TITLE

Sustainable and cost-effective teenage breast awareness campaigns: insights from a Nigerian high school intervention study.

Authors and Affiliations:

1. **Dr. Chris O. Ifediora** (MBBS, MPH, FRACGP)

(Corresponding Author)

- Senior Lecturer (Clinical Skills), Griffiths University Medical School, Gold Coast, Australia.
- President, OCI Foundation, Nigeria (www.ocifoundationng.org).

Email: c.ifediora@griffith.edu.au.

2. **Dr. Emmanuel C. Azuike** (MBBS, MPH, FWACP, FMCPH)

- Lecturer and Consultant Community Physician, Department of Community Medicine, Chukwuemeka Odumegwu Ojukwu University/University Teaching Hospital, Awka, Nigeria.
- President, Foundation for Health and Development in Nigeria (FHDN).

Email: emmanazuike@yahoo.com.

ABSTRACT

Background:

With limited government-sponsored breast screening programmes in developing countries, breast awareness remains the only realistic survival hope for millions. Poor levels of knowledge and preventive practices remain in these countries, and early enlightenments to empower teenage high school girls have been advocated recently. This study evaluates ways to ensure sustainability for such an approach.

Method:

A six-month longitudinal, interventional study of 432 female high school female students in South-eastern Nigeria, The efficacies of a video-assisted face-to-face intervention, as well as the the use of printed handouts, were evaluated.

Results:

A total of 317 (73.4%) and 301 (69.7%) valid responses were received from the pre-intervention (16.8±1.5 years) and post-intervention (17.2±1.6 years) surveys respectively.

Logistics regression revealed that participants who were “engaged” with the campaigns, either through symposium attendance, or by reading handouts, showed significant improvements on most aspects of knowledge regarding the cancer’s early symptoms and risk factors, as well as breast self-examination (BSE). However, the monthly practice of BSE was not significantly increased (Attendees: OR=1.44, P=0.18; Handout-readers: OR=1.52; P=0.17)

Also, when “engagement” to the respective empowerment activities was disregarded, a chi-squared analysis comparing the pre-intervention and post-intervention groups, showed significant improvements on specific knowledge regarding risk factors and early symptoms of breast cancer, as well as BSE techniques and regular monthly practice: $\chi^2(1, N=596) = 46.703, p<0.001$.

Across multiple parameters, the impact of exclusive face-to-face participation was not different to that from the reading of handouts.

Conclusion:

Face-to-face and handout were both effective and of similar impact. However, sustained impact on monthly BSE is doubtful. To surmount this, strategies to ensure ongoing engagements are vital. Perhaps adjusting existing high school curricula to allow repeated yearly teachings on breast cancer and BSE, along with in-built-in evaluation systems like examinations and quizzes, are ways of ensuring engagement.

Key words: Breast self-examination, BSE, breast cancer, intervention, education, campaign, women, secondary schools, knowledge, practice.

INTRODUCTION

Breast cancer accounts for 11.9% of all cancers, making it the commonest malignancy worldwide, apart from non-melanoma skin and lung cancers.[1] Over the years, its incidence has risen from 1-in-20 in the 1960s, to 1-in-8 in recent years.[2] With about 571,000 deaths attributed to it in 2015, it is the 5th commonest cause of global cancer deaths.[3]

In most developing countries, Government-sponsored screening programmes are non-existent,[4, 5] and empowering women to be 'breast aware' is a cheap intervention that can help detect breast cancers early.[4, 6] Unfortunately, breast awareness in most affected countries remain below average levels,[7, 8] with multiple studies revealing that women in these areas have poor knowledge of breast cancer and its associated risk factors.[9-14] Being breast aware, mainly through breast self-examination (BSE), can encourage positive behaviours like regular professional breast examinations[15] and improved medical help-seeking attitudes,[10, 16] and can, therefore, help break barriers to breast cancer diagnosis.[17, 18] BSE also empowers women to take some control and responsibility for their health.[19]

Despite the foregoing benefits of BSE, and the fact that approximately 90% of breast cancers are first noticed by patients themselves,[20, 21] it remains disappointing that few women actually practice it regularly,[2] even in communities where its knowledge is reasonably high.[7, 22] Regular public health education campaigns have been touted as a means to, not only improve knowledge, but also for bridging this gap between knowledge and practice.[23-25] When delivered by healthcare providers, participants tend to demonstrate greater confidence and knowledge towards BSE, with a tendency to routinely practice it.[19]

In view of the aforesaid knowledge-practice gap, which exists, not just with breast cancers, but also for other non-communicable diseases, it comes as little surprise that a recent WHO-sanctioned paper invited stakeholders to suggest ways of bridging the gap between policies, knowledge and implementation.[26] A recent publication[27] has suggested the inclusion of cancer prevention strategies into the academic curriculum of senior secondary (high) school students in developing countries, as a way to engage women early on in their lives, and hopefully improve practice. While such a recommendation is worthwhile, it brings up the question of

how to ensure that any such program for high school students in developing countries will be of high quality, effective and sustainable, with long-lasting effects. Such programs also need to be cost-effective and affordable to the stakeholders (governmental and non-governmental) championing it, given that funding in these areas pose major obstacles to wide-reaching campaigns. In addition, for hundreds of millions of women at-risk, these campaigns remain their only realistic way of fighting breast cancers, given that their governments lack organized screening programs.[4, 5]

Health campaigns delivered as face-to-face symposia can be capital-intensive, usually require physical locations, and can only reach out to a fraction of the women it needs to. The internet provides an alternative means of education, with a near-universal reach to people in most high-to-upper-middle income countries. However, internet costs in developing countries are beyond the reach of many, making it unaffordable and unsustainable.[28]

In the search for affordable and sustainable education techniques for breast cancer prevention campaigns, the quality and efficacy of the messages need to remain the same, whatever method is used. Unfortunately, research-based information that will inform choices are few, and this paper aims to reduce this knowledge gap. Its findings will assist health promotion organisations in choosing wide-reaching, effective, affordable, and sustainable tools, and its observations will hopefully help save costs and optimize resources, while providing useful insights in the design of other non-breast cancer interventions in resource-limited economies.

This paper evaluates two common education delivery techniques that can be used for high schools in developing countries. The first is the traditional, face-to-face health education campaigns, usually delivered as a lecture, with or without video and electronic teaching aids. The second is the use of printed educational materials that can be delivered as handouts, without the face-to-face teaching.

This study targets female senior secondary school girls, mainly in their mid to late teens, given that surveys on them have revealed that their attitudes towards breast cancer preventive strategies are positive,[29] while knowledge is poor.[4, 29, 30] Also, the recent recommendation that interventions be targeted at women in this demographic[27] warrants that studies to evaluate breast cancer education techniques, should be carried out with them.

In summary, this paper aims to:

1. Determine the six-month impact of health education interventions on the knowledge of breast cancers and BSE, as well as the actual practice of BSEs, among senior secondary school females;
2. Explore the potential impacts of the two identified education techniques;
3. Identify statistical differences, if any, between these two education techniques.

METHODS

Setting, Participants, and Inclusion Criteria

The participants included all female, final-year, senior secondary school students (equivalent to the final year of High School) in the 26 government-owned schools within the Otuocha Post Primary Schools Service Commission (PPSSC) Educational Zone of Anambra State, Nigeria. The Otuocha PPSSC is one of the six Educational Zones in Anambra State,[31] and covers three of the state's 21 Local Government Areas (LGAs).[32] Each school is headed by a principal, and all the principals in a particular zone report to a Zonal Director. Anambra is one of Nigeria's 36 states, with a projected 2016 population of 5,527,800.[32] Students in privately-owned schools were excluded from this study because their management structure is different, making access to participants difficult.

Based on the aforesaid criteria, a total of 24 schools with 432 participants met the study criteria.

Study design

This is a six-month longitudinal, randomized, pre-intervention and post-intervention cross-sectional surveys. This paper covers breast cancer only, but is part of a larger study that explored the knowledge, attitude and practices (KAP) of the participants regarding Breast Cancer, Breast self-examination (BSE) and Cervical Cancers.

The Intervention

The interventions involved a face-to-face symposium, as well as a paper handout. Both techniques presented the participants with similar content and information, but the delivery was different, and carried out separately.

A pre-intervention randomization divided the participants into the two groups of: “attend symposium” and “not attend symposium”. Even though randomization into “attend symposium” and “read handout” would have been better, we allowed all participants to receive handouts (Supplementary Data 1, or SD-1), including those who attended the symposium, so as to maximize the impact of the intervention, and ensure that as many girls as possible have the opportunity to be empowered. The potential limitation of this approach was offset by the fact that the design reached as many participants as possible with life-saving empowerment education, while still accommodating all of its research objectives.

The randomization, introduced to minimize bias, was achieved through a balloting process that allowed students to pick a paper from a pool containing “yes” or “no” options. Each school had a total number of ballot papers equal to the number of their eligible students, with half marked “yes”, and the other half, “no”. Students who picked “yes”, attended the symposium, while the others did not attend. This process ensured that approximately half of the students from each school participated in the symposium, and was necessary so as to ensure that preferences were not given to particular categories of girls, for instance, those that were either more intelligent, or those from more privileged backgrounds, or those with particular physical attributes.

Held on September 29th, 2017, the face-to-face education event was organized as a one-day Health Symposium and Empowerment Campaign, titled *“Breast Self-Examination (BSE) and the creation of awareness for the prevention of breast and cervical cancers among young women”*. It was a 2-hour event which included a 45-minute PowerPoint-assisted lecture delivered by a consultant public health specialist, and was followed by a 21-minute video on BSE.

To ensure uniformity, the handouts, which contained essentially the same information as those delivered during the symposium, were distributed from the first working day after the symposium.

The Questionnaire: Design

The Questionnaire for the pre-intervention study was developed through questions adapted from previous similar publications.[2, 20, 33, 34] Following some slight modifications, the original document was piloted to ensure ease of understanding among the participants. This piloting was done with 20 students in the same class

as the targeted participants, who attend schools in a different educational zone of Anambra State. Feedbacks from them, along with inputs from professional colleagues, were used to develop the final pre-intervention questionnaire (Supplementary Data 2 or SD-2).

A separate questionnaire was developed for the post-intervention survey (Supplementary Data 3 or SD-3), and was basically a slight modification of the validated SD-2.

Both questionnaires were divided into 4 parts, with Part 1 of each being the Introduction, Participant's Information, and Consent. Part 2 collected the basic demographics of the participants, and, in SD-3, also gathered data on the participants' modes of engagement with the Intervention (i.e., attend symposium, received handouts, and/or read handouts).

Apart from minor re-organizations in the order of the questions, the remainder of the questionnaires were exactly the same for S1 and S2. Part 3 focused on the Knowledge, Attitudes and Practices (KAP) on Breast Cancers and BSE, while Part 4 (not covered in this paper) was concerned with Cervical Cancers. Some of the questions concerning Knowledge were "Specific", and this refers to information with direct consequences, like risks and symptoms. Conversely, "General Knowledge" refers to aspects of breast cancer with less direct consequences, like "who" might be affected, "whether it kills", and so on. To reduce speculative responses, some questions in Parts 3 and 4 were worded negatively, while others were positive.

The Questionnaire: Despatch and Return

The pre-study questionnaires were dispatched on September 18th, 2017, and returned within one week (ahead of the intervention symposium on September 29th, 2017). The post-study questionnaires were dispatched on the 26th of March 2018, approximately six months after the intervention, and also returned within one week. All despatches were through the Zonal Director to the various school principals, and then to the eligible students. The return was a reversal of the process. Where return was not possible within the stated time frame, the questionnaires were not accepted. This was done so as to avoid contamination of the responses before the intervention, as well as to keep within the six-month period required for the post-intervention survey.

Data Analysis

All analysis was with the IBM® SPSS version 25.0 (SPSS Inc., Chicago, IL). Even though the questionnaires included both positively and negatively worded questions, only the positively worded ones were used for the analysis in this paper. This was done, not only to minimize the complexity of the reporting, but also because the earlier papers developed from the pre-intervention survey,[27, 29] revealed that the positively worded questions were representative of the participants' views.

Questions with options of "Yes/Agree", "Not Sure/Unsure" and "No/Disagree" were dichotomized into "correct" for the right ones, or "incorrect" for the "wrong and not sure/unsure" responses.

Where necessary, the Paired Samples T-test was used to compare the Means. Two different types of Inferential Analysis were used to answer the research questions. Firstly, to determine the impact of the interventions, the Chi-squared (χ^2) analysis was used to compare responses to the different aspects of Knowledge and Practice before and after the intervention. The associated change in "Attitudes" was not explored because it had been established in a related paper[29] that attitudes towards breast cancer and BSE among the pre-intervention respondents were already high. As such, much insight from a post-intervention analysis was not expected. The Null Hypothesis for this χ^2 analysis was that: "there would be no improvement in the Knowledge and Practice among participants following a breast cancer prevention campaign". This hypothesis was to be rejected if the significance level was ≤ 0.05 .

The second set of Inferential Analysis focused on the post-intervention participants only, and utilized Binary Logistics Regression (BLR) to separately explore the potential impacts of the two intervention techniques, as well as to directly compare the two techniques. The Independent/Predictor variables for this analysis comprised of the two identified intervention techniques ("attend symposium" and "read handout"), while the Dependent/Outcome variables were the responses ("Correct" versus "Incorrect") to various aspects of Knowledge on "General Issues", "Risk Factors", and "Early Symptoms" of breast cancer, as well as the "Knowledge of BSE", its "Techniques", and its "Actual Practice". The BLR analysis generated Odds Ratios (ORs), along with 95% Confidence Intervals (CIs) and Probability (p) values. Only p-values of ≤ 0.05 were accepted as significant.

It should be noted that, in exploring the potential impact of each intervention technique, participants who attended the symposium included all those that were physically present at the symposium, even if they later read the handouts, while those who “read the handouts” covered all participants who read them, even if they had earlier attended the symposium. However, for the direct comparison, only participants that exclusively attended the symposium (without reading the handouts), were compared to those that exclusively read the handouts (without attending the symposium). Even though this approach created overlaps in the separate analysis of the techniques, its justification lies in the fact that it allowed unique and multiple insights to be gained on how the various education techniques impacted on the overall learning outcomes.

Ethical Considerations

Ethical clearance was obtained from the Griffith University Human Research Ethics Committee. The Participant Information Sheet (Page 1 of SD-2 and SD-3) made clear that participation was voluntary, and that Consent was implied with procession to questionnaire-completion. Permissions were also obtained from the relevant state agencies and the responsible Zonal Director, and written notifications were given to the participating school principals, and through them, to the students and their parents.

RESULTS

BASIC SUMMARY (TABLE 1)

Table 1A reveals that a total of 317 (73.4%) and 301 (69.7%) valid responses were received from the pre-intervention and post-intervention surveys respectively. Poorly completed questionnaires, which did not provide enough responses to allow analysis, were excluded. There was a significant difference in the means ages for the Pre-intervention ($M=16.8$, $SD=1.5$) and Post-intervention ($M=17.2$, $SD=1.6$) groups; $t(296) = 2.835$, $p = 0.005$. Of the 301 respondents to the post-intervention survey, 133 (44.2%) attended the symposium, while a total of 189 (62.8%) read the handout issued after the symposium (including some who did not attend the symposium).

As shown in Table 1B, about 80 of those who read the handouts did not attend the symposium (read-only), while 21 of those who attended the symposium did not read the handout (attend-only). There was no difference

in the mean ages between the “read-only” (M=17.4, SD=1.9) and the “attend-only” (M=17.0, SD=0.9) groups; $t(96) = 0.931$, $p = 0.354$.

IMPACT OF THE INTERVENTIONS

A. Knowledge of Breast cancer (Table 2)

Overall, General Knowledge (Table 2A) of the participants remained virtually unchanged, with the proportion who knew that “breast cancer can occur in any woman aged 20 years or more” respectively at 56.5% and 56.0% before and after intervention, while the proportion of those who knew that “BSE can help detect breast cancer” increased by 3.5%. None of these was statistically significant, and has respective p-values of $p=0.91$ and 0.36 .

In contrast, analysis of the specific knowledge on the “risks” and “early symptoms” of breast cancer revealed significant improvements. As shown in Table 2B, a 19.1% increase was observed regarding “early onset of periods” ($p<0.001$), while a 10.7% increase was recorded regarding “having no babies” and their potentials to increase the risks of breast cancer ($p<0.001$). Even though an increase of 4.1% was also observed in the level of respondents that correctly identified that a “positive family history” as a breast cancer risk, this was not statistically significant ($p=0.27$).

Similarly, responses to the knowledge of early symptoms of breast cancer (Table 2C) showed increases of 18.7% for “breast lumps” ($p<0.001$), 24.6% for “lumps in armpits” ($p<0.001$), and 12.3% for “unilateral breast discharge” ($p=0.002$).

B. Knowledge of BSE, its actual Practice, and its Techniques (Tables 3 and 4)

As shown in Table 3A, an increase of 10.8% was observed on the knowledge that “BSE is for all women aged ≥ 20 years” ($p=0.01$), a 13.3% increase was noticed regarding the fact that “BSE should be done monthly” ($p=0.001$), while the knowledge that “BSE is best done 7-10 days after onset of periods” was increased by 17.5% ($p<0.001$). Regarding the actual monthly practice of BSE (Table 3B), a 20.4% increase was observed ($p<0.001$). Table 4, which reveals the findings on specific techniques of BSE, showed increases in the proportions of all the 14 parameters explored, and all but two of them were of statistically significant.

COMPARISON OF THE TWO INTERVENTION TECHNIQUES (Table 5)

As explained in “Methods”, the BLR analysis of only the post-intervention responses explored the potential impacts of the respective delivery methods, and then also a head-to-head comparison between them.

A. Attended symposium Vs Not attended:

Attendees to the symposium were two times more likely to know that “BSE can help detect breast cancer” (OR=2.18; p=0.004). Even though they were also 1.5 times more likely to know that “any woman aged ≥ 20 years can get breast cancer”, this narrowly missed statistical significance (OR = 1.51; p = 0.08). The attendees were also more likely to know that lumps in breasts (OR=2.24; p=0.002) and axilla (OR=2.46; p<0.001), as well as unilateral nipple discharges (OR=1.98; p=0.01), can be symptomatic of early breast cancer.

Regarding the risk factors, they were also more likely to remember that “early onset of periods” (OR = 1.71; p = 0.03), “having no babies” (OR = 2.77; p = 0.002), and “having a positive family history” (OR = 2.05; p = 0.01), can all increase breast cancer risks.

With respect to BSE, the attendees were more likely to remember that “BSE is recommended for all women aged ≥ 20 years” (OR=1.87; p=0.01), and that it should be “done about a week after the onset of monthly periods” (OR=3.89; p<0.001). However, they did not show significantly improved knowledge on the fact that “BSE should be practised monthly” (OR=1.07; p=0.83), or in “the actual monthly practice of BSE” (OR = 1.44; p = 0.18).

B. Read Handout Vs Did Not Read Handout:

Participants who read the handouts were more likely to know that “any woman aged 20 years or more can get breast cancer” (OR=2.13; P=0.003), and that “BSE can help detect breast cancer” (OR 1.93; P=0.01). They were also more likely to know that breast cancer early symptoms might include breast lumps (OR 1.81; P=0.03), lumps in the armpits (OR 2.59; P<0.001), and one-sided nipple discharges (OR 2.06; P=0.01).

Similarly, reading the handouts was associated with improved knowledge of the cancer’s risks, including “early onset of periods” (OR 2.34; P=0.003), “having no babies” (OR 2.31; P=0.03), and “having a family history of breast cancer” (OR 2.39; P=0.004).

Participants who read the handouts were also more likely to know that “BSE should be practised by any woman aged ≥ 20 years” (OR 1.67; P=0.045), and that it is best done 7-10 days after periods (OR 3.55; P<0.001).

However, just like in the “attend symposium” group, there was no association between reading handouts and the knowledge that BSE should be practised monthly (OR 0.72; P=0.32), and the monthly practice of BSE was also not significantly improved (OR=1.52; P=0.17).

C. Read Handout only Vs Attended Symposium only

Table 5 also reveals that a direct comparison between the two intervention techniques revealed no statistically significant differences on any parameter regarding “General Knowledge”, “knowledge of early symptoms”, “knowledge of the risk factors”, “knowledge of the BSE”, or the “monthly practice of BSE”.

DISCUSSION

The statistically significant difference in the means of ages between the pre-intervention (16.8 ± 1.5) and post-intervention (17.2 ± 1.6) groups confirms the age increase expected from a survey of the same individuals taken half a year apart. The non-statistical difference ($p=0.354$) in the mean ages of the “read-only” (17.4 ± 1.9) and “attend-only” (17.00 ± 0.9) groups confirms that the two groups, which were both drawn from the post-intervention survey, are similar. These two observations lend credence to the authenticity of our data, and arguably increases the reliability of the study’s conclusions.

The mixed improvements observed with respect to the knowledge on breast cancers is interesting, given that “general Knowledge” was not significantly improved, whereas “specific knowledge” on risks and early symptoms were generally increased. Explanations for these may lie in the findings of an earlier but related paper,[29] which observed an already high level of General Knowledge (75.2%), but poor levels on Risk Factors (41.5%) and Early Symptoms (46.1%) among the pre-intervention participants. This would imply that any post-intervention increase in General Knowledge is unlikely to be significantly high, and further justifies our decision to exclude “Attitude” (and focus only on “Knowledge” and “Practice”) in analysing the impacts of our interventions, given that “Attitudes” were already high as well.[29] These observations also further highlight the recommendation from that same earlier paper,[29] which recommended that health campaigners against breast cancers should emphasize more on specific and positive behaviours, rather than on more general or

negative ones. Unsurprisingly, our observations appear to be consistent with the reports from a study of about 3,000 Ugandan women,[35] which found a post-intervention increase in the knowledge of breast cancer risk factors. That study, however, was not among high school students.

Interestingly, on analysing only the post-intervention group, participants who engaged with one and/or the other of the intervention techniques showed statistical improvements with both general and the specific knowledge (shown in Table 5). This observation might imply that, even when knowledge is already high, ensuring engagement with breast cancer campaigns (whether by direct teaching or through printed materials), will further improve it. We, therefore, recommend that future breast awareness campaigns should endeavour to optimize engagement from the participants, possibly, through post-intervention examination or quizzes for high school students.

Further evaluation of the post-intervention group also reveals no difference with knowledge between the two delivery techniques (face-to-face campaigns or reading printed materials). This appears consistent with studies in Turkey[36] and Iran,[37] which both found no differences in outcomes with different education techniques. While the exact methods of those studies were not entirely identical to the techniques in our study, it does show that, provided engagement is ensured, different delivery methods are equally effective. Stakeholders involved in breast cancer campaigns should be encouraged by this, as this allows them to adopt any approach deemed cost-effective, sustainable, wide-reaching, and culturally-acceptable, provided participant engagement can be guaranteed.

With respect to breast self-examination (BSE), there were significant post-intervention improvements on its knowledge regarding who BSE is for, when it should be done, how frequently it should be practised, as well as its correct techniques. There was also an improvement with its monthly practice, from 6.1% to 26.5%; $\chi^2(1, N = 596) = 46.703, p < 0.001$. Surprisingly though, when only the post-intervention participants were analyzed, participants who were engaged with the intervention (i.e., attended and/or read the handouts) still displayed

statistically higher knowledge on “who” and “when” BSE should be done, compared to those who were not engaged (neither attended nor read them), but the monthly practice of BSE, along with the knowledge of its regularity, lost statistical significance. While it is not clear why this slight difference exists, the observation is very important, as it has revealed that, six months after a health intervention, even participants who were engaged with the BSE campaign may not actively practice it, even though they may still remember that it should be done, and this finding is the same whichever education technique was adopted. This further justifies our decision to explore different scenarios in the BLR analysis, given that important information might have been missed otherwise.

It is worth noting that multiple studies in Turkey,[36, 38] India,[39] and the United States[15] did find significant increases in BSE practice, at least in the immediate one to two months after their respective interventions. However, the only study that explored monthly practices of BSE after 12 months of an intervention was an Australian-based survey,[40] and it did find that the expected level of regular BSE practice was not maintained after 12 months. Combined to our own observations, these findings might appear to indicate that, even though BSE awareness campaigns might increase monthly practice in the short term, the level of practice after six months (medium term) is mixed, while the long term impact (12 months or more) may not be sustained. Studies have shown that repeated education can help transform learned behaviours into habits.[41, 42] Therefore, repeating breast awareness interventions may help sustain long-term BSE practices.

CONCLUSIONS

Notably, we found that, six months after the intervention, the participants’ knowledge on specific risk factors and early symptoms of the cancer were significantly improved and sustained, while more general, non-specific knowledge were not. Knowledge on breast self-examination (BSE) was also sustainably increased, but sustained monthly practices were doubtful. On multiple parameters, the impact of face-to-face teaching were not different from those achieved by intervention delivery through printed materials.

Overall, we conclude that health empowerment interventions to improve breast awareness and the practice of BSEs are generally effective, and yield the same outcome irrespective of whether delivery is face-to-face only,

or by reading printed information only. Ensuring engagement to the campaigns is the major key to a successful medium to long term outcome.

RECOMMENDATIONS

Firstly, we recommend that breast cancer campaigns should be flexible in adopting intervention techniques that are affordable, cost-effective, culturally-appropriate, and sustainable, given that different approaches are equally effective. Secondly, such campaigns should emphasize more on the specific and positive messages regarding breast cancer, and less on general, less specific, and negative ones. Finally, to encourage engagement in the medium to long term, we suggest that health campaigns should be designed in ways that they can be repeated at intervals, or in ways that will regularly remind participants to practice BSEs. For instance, any introduction into the curricula of senior secondary (high) schools should not be a one-off, but would be best taught at yearly intervals across the three final classes in high schools. Also, an assessment or evaluation system should be built into the program in the form of quizzes and examinations, so as to reinforce engagement.

Study Strengths and Limitations

One major strength of this work is its ability to explore various aspects of the interventions, and make multiple comparisons. This approach led to the discovery that, even with full engagement, participants may still not practice monthly BSEs in the medium to long term. The randomization also helped minimize bias, and is considered another strength.

One limitation is the inability of the study to identify the immediate impact of the interventions. Even though this was not a major aim of the work, such information might have helped assess how the lessons learned from the interventions had changed after a six month period. Another limitation was that the study ended only after six months, rather than twelve. Unfortunately, prolonging the study would have been technically difficult, given that the participants, already in the final year of their high school, were due to take their graduation examinations just two months from when the post-intervention survey took place. Delaying this part of the study might have interfered with their final examinations, or would have resulted in most of the students dropping out of the study.

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Conflicts of Interest

The researchers wish to declare that both of the authors were the respective Founders of the **OCI Foundation Nigeria** and the **Foundation for Health and Development (FHDN)**. The two Foundations were involved in delivering the health education on breast cancer and BSE to female secondary students in the Otuocha Educational Zone of Anambra State, Nigeria, who were the participants in this study.

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