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# Development and Modification of a Culturally Tailored Education Program to Prevent Breast Cancer in Korean Immigrant Women in New York City

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## Abstract

Breast cancer (BC) is the most common cancer in Korean American (KA) women. In view of its high prevalence in these women, their low screening rates, and the cultural influence of BC risk factors in their lifestyles, we developed a community-based culturally tailored BC prevention program, the Korean Breast Cancer Risk Reduction Program (KBCRRP). Guided by the PRECEDE-PROCEDE and health belief models, the KBCRRP was developed to achieve four goals: (1) healthy weight, (2) physically active lifestyle, (3) healthy diet, and (4) BC screening and adherence. KBCRRP combines effective multicomponent strategies for BC screening and a group-based lifestyle intervention incorporating traditional Korean health beliefs and is tailored for BC risk reduction. In this paper, we provide an overview of the program, the process of program development, implementation, and evaluation, and modification during the COVID-19 pandemic. The initial program involved 8 weeks of in-person group education sessions led by interdisciplinary healthcare professionals and 16 weeks of follow-up involving smartphone applications, phone calls, and text messaging from trained lifestyle coaches. Participants received opportunities to obtain free mammography during the program. After feasibility testing, the program was modified by incorporating participants' feedback. During the COVID-19 pandemic, we provided the program using the Zoom video platform. Participants' recruitment and retention during the pandemic was successful, reflecting the fact that virtual delivery of group-based education was a feasible and acceptable alternative to in-person sessions. Collaboration with community organizations serving the target population is the key to developing and sustaining a successful community-based educational program.

**Keywords** Breast cancer · Risk factors · Lifestyle modification · Community-based education · Cancer prevention · Korean American

## Introduction

Breast cancer (BC) is the most common cancer in Korean American (KA) women [1], a relatively recent but fast-growing Asian subpopulation in the USA [2, 3]. The increase

in BC prevalence among these women is likely related, at least in part, to their low BC screening rates that are influenced by their health beliefs regarding BC screening [4–6]. Even though the American Cancer Society (ACS) recommends a yearly mammogram for women aged 40 years or more, recent studies reported that about 10–53% of KA women had a mammogram in the last 2 years, and about 10–29% never had a mammogram in their lifetimes [5–7]. Early BC screening starting at age 40 is especially important for these women. In the USA, BC prevalence is the highest among women after menopause (50 years or older), whereas in Korea, women aged 40–49 years show the highest BC incidence rate of about 35% [8, 9]. Several studies report that KA women tend to delay and underutilize professional healthcare services and to depend more on informal health services [10, 11]. A high proportion are foreign-born with limited English proficiency, constitute the group with

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an especially low rate of health coverage, and often lack a usual source of health care and a primary care physician [6, 10, 12]. Many are not aware of the need for regular health screening [11, 13]. These insufficiencies in their healthcare utilization patterns warrant additional attention to target possible disparities in access to care, as well as further research in identifying and reducing relevant BC risk.

A systematic review published in 2016 supported specific lifestyle recommendations that significantly reduced BC incidence (19–60%), including a healthy weight throughout life, a physically active lifestyle, and a healthy diet [14]. Although BC incidence among KA women has been found to be lower than in some other ethnicities, it has still been found to be the most prevalent of all cancers for KA women, and at least double that compared to native Korean women [15]. Adopting a Western lifestyle associated with acculturation and longer length of stay in the USA has led to increased risk of developing BC [15–17]. Notably, acculturation can sometimes influence an immigrant's adoption and maintenance of physical activity (PA) [18]. Overall, physical inactivity is common in this group of immigrant KA women [19], including inactivity relative to non-Hispanic white women [20]. This suggests the need for further rigorous investigation to detect and eliminate barriers to PA, education on the importance of PA to reduce BC risk, and provision of social support to encourage greater PA involvement. In addition, a 14-year prospective cohort study in Korea demonstrated that obese women aged 50 years or older were at increased risk for developing BC [21]. Notably, classification of overweight and obese with obesity classified by  $BMI > 30 \text{ kg/m}^2$  has been criticized for its lack of applicability to Asians because it underestimates the health risk in this population [22]. At a lower BMI, Asians and Asian Americans may have increased risks to their health [22, 23]. Furthermore, dietary acculturation (i.e., adoption of Western dietary habits) may result in adverse health outcomes such as obesity and diabetes [24]. Moreover, regardless of their ethnic group, middle-aged women experience physical and psychological changes and weight gain after menopause that has been strongly associated with BC [25, 26].

Several educational programs targeting KA women in states other than New York have been developed and tested to prevent BC [27–29]. However, they typically focus on increasing BC knowledge and uptake of mammography. In view of the high incidence of BC in KA women, their need for regular BC screening, and the cultural influence of BC risk factors in their lifestyles, we developed a community-based culturally tailored BC prevention program in New York City (NYC). The Korean Breast Cancer Risk Reduction Program (KBCRRP) aims to address KA women's traditional health beliefs regarding BC risk factors by lifestyle modification, together with multicomponent strategies to reduce structural and cultural barriers for BC screening. It is hypothesized that Korean Breast Cancer Risk Reduction Program (KBCRRP) will achieve four specific

goals for participants: (1) healthy weight, (2) physically active lifestyle, (3) healthy diet, and (4) BC screening and adherence. The purpose of this paper is to provide an overview of the program, the process of program development, implementation, and evaluation, and modification as a result of the coronavirus disease 2019 (COVID-19) pandemic.

## Methods and Results

### Program Overview

Funded by the New York State Department of Health, the KBCRRP is an innovative community-based and culturally tailored primary and secondary prevention educational program. Together with a NYC-based community organization serving the Korean community, it is intended to reduce BC risk among KA women. Guided by the PRECEDE-PROCEDE and health belief models, KBCRRP was developed to achieve its four specific goals for participating women: (1) healthy weight, (2) physically active lifestyle, (3) healthy diet, and (4) BC screening and adherence. The KBCRRP combines effective multicomponent strategies for BC screening and a group-based lifestyle intervention incorporating traditional Korean health beliefs that is tailored for BC risk reduction. The intervention involves 8 weeks of in-person group education sessions led by interdisciplinary healthcare professionals and 16 weeks of follow-up involving smartphone applications, phone calls, and text messaging from trained lifestyle coaches. Participants received opportunities to obtain free mammography during the program.

### Theoretical Framework

Two theoretical approaches were used to guide the development of the community-based education program: the PRECEDE-PROCEDE model and the health belief model (HBM). The PRECEDE/PROCEED model provides a framework for planning and evaluating health interventions [30]. The model focuses on a multi-sectoral, multi-level ecological approach including contextual factors beyond the individual level and emphasizes the need for careful assessment of these factors to improve care and address specific individual and public health needs [30]. In this study, the educational program targeted three factors (predisposing, enabling, and reinforcing) in the PRECEDE-PROCEDE model to influence behaviors that reduce BC risk (Fig. 1).

The HBM guided the content development of the culturally tailored BC education for KA women. It also provides the frame of reference for initiating health promotion dialogs with participants. The HBM encompasses four main perceptions regarding initiation of a health-related action:

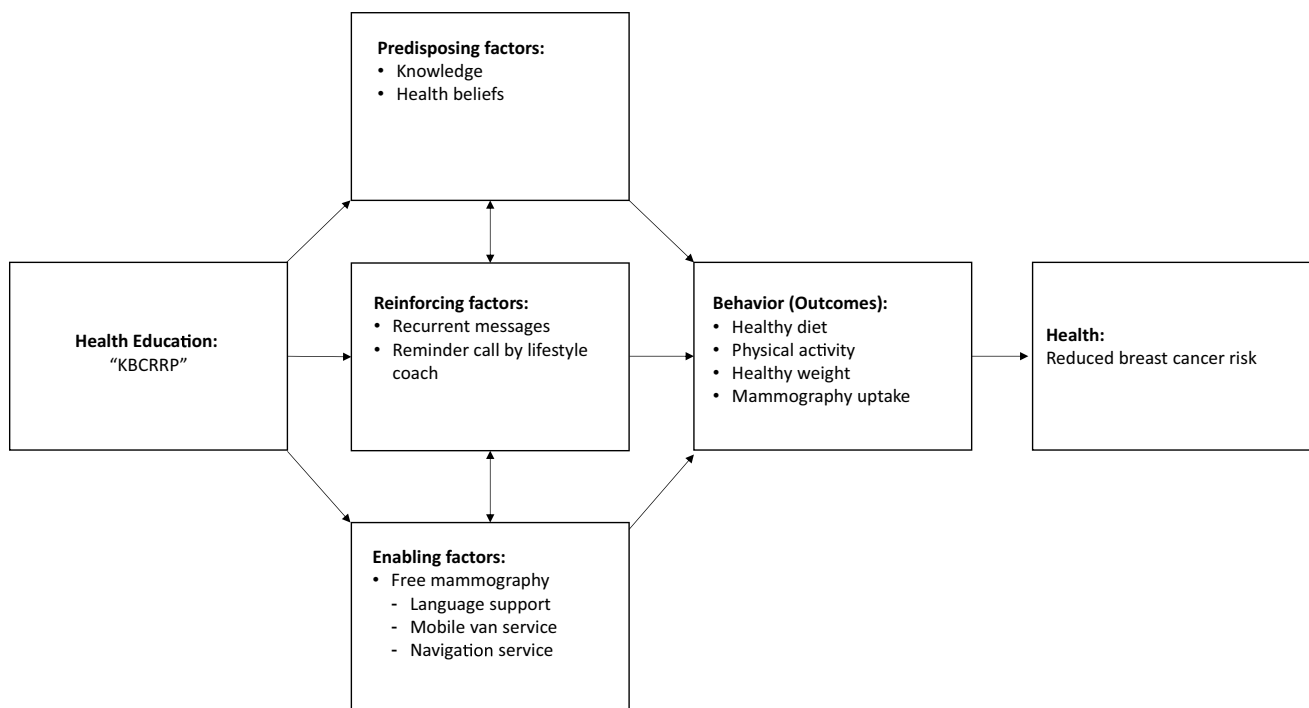


Fig. 1 Theoretical framework

susceptibility, seriousness, benefits, and barriers [31]. The content of the educational program was based on evidence that increasing women's knowledge about BC and screening behaviors, as well as motivating health-promoting behaviors, may influence their actual practice of BC prevention and detection [32]. The program also involves addressing inaccurate knowledge and unhelpful health beliefs consistent with KA women's cultural backgrounds.

## Program Development

The educational program targeting modifiable lifestyle risk behaviors related to BC (physical inactivity, obesity, and unhealthy diet) and BC screening was developed by an interdisciplinary team (women's nurse practitioner, oncology nurse practitioner, registered nurse, registered dietitians, community health workers/lifestyle coaches, and physical trainer) who had expertise in both content and Korean culture. It specifically involved collaboration between academic researchers familiar with KA women and an established KA community organization. Once developed, the program was reviewed by content experts (nurse practitioners, a breast surgeon, and a physician in women's health). Each week during the first 8 weeks, interdisciplinary health professionals conducted interactive group sessions. At week 8, participants could register for a free mammogram. For the next 16 weeks, an assigned lifestyle coach sent text messages to participants to encourage healthy lifestyles. Text messages

were consistent with the information delivered during the 8-week in-class sessions. An overview of the educational program is summarized in Table 1.

## Program Implementation

To test the feasibility of implementing the KBCRRP, a quasi-experimental study was conducted at the Korean Community Services of Metropolitan New York, Inc. (KCS), in the borough of Queens, NYC (June to December 2019). KCS is one of the largest non-profit, community-based, and social service organizations in the USA dedicated to addressing the needs of the KA community. The KCS Women's Health Program has been primarily focused on providing free mammography offered by the New York State Cancer Prevention Program and annually provides this mammography to 350–400 KA women. The study's inclusion criteria required that the participant be a Korean immigrant woman (1) aged 40 or over, (2) without a BC history, (3) with a smartphone for use in the program, (4) have a BMI of 23 or more (classified as overweight or obese among Asians [22]), and (5) understand and read Korean. Smartphone applications were used to deliver 16 weeks of follow-up. Because the program was provided in Korean, and anyone who could not understand and read Korean was excluded.

The study was approved by the CUNY Hunter College's Institutional Review Board (IRB), and written informed consent was obtained prior to the study. The intervention

**Table 1** KBCRRP topics and program overview

Week	Topics	Lecture contents	Group/individual activities
1	BC overview: know your risk factors and prevent BC	<p>Program introduction and overview</p> <p>What is breast cancer (BC)? BC facts and racial and ethnic differences; common BC myths and cultural beliefs associated with BC; BC risk factors; knowing individual risk by using a BC risk assessment tool; American Cancer Society (ACS) recommendation for BC prevention; importance of lifestyle modification to reduce BC risk</p> <p>Importance of maintaining healthy weight through diet and physical activity in relation to cancer incidence; how to calculate BMI and different categories of BMI; introduction to ACS guidelines on physical activity; different types of physical activity focusing on aerobic exercise; things to consider when making a personal physical activity plan</p>	<p>Healthy snacks tasting</p> <p>Ice breaker</p> <p>Quiz for common BC myths</p>
2	Physical activity 1	<p>Importance of maintaining healthy weight through diet and physical activity in relation to cancer incidence; how to calculate BMI and different categories of BMI; introduction to ACS guidelines on physical activity; different types of physical activity focusing on aerobic exercise; things to consider when making a personal physical activity plan</p>	<p>Healthy snacks tasting</p> <p>Physical activity session led by a personal trainer focusing on aerobic exercise</p>
3	Healthy diet 1	<p>ACS guidelines for healthy diet: Healthy food choices for healthy weight; healthy diet with an emphasis on plant foods; guidelines for added sugar, alcohol, and sodium consumption; understanding food labels; tips for healthy diet shift for weight control</p>	<p>Healthy snacks tasting</p> <p>Diet record sharing session: Each participant receives the assessment instrument for the diet record; selected participants present their previous week's diet record; each presentation is followed by class discussion for healthy diet</p>
4	Healthy diet 2	<p>Application for a healthy meal plan: Nutrition guide for typical Korean food items (rice, soybean paste stew, kimchi, meat, ramen, vegetables, and fruits); common measures for cooking; understanding food labels; examples of healthy recipes</p>	<p>Healthy snacks tasting</p> <p>Meal plan application session: Examples of healthy weekly meal plan presented by instructor; personal healthy recipes shared with all participants; Q&amp;A session for healthy meal plan</p>
5	Physical activity 2	<p>Health benefits of physical activity including for people with chronic health conditions and disabilities; key physical activity guidelines for adults and older adults; weight management; different types of physical activity focusing on muscle strengthening activity</p>	<p>Healthy snacks tasting</p> <p>Physical activity session led by a personal trainer focusing on muscle strengthening</p>
6	Stress management to prevent depression and cancer	<p>What is stress? Stress response and effects of stress on health (obesity, depression, cancer); acculturation and adaptation stress among immigrants; traditional beliefs regarding mental health; unhealthy stress coping mechanisms; healthy strategies to prevent mental health issues; stress management strategies; benefits of exercise on stress management; types of stress reduction exercises</p>	<p>Healthy snacks tasting</p> <p>Stress test: small group discussion about stressors in participants' lives</p> <p>Physical activity session led by a yoga instructor focusing on mental (meditation, stress relief) and physical benefits (flexibility and stretching)</p>
7	Menopausal transition and women's health after menopause	<p>Understanding the menopausal transition and changes after menopause; importance of health maintenance; recommendations for health maintenance after menopause; health screening guidelines, healthy lifestyle (physical activity and diet), sexual health and hormone replacement therapy, psychological well-being</p>	<p>Healthy snacks tasting</p> <p>Applying the Menopause Rating Scale</p> <p>Group discussion: sharing menopausal symptoms and changes related to aging</p>

Table 1 (continued)

Week	Topics	Lecture contents	Group/individual activities
8	BC screening and adherence: know your breast and detect early	BC screening guidelines: mammography, clinical breast exam (CBE), breast Self-examination (BSE), importance of BC screening and early detection, how to do a BSE, early signs of BC, understanding mammography (definition, procedure, how to read the report), common barriers to BC screening among Koreans, how to reduce barriers	Healthy snacks tasting Small group discussion: cultural barriers to mammography and sharing participants' experiences of mammography BSE demonstration and practice: using breast models and Korean translated BSE pamphlet developed by the Breast Treatment Task Force Information session for a free mammography event: in-person sign-up for mammography
9–24	16 weeks of follow-up sessions using smart phone apps, phone calls, and text messaging by trained lifestyle coaches	Weekly text message to the participants to encourage healthy lifestyle, incorporating 8-week in-class topics: healthy weight, physically active lifestyle, healthy diet, and BC screening and adherence Call to participants to encourage mammography uptake and remind them of their due dates for mammography. Providing a mobile van service for CBE and mammography in the Queens NYC area	Offer of a free mammogram scheduled monthly at the Korean community sites Provide support for scheduling, paperwork, interpretation, and referral for mammography as needed Provide a personal report including changes over 6 months on diet, weight, and physical activity and a reminder for BC screening

group received the 24-week KBCRRP, including 8 weeks of in-class group sessions to reduce BC risks (a total of 8 sessions, once each week for 8 weeks on Tuesdays from 7:00 pm to 8:30 pm) and 16 weeks of individual follow up contacts from health coaches for reinforcement to maintain healthy lifestyles (a total of 16 contacts, one per week on Tuesdays via text message or phone call). Intervention group participants received a booklet including handouts and diet recipes to follow the class they attended and provided detailed information about the weekly topic. The control group received usual care provided by the community site that included written (at baseline) and online (at week 4) materials regarding cancer risk factors in general. With the ACS's permission, we translated a booklet in Korean that provides guidelines for nutrition and physical activity for adults: "Take Control of Your Health – and Help Reduce Your Cancer Risk." Offered each month, participants of both groups received the same opportunities to obtain free mammography during the program. At the end of the program's feasibility study, to improve the subsequent implementation of the educational program, we conducted semi-structured interviews with 10 participants from the intervention group in which we asked about their experiences with the KBCRRP, its influence on their lifestyles, and suggestions for revision. A separate written consent was obtained for participants from the intervention group who participated in the optional, semi-structured individual interview for feasibility study evaluation.

## Participants

We enrolled 30 KA women through community outreach to test the program's feasibility (15 for the intervention group and 15 for the control group). Fourteen in each group completed the program ( $N=28$ , 7% attrition rate), and there were no statistically significant group differences in assessed sociodemographic characteristics at baseline. The average age of participants was 58.07 years (SD: 6.78, range: 48–67), and the great majority was married (85.7%), was at least high school graduates (89.3%), spoke Korean at home (92.9%), had limited English proficiency (85.7%), and attended a Korean church (82.1%). On average, they had lived in the USA for 26.5 years (SD: 10.95). Two thirds reported having chronic diseases (67.9%) and more than half perceived their health as fair or poor (60.7%). About three quarters reported having health insurance (82.1%), a usual source of care (82.1%), and a Korean doctor (85.7%). Even though almost all had seen their health providers in the past year (92.9%), participants did not often receive preventive services. In the past year, only 71.4% had an annual physical exam, 50% had a mammogram, 35.7% had a clinical breast exam, and only 57.1% had a Pap smear in the last 3 years.

## Evaluating the Program's Feasibility

At week 24, intervention group participants evaluated the educational program via a satisfaction survey and semi-structured individual interviews. On the survey, participants rated their overall satisfaction with the program, its educational content, and other aspects of the program (i.e., facility, snacks, location, time, staff) on a 10-point Likert scale (1 = not satisfied at all to 10 = fully satisfied). The survey also contained a dichotomous question to assess their intention to refer others to participate in the program: "Would you recommend this class/program to others?" In the semi-structured individual interviews, participants were asked about their experiences with the program and its influence on their lifestyles and to provide suggestions for its revision. Each interview took 30 to 45 min. Interviews were audio-recorded and transcribed verbatim by a professional transcription service. Transcripts were checked for accuracy by the interviewer. Content analysis was conducted by using a team approach. To understand culturally embedded meaning, three bilingual Korean-English team members analyzed data in Korean independently and collaboratively. The data were analyzed using a qualitative data analysis program, QSR NVivo 12.

## Program Evaluation

### Satisfaction with the Program

Fourteen participants in the intervention group attended most or all of the 8 in-class sessions (range: 5 to 8, average 7.50). Overall satisfaction of intervention group participants who completed the 24-week educational program was very high for both the educational content and the overall program (average 9.64 on a 10-point scale) and aspects other than the educational program, such as the facility, snacks, location, time, and staff (average 9.71 on a 10-point scale). All reported that they would recommend our program to their neighbors and friends. Respondents reported that the program provided learning opportunities through hands-on experience and group activities. One participant reported her satisfaction with the program this way: "It was a very good experience. When we talked about healthy diets, we ate various options of healthy snacks, together. I learned which foods to choose to be healthy...Yeah, I really liked (what) we practiced at the class. We actually did practice yoga or stretching at the gym after (the) lecture." Another participant shared her experience of group engagement: "I am very satisfied...Taking the time to see what other people do, and also the talks about what we learned, were all very good." In addition, the program provided an opportunity for them to reflect on their lifestyles and health and reinforced how to have a healthy lifestyle. One participant shared her

experience: "I think this program gave me an opportunity to look back on myself. I knew I had to exercise but it was too hard. This program gave me the opportunity to start again."

### Positive Lifestyle Change

Participants reported positive behavioral changes in their lifestyles (being active and eating healthy). All participants agreed that they increased their physical activity and reduced their sitting time. Increasing physical activity was the most common but dramatic lifestyle change. One woman said: "When I wake up, if (the) weather is good or not, I just go out and walk. My husband also joins me on Saturday, Sunday, or (the) rest of the days." Increasing exercise provided better health outcomes, such as having less joint pain, better mood, and weight loss. One participant with chronic back pain reported: "I'm doing just yoga and stretching too. I feel less pain. I think it works well to do (the) stretching I've learned." Participants tried to find time to increase physical activity in their daily routines during their commute to work or their working time. One participant shared her strategy: "I used to park my car just right (in) front of the place. Now I park a little farther and walk from (the) parking lot...I keep my eyes on my health in daily life." Participants also tried to eat healthy to reduce weight or improve chronic health issues such as diabetes or hypertension. One participant who was recently diagnosed with diabetes shared her diet change: "I have hypertension, so I was a little bit worried about diabetes. Now I am making a lot of better food choices. I live mainly on fish and vegetables. I was a meat lover. Nowadays, if I want to eat meat, I eat a little bit. As I learned during the program, I reduced my eating portions a lot. I try hard." She indicated that her diabetic condition was well improved, saying, "I recently visited my doctor. He told me that it is very rare to lose weight in such a short time. He praised my hard work and lowered my medication dose."

In addition, after 24 weeks of the program, they reported an uptake in mammography and a positive attitude toward BC screening, having learned about the importance of this screening. One participant who had not screened for BC for many years reflected on her behavioral change after the program: "I just overlooked breast cancer, but it's the most common female cancer and dangerous. I was not screened because I was busy raising children. Through the program, I learned (breast cancer) can be prevented. It should be detected early. I did not know the importance of screening before. After the program, I went to get a mammogram." A free mammogram opportunity reduced structural and language barriers to healthcare access. One participant who does not have health insurance said: "After (the) program, I registered (for) a free mammogram event here. Definitely, I'm going to get it since my due (date for a mammogram) is coming."

## Areas for Improvement

Participants also suggested areas for improvement in the program. Even though participants reported positive changes in physical activity, they requested the provision of additional exercise sessions during the in-class group sessions and home workout videos during the follow-up sessions to achieve better outcomes. Even though participants tried to make healthier choices for their diets, several participants expressed difficulty in making changes in their diets because they were responsible for preparing meals for the whole family. One participant explained: “It is difficult to change diets. I don't live alone, so it's hard for me to just eat whatever I want. Most Koreans eat soup and rice in each meal.” Because almost all participants have a traditional Korean diet at home, they requested the inclusion of various healthy recipes applicable to Korean traditional diets and monthly diet plans for the family. Additionally, they suggested a possible time change for the in-class sessions, various community channels to advertise the program, and different types of pedometers to monitor their physical activity.

## Program Modification

### Program Revision after the Feasibility Study

Based on qualitative findings and the satisfaction survey, we revised the educational program and updated the educational materials (PowerPoint slides, participant's booklet). KCS staff strived to improve in ways that were suggested by participants (facility, menu update, food preparation, recruitment strategy, etc.). The research team had regular meetings with community partners to modify the program in early 2020. Because participants requested recipes applicable to a Korean diet for their families, two dietitians developed healthy recipes applicable to Korean diets, and weekly recipes for 8 weeks were included in the participant booklet. During two healthy diet sessions, the program included dietary assessments, counseling, and individualized diet planning to reduce weight and to guide a healthy diet. It also highlighted strategies to apply to Korean traditional diet and assisted with making weekly diet plans for the whole family. We also adopted a pedometer with a clip and strap to provide multiple wearing options for participants' preferences. In addition, the original program had three exercise sessions, but we added a fourth one, resulting in two physical training and two yoga sessions. We also videotaped workout sessions and uploaded videos to YouTube to increase their physical activity outside of the in-class sessions.

## Transition to a Virtual Program during the COVID-19 Pandemic

Due to the COVID-19 pandemic, the community site was closed for 6 months, and in-person research activity was suspended until August 2020. To compensate for the significant delay of the in-person program implementation, we communicated with the community organization and the funder and restructured our program by adapting to a virtual format. With the funder's approval, we converted 8 weeks of the 90-min in-class sessions to virtual ones for public safety with the support of the Zoom video platform. The research team and community partners had weekly meetings to discuss a detailed plan for safety measures for the subsequent study prior to in-person contact for data collection and staff training. Participants would be recruited for both intervention and control groups (25 participants in each of the two groups) in each of the following 2 years. Both groups were to be administered survey questionnaires and anthropometric measurements were to be taken at baseline, 8 weeks, and 24 weeks. To examine baseline and post-baseline changes, we planned to use comprehensive outcome measures including (1) BC knowledge and BC screening awareness, (2) healthy weight using BMI and waist/hip ratio, (3) physical activity using self-report and daily steps measured by a smartphone application, (4) healthy diet using self-reported weekly diet patterns and alcohol consumption, and (5) intention to screen for BC and actual mammogram uptake.

With the IRB's approval, the 8-week in-class sessions were to be delivered virtually by using Zoom Video Communications, with the 16-week follow-up to be delivered as was previously provided in the feasibility study (smartphone app, text message, and phone call). To accommodate virtual education, a registered dietitian videotaped cooking demonstrations of healthy foods to share tips for the recipes at each session (8 cooking videos). We videotaped the exercise sessions for participants to increase their physical activity during the virtual educational sessions and made it available online to support maintenance of healthy behaviors. The 8-week in-class group sessions were to be implemented as virtual group sessions via Zoom and would also be recorded, and we anticipated helping participants to set up an exercise app and a Zoom app on their smartphones, tablets, or computers. Lifestyle coaches checked their access to the virtual meeting via a test session. We developed and provided a written Zoom user guide and virtual learning etiquette in Korean. During each virtual session, several lifestyle coaches provided support if anyone needed help. A detailed outline of the virtual educational program compared to the in-person program is summarized in Table 2. During the COVID pandemic, we provided two 24-week virtual programs to 49 KA women (September 2020 to March 2021 and April 2021 to October 2021, 10.2% attrition rate).



**Table 2** Program modification and virtual transition

Week	Original program	Program modification	Virtual program
Setup	Participants came to the Korean Community Service (KCS) office before the program to set up for smart phone applications and pick up pedometer and educational materials (45 min)	Provided a different type of pedometer	Individual visit by appointment to the KCS following COVID-related safety measure to set up smart phone applications and to pick up a pedometer and educational materials (30 min); a written Zoom user guide and virtual learning etiquette provided
1	Healthy snacks tasting (15 min) Program introduction (15 min) Lecture (45 min)	Program starting time changed as per participants' recommendation Included more healthy snack recipes in the program booklet	Cooking demo: provided nutritional value and tips/variations by a dietitian (15 min) Program introduction; presentation of Zoom user guide and virtual learning etiquette (15 min) Lecture (45 min) Q&A session; announcement for next week (15 min)
2, 5, 6	Lecture (45 min) Healthy snacks tasting (15 min) Activity: exercise training (30 min)	Physical activity sessions were delivered online synchronously. Online session was recorded and provided to the participants for continued guidance on their daily physical activity	Cooking demo: provided nutritional value and tips/variations by a dietitian (15 min) Lecture (45 min) Group activity: exercise training (30 min)
3, 4	Lecture (45 min) Healthy snacks tasting (15 min) Group activity (30 min)	Increased number of practical examples for healthy food items and meal plan were provided throughout the session	Cooking demo: provided nutritional value and tips/variations by a dietitian (15 min) Lecture (45 min) Group activity: Zoom breakout room discussion and group presentation (30 min)
7	Lecture (45 min) Healthy snacks tasting (15 min) Group activity (30 min)	Additional physical activity session (yoga training) was added	Cooking demo: provided nutritional value and tips/variations by a dietitian (15 min) Lecture (45 min) Group activity: exercise training (30 min)
8	Healthy snacks tasting (15 min) Lecture (45 min) Group activity (15 min) Sign-up for mammography event, sharing reflections, announcement of follow up sessions (15 min)		Cooking demo: provided nutritional value and tips/variations by a dietitian (15 min) Lecture (45 min) Group activity: BSE demonstration (15 min) Sign-up for mammography event, sharing reflections, announcement of follow-up sessions (15 min)

## Discussion

Although many BC prevention programs have been established and studied, few programs have accommodated the cultural, linguistic, and social needs of ethnic minorities. Existing BC prevention programs designed to address KA women' cultural and linguistic needs have generally focused on cancer screening behaviors, such as adherence to mammography guidelines, BC awareness, knowledge, and attitude or intention regarding BC screening uptake [27, 28]. They lack intervention protocols targeting lifestyle behavioral modification to address BC risk among KA women. A recent systematic review regarding KA women' health service utilization found that interventions targeting multiple factors were strongly effective in encouraging KA women to utilize health services for cancer screening [10]. The KBCRRP was developed by incorporating predisposing, enabling, and reinforcing factors with multicomponent strategies to improve adherence to mammography guidelines. To provide consistent support and reinforcement to change BC screening behavior among KA women, it is important to facilitate communication through reminders, incentives, and ethnic mass media, and to reduce structural barriers by providing language support, easy access to mammograms, support making appointments, and reduction of out-of-pocket costs [10, 29].

After feasibility testing of the KBCRRP, the program was modified according to participants' feedback based on a satisfaction survey and interview. We planned to implement the modified KBCRRP to a larger population. However, due to the COVID-19 outbreak, in-person research activities except for urgent need had been suspended, and the NYC community site was closed for a few months. The KBCRRP was successfully adapted to a virtual format to deliver the BC prevention program to KA women during the pandemic. Virtual delivery of group-based education was a feasible and acceptable alternative during COVID-19 to overcome social distancing. An unexpected benefit was that it enabled participants living far from NYC to participate in the program without commuting to the community center during the pandemic. Participant recruitment and retention during the pandemic was successful, reflecting the strong needs of KA women. Collaboration with community organizations serving the target population, with expertise, resources, and community engagement strategies is the key to developing and sustaining a successful community-based educational program.

This study has several limitations. As a feasibility test of an educational program with few participants, its findings may be limited due to the small sample size. Further study is needed to test the effectiveness of the program with a more robust research design and a larger sample. In addition, the

use of a convenience sample limits generalizability, and up to 6 months of follow-up to measure the effectiveness of the intervention may not be sufficient to reflect significant changes in lifestyle and BC screening behaviors. Future studies are recommended to support longitudinal designs to examine whether participants maintain a healthy lifestyle over time.

These limitations are outweighed by the study's strengths. This novel educational program was developed through collaboration between an academic organization having research and content expertise and a community-based organization that has served the Korean community for decades with expertise on the study population and community engagement strategies. Compared to other educational programs, KBCRRP was specifically intended to address traditional Korean health beliefs and tailored for BC risk reduction for the KA population. In addition, it uses various effective literature-based strategies to reduce structural and cultural barriers for BC screening, and uses innovative approaches, such as smartphone apps, to change health behaviors. Using smartphone applications for a virtual education is feasible for KA women due to a high smartphone ownership rate. The use of the "Kakao Talk" app, the most popular communication app among the KA population, was especially helpful to send messages, educational materials, and reminders, to encourage healthy lifestyles, and to retain study participants over the 6 months of the program.

## Conclusion

This paper provided a detailed account of program development, implementation, and modification based on a preliminary evaluation of KBCRRP's feasibility and efficacy. As a lifestyle change program, it was tailored for BC risk reduction in a group of overweight or obese KA women aged 40 or more living in NYC. Ease of recruitment and low attrition rates demonstrated the feasibility of the educational program. Positive feedback from participants and their reported behavioral changes in their lifestyles demonstrated the efficacy of the educational program. In addition, to reduce structural and cultural barriers, the KA women who participated in our program, members of a socioeconomically vulnerable population in NYC, had the opportunity to receive a free mammogram. As the COVID-19 pandemic continues and in view of our implementation modifications in a virtual format, the next step for KBCRRP is to test whether virtual group education is effective in producing desired outcomes.

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Ethical Approval, Consent to Participate, and Consent for Publication.

This protocol was reviewed and received approval from our institutional review board (CUNY-UI IRB: #2019–0273). Informed consent for participation and publication was obtained from all participants.

## Declarations

**Conflict of Interest** The authors declare no competing interests.

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