city in a LMIC.

Materials and Methods

This quasi-experimental, community-based study was conducted over two years in a tertiary medical teaching and research institution in India. Our objective was to assess the impact of a structured, video-based teaching module provided through a virtual platform on the existing knowledge and attitudes towards breast cancer awareness and practices of BSE in school-teachers.

The study was cleared from the Institute Ethics Committee at the All India Institute of Medical Sciences, New Delhi, India vide letter number IECPG/746/23.12.2020, date: 24.12.2020. The list of participant schools was selected using simple random sampling.

A computer-generated random number technique was used to select schools from the list of all schools within the city, downloaded from the Directorate of Education website. The school principals/activity coordinators were contacted, and a participant information sheet was shared with them before recruitment. The principals then invited voluntary participation from schoolteachers. Potential participants were informed that confidentiality would be maintained and personal data anonymized before analysis. Online informed written consent was obtained from the participants prior to their filling in the questionnaire. Inclusion criteria included female school-teachers aged 25 years or more with access to a virtual platform (email and/or WhatsApp™).

Questionnaire Creation and Validation

Baseline and follow-up questionnaires for the assessment of knowledge, attitude, practices of breast cancer awareness and BSE were designed after extensive review of literature. The questionnaires consisted of four domains: (1) sociodemographic details of the participants; (2) knowledge; (3) attitude; and (4) practices. All questions were objective in nature with the maximum score for domains of knowledge, attitude and practices being 36, 3 and 4 points, respectively. The questionnaire was then validated by administering it to three experts in the institute and twenty volunteers meeting inclusion criteria in a phased manner. Their feedback was obtained, and requisite changes were made to the questionnaire.

Educational Tool Creation

An animated audio-video educational tool covering areas of knowledge, attitude and practices of breast cancer awareness and BSE was made in collaboration with the virtual skills lab at our institution. The content and quality of the video was approved by two faculty members of the department of surgical disciplines.

Sample Size Calculation

The study by Singh et al. (3) among community health workers in a similar geographic location observed a minimum 20% increase in knowledge following an educational intervention. Assuming a similar increase in knowledge, with 80% statistical power (1-β), 95% confidence interval and 20% non-response or loss to follow-up rate, the required sample size of 103 women was calculated.

Data Collection and Statistical Analysis

The baseline survey was conducted by virtually sharing the self-administered structured questionnaire developed for this study. Once the questionnaire was filled, the educational video was shared with respondents. The participants were instructed to watch it twice over a period of two weeks, with regular reminders sent to them. Then follow-up surveys were performed using the post intervention questionnaire provided at two intervals of 6–8 weeks and 10–16 weeks from the date of finishing the teaching module, which was confirmed by an email or message.

The responses of participants were entered in an spreadsheet (Microsoft Excel, Microsoft Inc., Redmond, WA, USA) and scores calculated. Each correct response was given one point and cumulative scores for each domain were calculated by summing up the score for all correctly answered questions. For ease of data representation and analysis, responses to questions with multiple options were categorised into "correct" and "incorrect". In addition, the score obtained with respect to questions assessing knowledge about risk factors, symptoms and screening modalities were subclassified into categories of "poor", "average" and "good" based on the number of correct responses marked for that question. For knowledge of risk factors, poor awareness was defined as correct identification of fewer than five risk factors, average awareness as correct identification of five to nine risk factors, and good awareness as correct identification of ten to fourteen risk factors. For knowledge of symptoms, poor awareness was defined as recognition of fewer than four symptoms, average awareness as recognition of four to six symptoms, and good awareness as recognition of seven to nine symptoms. Regarding knowledge of screening methods, poor awareness was defined as awareness of zero to one screening method, average awareness as awareness of two screening methods, and good awareness as awareness of all three screening methods.

Quantitative data was reported as mean ± standard deviation (SD), if normality assumptions were met and otherwise as median [interquartile range (IQR)]. Qualitative data was reported in numbers or as percentages, as appropriate. To establish the association between parameters, chi-square test or Fisher's exact tests were applied. The Friedman test was used to analyse the overall change in scores of knowledge, attitude and practices of breast cancer awareness and BSE after the video based educational intervention. Pairwise comparisons using the Wilcoxon signed-rank test adjusted with Bonferroni correction were used to assess changes between the three different time points. Cochran's Q test was applied to the categorical data of each of the participant's responses before and after the video based educational intervention to assess overall change in binary outcome variables. Furthermore, a pairwise comparison was done using McNemar test with Bonferroni correction to analyse the statistical significance of change between the three time points. A *p*-value of less than 0.05 was considered to represent statistical significance. The Kruskal-Wallis test was used to investigate the statistical significance of differences between subgroups at each time point with respect to the scores for knowledge, attitude and practices. Then pairwise comparison was performed using the Dunn test with Bonferroni correction to analyse the statistical significance of change in between the three time points. All statistical data analyses were performed using IBM SPSS version 24 (IBM Inc., Armonk, NY, USA) and STATA 16.1 (STATA MP, College Station, TX, USA). The questionnaire used in the baseline survey is presented in Appendix 1.

Results

The survey was completed by 181 participants, with a mean ± SD age of 41.79±9.20 years. Around a third (35%; 64/181) of participants were under 40 years of age. In addition, 85% (154/181) were postgraduates and 15% (27/181) graduates. Family history of breast cancer was present in 8.8% (16/181) and 18.2% (33/181) had a history of visiting a medical professional for breast related symptoms.

Knowledge Domain

All study participants were aware of breast cancer and 98.8% (179/181) believed that early detection of breast cancer would have a significant positive impact on disease outcome. At the baseline survey, most participants considered a breast lump as the only mode of presentation. The knowledge about various symptoms improved significantly post intervention. Electronic media was the most common source of information for participants with respect to both breast cancer and BSE, seen in around 73% participants at baseline. Only 30% reported that medical professionals were a source of information. There was a significant increase in participants knowing that breast cancer could afflict either gender. A significant increase in knowledge score was seen for age at risk of developing breast cancer, prevalence of disease, pattern of inheritance, and gender predisposition. These results are shown in Table 1.

Awareness about BSE was present in 89.5% (162/181) participants at baseline, increasing to 100% at 6 and 10 weeks of study. Amongst those with awareness of BSE, 73.5% (119/162) participants had some knowledge of the technique at baseline and most (64.5%) had self-learned it. Knowledge related to technique for BSE along with awareness regarding the age for starting BSE, frequency and the timing for BSE improved significantly after the intervention (Table 1).

There was a significant improvement in knowledge regarding risk factors, symptoms and screening modalities for breast cancer, as shown in Table 2. Before the intervention, only 3.3% (6/181) of the participants were in the category of "good" knowledge about the risk factors, which increased significantly to 47.5% (86/181) after 12 weeks of the intervention ($p<0.001$). In terms of symptoms of breast cancer, a significant improvement in the proportion of participants achieving "good" category from baseline (20.9%) to 6 weeks (42.5%) and 10 weeks (44.2%) after the intervention was observed ($p<0.001$). Knowledge regarding modalities for breast cancer screening also increased significantly, with 54.1% in the "good" category at the baseline which increased to 69.6% and 70.1% at 6 and 10 weeks, respectively.

The maximum possible score for the knowledge domain was 36. The median cumulative score increased from 18 points at baseline to 24 points at 6 weeks and 25 points at 10 weeks,

Table 1. Responses to knowledge domain at baseline, 6 weeks and 10 weeks following educational intervention

S. No	Question	Response	Baseline *n* (%)	6–8 weeks *n* (%)	10–16 weeks *n* (%)	*p*-value
1	Sources of information on breast cancer	Electronic media	132 (72.92)	132 (72.92)	135 (74.58)	0.05
		Lectures/conferences	95 (52.48)	95 (52.48)	96 (53.03)	0.36
		Books/printed material	89 (49.17)	89 (49.17)	93 (51.38)	**0.01**
		Friends or family	79 (43.64)	79 (43.64)	83 (45.85)	**0.01**
		Medical professionals or hospitals	53 (29.28)	53 (29.28)	53 (29.28)	0.99
2	Prevalence of breast cancer	Correct response	132 (72.92)	140 (77.34)	145 (80.11)	**0.03**
		Incorrect responses	49 (27.08)	41 (22.66)	36 (19.89)	
3	Gender at risk of breast cancer	Women only	75 (41.43)	143 (79.0)	148 (81.76)	**<0.01**
		Men & women both	106 (58.6)	38 (21.0)	33 (18.2)	
4	Impact of early detection on outcome	Yes	179 (98.89)	181 (100)	181 (100)	**<0.01**
		No	2 (1.1)	0 (0.0)	0 (0.0)	
5	Mode of presentation	Lump	171 (94.47)	176 (97.23)	176 (97.23)	<0.01
		Nipple discharge	108 (59.66)	141 (77.90)	144 (79.55)	<0.01
		Change in size	103 (56.90)	134 (74.03)	135 (74.58)	<0.01
		Change in shape	100 (55.24)	132 (72.92)	134 (74.03)	<0.01
		Change in nipple position	64 (35.35)	108 (59.66)	109 (60.22)	<0.01
		Nipple destruction	0 (0)	77 (42.54)	102 (56.35)	<0.01
		Redness or rash of skin over breast	87 (48.06)	113 (62.43)	111 (61.32)	<0.01
		Dimpling or thickening of skin overlying breast	90 (49.72)	110 (60.77)	113 (62.43)	<0.01
6	Age at risk for breast cancer	Correct response	144 (79.55)	160 (88.39)	163 (90.05)	**<0.01**
		Incorrect response	37 (20.45)	21 (11.69)	18 (9.95)	
7	Inheritability of breast cancer	Correct response	137 (75.69)	150 (82.87)	152 (83.97)	**<0.01**
		Incorrect response	44 (24.3)	31 (17.1)	29 (16.0)	
8	Pattern of inheritance for breast cancer (*n* = 137/150/152)	Mother	56 (40.87)	50 (33.33)	50 (32.89)	**<0.01**
		Both mother and father	81 (59.12)	100 (66.66)	102 (67.10)	
9	Awareness of technique for BSE (*n* = 162)	Yes	119 (73.5)	181 (100)	181 (100)	**<0.01**
		No	62 (26.5)	0 (0.0)	0 (0.0)	
10	Age for starting BSE	Correct response	41 (22.65)	91 (50.27)	95 (52.48)	**<0.01**
		Incorrect responses	140 (77.35)	90 (49.73)	86 (47.52)	
11	Frequency of BSE	Correct response	89 (49.17)	117 (64.64)	121 (66.85)	**<0.01**
		Incorrect responses	92 (50.83)	64 (35.36)	60 (39.15)	
12	Timing of BSE	Correct response	60 (33.14)	109 (60.22)	117 (64.64)	**<0.01**
		Incorrect responses	121 (66.86)	72 (39.78)	64 (35.36)	

BSE: Breast self-examination

Table 2. Awareness levels for risk factors, symptoms and screening methods at baseline, and after at least 6 weeks and 10 weeks following educational intervention

Knowledge domain factor	Category of knowledge	Baseline *n* (%)	6–8 weeks *n* (%)	10–16 weeks *n* (%)	*p*-value
Risk factors for breast cancer	Poor	132 (72.9)	72 (39.7)	65 (35.9)	<0.001
	Average	43 (23.7)	23 (12.7)	30 (16.5)	
	Good	6 (3.3)	86 (47.5)	86 (47.5)	
Symptoms of breast cancer	Poor	80 (44.2)	44 (24.3)	41 (22.6)	**<0.001**
	Average	63 (34.8)	60 (33.1)	60 (33.1)	
	Good	38 (20.9)	77 (42.5)	80 (44.2)	
Screening modalities for breast cancer	Poor	40 (22.1)	16 (8.8)	16 (8.8)	**<0.001**
	Average	43 (23.7)	39 (21.5)	38 (20.9)	
	Good	98 (54.14)	126 (69.6)	127 (70.1)	

Footnote for Table 2: Risk factors - Poor awareness: <5 risk factors, Average awareness: 5–9 risk factors, Good awareness: 10–14 risk factors, Symptoms -Poor awareness: <4 symptoms, Average awareness: 4–6 symptoms, Good awareness: 7–9 symptoms, Screening methods - Poor awareness: 0–1 screening methods, Average awareness: 2 screening methods, Good awareness: 3 screening methods

respectively. The pairwise comparison between time points showed significant improvement at 6 and 10 weeks, respectively, compared to baseline (p<0.001). The improvement in scores was also significant between 6 weeks and 10 weeks (p<0.001). This is depicted in Figure 1.

Attitude Domain

There was a significant increase in the study participants who considered that periodic BSE can help in early detection of breast cancer (Table 3). The number of participants who would definitely or were likely to visit a medical professional upon developing symptoms or detecting something unusual on BSE showed an improvement from 75.6% to 86.6% at 6 weeks and 91% at 10 weeks. Prior history of screening mammography was present in 22.1% (40/181) participants at baseline. This showed a significant improvement to 27.6% (50/181) at 6 and 10 weeks of the study. The likely medical professional of choice for subsequent evaluation continued to be gynecologist in 81.7% (148/181), 76.7% (139/181), 77.6% (142/181) participants at baseline, 6 weeks and 10 weeks of study, respectively, with no significant change.

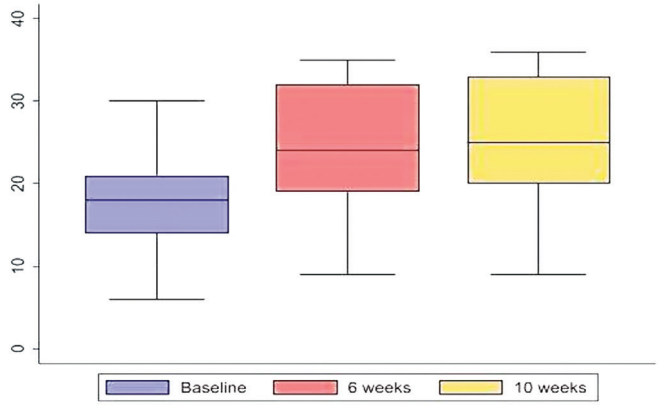

Figure 1. Box and Whisker plot depicting scores for knowledge domain

The maximum score for the attitude domain was 3. The number of study participants with a score of 3 points increased from 58% (105/181) at baseline to 72.8% and 75.1% (136/181) after 6 and 10 weeks of educational intervention. The number of study participants with a score of 2 points decreased significantly from 33.7% (61/181) at baseline to 23.7% at 6 weeks and 23.2.1% at 10 weeks. These results are depicted in Figure 2. The pairwise comparison between time points showed a significant change in the cumulative scores of the attitude domain between baseline and 6 weeks (p = 0.044) and baseline and 10 weeks (p = 0.008), with no significant change between 6 weeks and 10 weeks (p = 0.99).

Practices Domain

BSE was practised by 58.6% (106/181) participants which increased significantly to 70.2% (127/181) at 6 weeks and 74% 10 weeks (134/181) after the intervention. At baseline, only 16% of these participants were practising the correct technique, based on the self-assessment questions asked in the questionnaire. This number increased significantly to 50.3% (64/127) and 57.4% (77/134) at 6 and 10 weeks respectively after being taught the correct technique in the video.

Amongst the 75 participants not performing BSE at baseline, uncertainty regarding the technique for BSE was found to be the leading cause, noted in 77.3% (58/75) of these participants. This uncertainty declined significantly to 57% (31/54) and 48.93% (23/47) at 6 and 10 weeks respectively (Table 4).

Table 3. Responses to attitude domain at baseline, 6 weeks and 10 weeks following educational intervention

S. Nn	Question	Response	Baseline *n* (%)	6–8 weeks *n* (%)	10–16 weeks *n* (%)	*p*-value
1	Role of periodic BSE in earlier detection of breast cancer	Yes	164 (90.6)	173 (95.58)	174 (96.13)	**<0.01**
		No	17 (9.4)	8 (4.4)	7 (3.9)	
2	Role of periodic CBE in breast cancer screening	Yes	150 (82.87)	157 (86.74)	155 (85.63)	0.15
		No	31 (17.1)	24 (13.2)	26 (14.3)	
3	Likelihood of visiting a doctor on noticing signs/symptoms of breast cancer	Definitely visit/likely visit depending on schedule	137 (75.68)	157 (86.73)	165 (91.15)	**<0.01**
		Discuss/read friends family/ Internet etc.,) or undergo imaging and then decide	44 (24.29)	24 (13.24)	16 (14.34)	
4	Medical professional of choice for subsequent evaluation	Gynecologist	148 (81.76)	139 (76.79)	142 (78.45)	0.53
		Surgeon	17 (9.39)	31 (17.12)	32 (17.67)	**<0.01**
		Others	16 (8.83)	11 (11.07)	9 (4.96)	**<0.01**
5	History of undergoing screening mammography	Yes	40 (22.09)	50 (27.62)	50 (27.6)	**<0.01**
		No	141 (77.9)	131 (72.4)	131 (72.4)	

CBE: Clinical breast examination; BSE: Breast self-examination

The maximum score for the practice domain was 4. The baseline median cumulative score was 1 (IQR: 0–2). The number of study participants with a score of 3 or more points increased from 22% (40/181) at baseline to 41.2% (74/181) at 6 weeks and 49.1% (89/181) at 10 weeks of educational intervention. The number of participants with a score of 2 or less points decreased from 77.8% (141/181) at baseline to 58.8% (107/181) at 6 weeks and 50.9% (92/181) at 10 weeks. These findings are depicted in Figure 3.

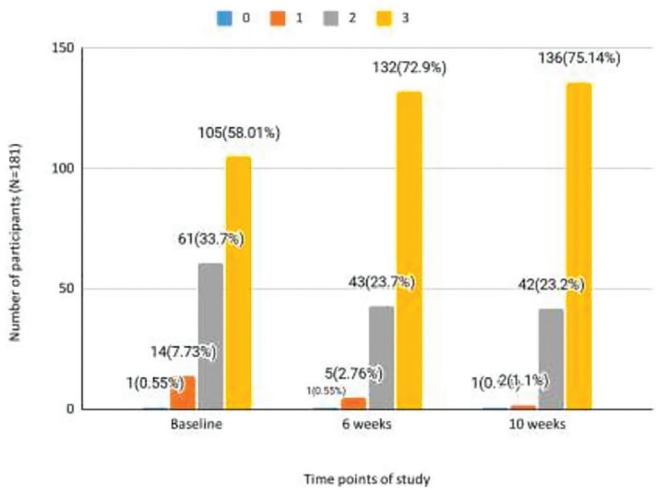

Figure 2. Distribution of cumulative scores for attitude domain

The pairwise comparison between time points showed significant improvement in the attitude of study participants at 6 ($p<0.001$) and 10 weeks ($p<0.001$) respectively compared to baseline, with no significant change between 06 weeks and 10 weeks ($p = 0.54$).

Discussion and Conclusion

Breast cancer in India and several Asian countries typically presents at a younger age and with more advanced disease,

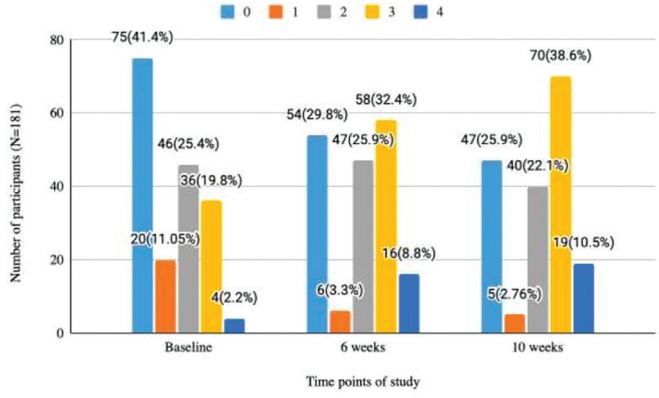

Figure 3. Distribution of cumulative scores for practices domain

Table 4. Responses to practices domain at baseline, 6 weeks and 10 weeks following educational intervention

S. No	Question	Response	At baseline *n* (%)	6–8 weeks *n* (%)	10–16 weeks *n* (%)	*p*-value
1	Practice of BSE among study participants	Yes	106 (58.56)	127 (70.16)	134 (74.03)	**<0.01**
		No	75 (41.4)	54 (29.8)	47 (26.0)	
2	**Reason for not performing BSE (*n* = 75/54/47)**	Lack of time to perform it	13 (17.33)	15 (27.77)	6 (12.76)	**<0.01**
		Unclear about the way to perform it	58 (77.33)	31 (57.40)	23 (48.93)	**<0.01**
		Other reasons	4 (1.33)	8 (14.76)	18 (38.29)	**<0.01**
3	**Frequency of performing BSE (*n* = 106/127/134)**	Once in a month	60 (56.60)	85 (66.92)	91 (67.91)	**<0.01**
		Others	46 (43.39)	42 (33.0)	43 (31.3)	
4	**Technique followed for BSE (*n* = 106/127/134)**	Incorrect technique	89 (83.9)	63 (49.6)	57 (42.5)	**<0.01**
		Correct technique	17 (16.03)	64 (50.39)	77 (57.46)	
5	**Examination of axilla during BSE (*n* = 106/127/134)**	Includes axilla examination always as a part of BSE	54 (50.94)	62 (48.89)	69 (51.49)	**<0.01**
		Does not include axilla as part of BSE	52 (49.0)	65 (51.18)	65 (48.5)	
6	**Detection of abnormality during BSE (*n* = 106/127/134)**	Yes	8 (7.54)	15 (11.8)	15 (11.19)	**<0.01**
		No	98 (92.4)	112 (88.1)	119 (88.8)	

BSE: Breast self-examination

largely due to limited awareness, sociocultural barriers, and healthcare constraints. The median symptom duration at presentation is approximately 5–6 months (4, 5). While early detection of breast cancer is associated with a better disease prognosis and thus highlights the importance of screening and clinical downstaging, population-based mammographic screening poses logistical challenges in resource-limited settings and this is compounded by the absence of national guidelines. Promoting awareness of risk factors, symptoms, and BSE is therefore of high importance, given the prevalence of breast cancer. Virtual media offers a cost-effective platform with wide community reach, even more so now that the "Digital India" campaign has reached the interiors of the country. According to the Internet and Mobile Association of India's 2013 report, 52% of working women and 55% of non-working women use social media in India (6). This societal change in the worlds' most populous country provided the rationale for the present study, investigating the impact of a video-based educational intervention, delivered through virtual platforms, on urban literate women in Delhi.

Our study identified a notable lack of knowledge regarding various modes of breast cancer presentation beyond recognition of a breast lump. At baseline, only just over half of participants were knowledgeable about additional symptoms, such as bleeding or nipple discharge (59.6%), changes in breast size (56.9%), alterations in breast/nipple shape (55.2%), or changes in nipple position (35.3%) as indicators of breast cancer. Post-intervention, awareness had significantly improved across all parameters. These findings are consistent with other studies (7-9). Shankar et al. (8), who reported that while 83.3% of women recognized a breast lump as a symptom, only 48–60% were aware of other presentations, with significant improvement following intervention. Similar results were seen in the meta-analysis by Wang et al. (9), where 71% (95% confidence interval: 62–80%) of participants were aware of breast lumps, while fewer than half of the participants exhibited awareness of the other nine assessed symptoms. Recognizing and comprehending risk factors and modes of presentation are of even greater importance in resource-limited settings. Interventions aimed at enhancing knowledge of these factors is likely to make a positive impact on health promotion and early detection efforts.

Within our cohort, most participants consistently believed that regular BSE facilitated early detection [baseline (90.6%), 6-week (95%), and 10-week (96.1%)]. This collective attitude toward BSE indicates a generally positive disposition within the study population. Despite this favourable perspective, BSE was practised by only 58.6% of participants at baseline. Of those who practised BSE, only 16% were found to employ the correct technique. However, notable enhancement in BSE practice and technique was evident following the intervention. Global prevalence rates of BSE practice vary significantly both within and across countries. In a previous survey of 20 European countries,

only around 54% of women had never practised BSE (10). Dahiya et al. (11) reported that 76.6% women believed BSE aids in early breast cancer detection, yet only 49.1% practised it regularly. Similarly, Singh et al. (7) found that only 10% of participants engaged in BSE. More importantly, their study showed that none were acquainted with the recommended method or frequency.

The scenario is similar in other developing nations. In a study done on future healthcare professionals in Ghana, only 42.6% participants performed BSE (12). An interventional study by Alameer et al. (13) in Saudi Arabia's Jazan region reported an initial BSE practice rate of only 57.3%, which improved significantly to 92% at 6 weeks post-intervention. Sarker et al. (14) showed a significant improvement in BSE practices after an educational intervention using leaflets and brainstorming sessions (21.3% *vs.* 33.8%; $p<0.001$). Another study in Nigeria by Alabi et al. (15) revealed that only 42.2% of the women aware of BSE performed it. Most of the studies however did not assess the technique of performing BSE, unlike our study wherein the questionnaire enquired about the steps of BSE. Moreover, the participants were able to self-assess their technique after watching the video, and this reflected in the post intervention questionnaires as well. Our study as well as the earlier literature review have highlighted the gap between positive attitudes towards BSE and its actual implementation using the correct technique, showing a pressing need for effective educational interventions to bridge this disparity.

In the initial survey, a notable 22% of participants had a history of undergoing screening mammography, which increased to only 27% post intervention. Curiously, even though 63.5% of the study's participants were over 40 years of age, this finding indicated how a lack of awareness coupled with the absence of national guidelines for screening mammography impacted educated participants' health-related choices. The promotion of BSE as a screening approach for breast cancer holds promise for resource-constrained environments where annual mammography is often impossible (16). Throughout the study period, gynecologists emerged as the preferred choice of medical professionals that participants would consult upon detecting breast cancer symptoms. This preference may indicate the influence of certain attitudes and personal inclinations even amongst literate women, such as the preference for female clinicians, that could be resistant to change despite the educational interventions delivered through virtual platforms. This can also be taken as a leading lesson wherein gynecologists can be preferentially trained to teach BSE to patients visiting them as well as convince their patients to seek consultation with a surgeon for breast ailments.

Our and similar studies have shown that electronic media was the most common source of acquiring information about breast cancers (8, 17). Among our participants, 18% had a history of prior doctor visits due to breast-related symptoms, which is comparable to 11% as reported by Alabi et al. (15). Despite limited existing research on the relationship between past doctor visits and breast cancer awareness and knowledge of BSE, the prevalence of individuals seeking medical attention for benign breast-related concerns suggests an opportune moment for implementing interventions to encourage beneficial practices and contribute to the clinical downstaging of breast cancer.

This study demonstrated a significant improvement in the scores of the three domains studied, knowledge, attitude and practices, at six weeks. Similar improvement in scores has been reported in other studies (14, 18, 19). However, a direct comparison is not possible because of different questionnaires and scoring methods used. In our study, only the knowledge domain showed a further improvement at 10 weeks, suggesting that while reinforcement of knowledge may lead to better awareness, the attitude and practices may not change significantly after an initial satisfactory intervention. Previous other studies have also shown that there is not much change between the practice of doing BSE or undergoing mammography between two time points after intervention (8, 19).

The findings of our study suggest clinically useful practical applicability within settings constrained by resources. This study focussed on schoolteachers who may influence a wider population including peers, family, friends and especially their students. Other noteworthy highlights of this study are its quasi-experimental design, evaluating the effect of intervention at two distinct time points, study of various factors encompassing domains of knowledge, attitude and practices about breast cancer and BSE, and comprehensive assessment of technical performance of BSE. The use of a novel audio-visual intervention allowed us to provide information in a comprehensible manner and conduct the study in multiple schools even during the coronavirus disease pandemic. The study was adequately powered.

Nevertheless, the study lacks personalised engagement with women who did not exhibit a positive shift in attitude or behaviour regarding BSE. Self-reporting of outcomes may also invite desirability bias. Furthermore, the absence of a long-term follow-up and the specific focus on an educated group of women may prevent the broad generalisation of these findings.

In the future, we wish to share the audiovisual aid publicly and encourage its use and widespread distribution by community health workers for teaching BSE, who can also help disperse our message into rural areas of our community. We also plan to develop this audio-visual aid in the format of a video game to assess for retainability and greater participant interaction.

Video-based educational interventions improved the knowledge about breast cancer and promoted BSE among a cohort of educated, urban Indian women with electronic media access. In our digitally connected world, such interventions may serve as a valuable tool to encourage self-examination, potentially leading to earlier breast cancer detection and improved outcomes, especially in resource-constrained settings without established routine screening guidelines and programs. These efforts can be further adapted and strengthened through in-person awareness sessions conducted by primary health care workers at the community level, where the correct BSE technique can be demonstrated and reinforced using audio-visual aids, especially in areas with lower literacy levels.

Ethics

Ethics Committee Approval: The study was cleared from the Institute Ethics Committee at the All India Institute of Medical Sciences, New Delhi, India vide letter number IECPG/746/23.12.2020, date: 24.12.2020.

Informed Consent: Informed consent was obtained from all participants prior to study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: R.R.M., S.S., R.K., M.A.K., M.K.J., H.K.B., R.P.; Concept: R.R.M., S.S., R.K., H.K.B., R.P.; Design: R.R.M., S.S., R.K., M.K.J., H.K.B.; Data Collection or Processing: R.R.M., R.K., M.A.K., H.K.B.; Analysis or Interpretation: R.R.M., S.S., R.K., M.A.K., M.K.J., R.P.; Literature Search: R.R.M., S.S., M.K.J., H.K.B., R.P.; Writing: R.R.M., S.S., R.K., M.A.K., M.K.J., H.K.B., R.P.

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