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Educational Intervention Targeting Breast Cancer Knowledge and Awareness Among Women in Cusco, Peru: A Pre- Post-Test Intervention

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Abstract

Educational Intervention Targeting Breast Cancer Knowledge and Awareness Among Women in Cusco, Peru: A Pre- Post-Test Intervention

By Sloan R. Oliver

Breast cancer is the most common cancer diagnosis worldwide and the second leading cause of cancer death for Peruvian women. Increased adverse effects and mortality from breast cancer in Latin America, and in Peru specifically, are in part caused by delayed diagnosis and treatment. In Peru, 50-75% of breast cancer diagnoses have already progressed to phase III or IV. To address this disparity, a pre- post-test intervention was conducted by a group of United States based researchers in collaboration with CerviCusco, a Peruvian non-profit organization committed to improving the health and quality of life of Peruvian women through primary and secondary cancer prevention, to obtain baseline data on breast cancer knowledge and awareness for women in Cusco, Peru and evaluate the effectiveness of an educational intervention (a 2.5-minute animated video and pamphlet). The survey instrument, BreastCAM, was adapted for cultural relevancy and translated to be used for data collection. Seventy-five self-identifying adult women who understood Spanish or English were recruited for the pre-test, and 31 were retained for the intervention and post-test. Results indicated that knowledge and awareness significantly increased in relation to risk factors (p-value=0.017) and confidence in self-breast examinations (p-value=0.001), but not early warning signs (p=0.10) and local resource utilization (p-value=0.246). The results of this study, limited in generalizability, provide baseline data on knowledge and awareness to inform future interventions with our partner organization and others. The study also validates the use of the educational video and pamphlet to inform on risk factors of breast cancer. Results indicate a need to improve access to local resources and educate on early warning signs differently. Closing the gap in knowledge and awareness in the population is the first step to reducing the disparity in breast cancer mortality that is fueled by systemic and structural barriers to accessing and utilizing health care.

Key Words: education, breast cancer, women, knowledge, awareness, Peru, early detection, risk, health, public health

301 Words

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Chapter One: Introduction

Introduction and Rationale

Breast cancer is a global health concern, impacting women and men everywhere. Female breast cancer is the most common cancer worldwide, with 11.7% of all cancer diagnoses (Sung et al., 2021). In 2019, 2.66% of all female deaths around the globe were caused by breast cancer, up from 1.98% in 2000 (Institute for Health Metrics and Evaluation, 2019). The trend of increasing breast cancer rates is continuing globally (Justo et al., 2013; Matsumoto et al., 2020).

Breast cancer is global, but incidence, survival, and many other factors differ between lower- and middle-income countries (LMICs) and higher-income countries (HICs). The Central and South American region has undergone an epidemiological and demographic transition brought about by rapid economic growth, and it is now experiencing a high burden of breast cancer (Sibio et al., 2016). LMICs have an increasing burden of cancers compared to HICs, represented by a much higher death rate (Jerônimo et al., 2017; Momenimovahed & Salehiniya, 2012; Sung et al., 2021; Torre et al., 2012). HICs account for half of worldwide breast cancer cases yet, only 38% of the deaths (Torre et al., 2012); LMICs represent half of the cases and 62% of the deaths (Torre et al., 2012; Vieira et al., 2017). This higher mortality associated with the disease is correlated to several systemic, cultural, and individual level practices and predispositions (Momenimovahed & Salehiniya, 2012).

In Latin America, there are an estimated 1.4 million new cancer cases and 670,000 cancer deaths each year (Nuche-Berenguer & Sakellariou, 2019). Breast cancer is the most commonly diagnosed cancer and the leading cause of cancer death in Latinas (Hurtado-de-Mendoza et al., 2019). The cancer mortality rates in Latin America are twice that of HICs (Strasser-Weippl et al.,

2015). The international benchmark for breast cancer survival is 85%; in Latin America, the survival benchmark does not exceed 70% (Justo et al., 2013).

Multiple studies in Latin America cite shortages in knowledge and awareness of breast cancer risk and early detection methods. In a study where 18 women undergoing breast cancer treatment were interviewed in Brazil, the majority of women (77.8%) detected their cancer through self-breast examination. While these women utilized this early detection method, researchers indicated that they did not perform the self-examination correctly, highlighting a need for increased knowledge on relevant steps and procedures. Older women in the study were found to perform breast self-examinations more often, and higher levels of schooling were correlated with greater knowledge of breast self-examination (Silva & Ruil, 2011). Results of another study that included 393 women in the city of Dourados, Brazil, indicated that while 86.5% of women had received some information on breast cancer, the risk factors for breast cancer were known by only 54.2% of the women (Bastiston et al., 2011). Of the 54.2% of women who knew risk factors, 28.5% knew one risk factor and 2.8% knew four risk factors (Bastiston et al., 2011). Analysis revealed that knowledge of risk factors was associated with family history ($p=0.004$) and years of schooling ($p=0.01$) (Bastiston et al., 2011). Lastly, out of the women who indicated knowing risk factors, 52.2% took preventative action (Bastiston et al., 2011). Findings of Bastiston et al. (2011) indicate that the majority of knowledge on breast cancer is on early detection, specifically breast self-examination, and in this population, risk factors are not often addressed in health education campaigns. Jerônimo et al. (2017), in a systematic review of Latin American literature, found that the studies in Latin America were focused on early detection, specifically breast self-examination, when addressing or measuring breast cancer awareness and knowledge, compared to other risk or preventative factors.

In Peru, the country where this work was focused, breast cancer is the second most common cancer diagnosis among Peruvian women (Matsumoto et al., 2020). In Peru, there are 4-to-5-month delays of presentation to doctor to receive a diagnosis; delays longer than 12 weeks are considered to affect stage and consequentially outcomes and survival (Amadou et al., 2014; Goss et al., 2013). In 2017, 75% of the breast cancer diagnoses in Peru had already progressed to stage III or IV (Duggan et al., 2017). Many of the preventable deaths from breast cancer can be attributed to delayed diagnosis and lack of primary prevention (Justo et al., 2013; Amadou et al., 2014).

Primary prevention is noted as the most effective prevention strategy for all cancers (Amadou et al., 2014). While cancer mortality has dropped over the years due to secondary prevention, incidence rates have risen due to a lack of primary prevention (White et al., 2020; Xu et al., 2021). Secondary prevention of breast cancer at the individual or population level centers on early detection and subsequent treatment to improve outcomes and reduce mortality (Sung et al., 2021). Early detection, through self-examinations, clinical breast examinations, and adherence to regular screenings, is key to diagnosis and improving survival when mammographic diagnosis is not feasible, but many women are unaware of these resources (Confortini & Krong, 2015; Vieira et al., 2017). Mammography services are not cost-free and are highly inaccessible in Peru (Jerônimo et al., 2017; Sibio et al., 2016). Plan Esperanza, a Peruvina national cancer control program, was meant to increase accessibility to early detection services such as clinical breast exams and mammographies (Mendoza-Cervantes et al., 2017). These intentions aside, less than 20% of the eligible population in Peru has received a mammography in their lifetime (Matsumoto et al., 2020). Goss et al. (2013) identified health care costs, health care infrastructure, and delays in diagnostic testing and intervention once cancer is detected are some

of the most influential systemic barriers to breast cancer screening. Nuche-Berenguer & Sakellariou (2019) concluded that low income, low education level, lack of health insurance, and single marital status were all found to be determinants of underuse of breast and cervical cancer screening services in Latin America. Similar to the whole of Latin America, Peru faces many barriers to breast cancer screening. The centralization of health care services is a barrier to access (Strasser-Weippl et al., 2015). There are 55 mammography machines in Peru, and they are centered in metropolitan areas; this is much less than is needed for adequate coverage of the population (Bain et al., 2018). To increase service screening utilization, efforts are needed outside of the city centers (Matsumoto et al., 2020). Because screening is known to be an effective tool in reducing deaths from breast cancer, accessible and effective screening services need to be established and utilized (Nuche-Berenguer & Sakellariou, 2019).

The right to health is specifically cited in multiple international human rights instruments (United Nations, 1948; United Nations, 1966; World Health Organization, 2017). As a member state of the United Nations, Peru has obligations to ensure the rights of citizens and adopt and apply legal and institutional frameworks to facilitate the enjoyment of all human rights (United Nations, 1948). The inability to obtain adequate primary and secondary prevention of adverse breast cancer outcomes violates an individual's right to health. Specifically, the inability to access health services is a direct violation of Article 25 of the Universal Declaration of Human Rights (United Nations, 1948).

Problem Statement

There is a high rate of breast cancer among Peruvian women (Zafra-Tanaka et al., 2020). With evidence that primary prevention and early detection are the most effective breast cancer

prevention and methods to reduce mortality, interventions utilizing these methods to further the public health of communities are vital. If detected early, treatments for breast cancer are known to be highly effective (World Health Organization, 2021). In Peru, 57% of women diagnosed with cancer are diagnosed with stage III and IV disease, which leads to increased mortality (Bain et al., 2018). Within this population, there was no baseline breast cancer awareness data available for researchers to use when developing interventions and programs. A group of researchers, Matsumoto et al. (2020), began a novel campaign to increase secondary prevention service utilization for breast cancer in Cusco, Peru but did not collect baseline awareness data from women. To offset this gap, our study was designed to target specific gaps in the population's breast cancer knowledge as well as reinforce it in the areas of early warning signs, frequency of self-examinations, local resource utilization, and risk factors. With valid baseline data, educational and prevention interventions can be developed to reduce breast cancer-associated mortality and reduce the disparity in breast cancer mortality that Peru and other countries in Lain America experience.

Purpose Statement

There was a need to identify baseline breast cancer awareness among women in Cusco, Peru, in order for appropriate and effective educational interventions to be developed and disseminated throughout the population. To fill this gap in knowledge, a validated breast cancer awareness survey instrument, BreastCAM (Linsell et al., 2010; Rakkapao, et al., 2016; Al-Khasawneh, et al., 2016), was adapted to ensure contextual and cultural relevance and used in this study. The overarching purpose of the research study was to identify baseline breast awareness of breast cancer related to early detection methods and risk factors of breast cancer

through the use of the adapted BreastCAM, as well as analyze the effect of a culturally sensitive educational intervention on knowledge and awareness.

Objectives

Guiding this research were four objectives: (1) Translate the Breast CAM tool into Spanish (although this tool has been validated in various languages, Spanish is not one), revise the instrument for cultural relevance, and deploy the survey to women in Cusco, Peru. (2) Collect, analyze, and interpret baseline breast cancer awareness data from women in Cusco, Peru. (3) Develop culturally sensitive educational materials, including an infographic handout and public service announcement to raise breast cancer awareness. (4) Evaluate the effectiveness of the education intervention in raising breast cancer knowledge and awareness by comparing pre-test to post-test data.

Significance Statement

Early detection of breast cancer is the primary factor in survival (World Health Organization, 2021). Education and access to resources and screening are vital for rates of early detection to rise (Nuche-Berenguer & Sakellariou, 2019; Sung et al., 2021). Data gathered through this research has been and will continue to be directly used to create and improve upon educational and primary prevention interventions to reduce breast cancer mortality and increase early detection in Cusco, Peru. Programs done by governmental and nongovernmental agencies can utilize these data to inform evidence-based interventions.

This work is embedded in rights-based framework to health and health care access. The right to health is specifically cited in multiple international human rights instruments. As a

member state of the United Nations, Peru has obligations to ensure the rights of citizens and adopt and apply legal and institutional frameworks to facilitate the enjoyment of all human rights (United Nations, 1948). The inability to obtain adequate primary and secondary prevention of adverse breast cancer outcomes violates an individual's right to health. Specifically, the inability to access health services is a direct violation of Article 25 of the Universal Declaration of Human Rights (United Nations, 1948).

This research creates a basis for work that can prioritize Peruvian women without adequate access to screening and early detection programs, such as Indigenous women and those in rural areas. It also offers data to inform breast cancer prevention efforts in these populations. Through the rights-based approach, equity in health can be promoted and, in time, enjoyed by Peruvians.

Definition of Terms

- Awareness – To have awareness is to have an understanding of one's health needs and future potential vulnerabilities.
- Primary Prevention – Primary prevention is to intervene in a health condition before it occurs.
- Secondary Prevention – Secondary prevention is to intervene in a health condition before the onset of symptoms or through early detection of a condition, such as through screening.
- Breast Cancer Early Detection – Early detection of breast cancer is characterized by the detection and timely treatment of breast cancer in a timeframe that does not impact survival outcomes, before stage III of the disease.

- Breast Cancer Late Detection – Late detection of breast cancer leads to adverse outcomes and less survival. It is characterized by the detection and treatment after the disease has progressed to stage III or IV.
- Intervention – Actions taken by researchers, public health professionals, nurses, etc., that aim to improve or protect the health status of individuals, communities, or systems (Minnesota Department of Health, 2019).
- Health Education – Health education comprises consciously constructed opportunities for learning involving some form of communication designed to improve health literacy, including improving knowledge, and developing life skills which are conducive to individual and communities (World Health Organization, n.d.).
- Woman – Any adult person self-identifying as female.
- Lower- and middle-income countries – Gross national income (GNI) per capita is the main indicator used by the World Health Organization to categorize countries. Lower- and middle-income countries' GNI ranges from less than $1,036 to $12,535 (Fleming, S., 2022). In this paper, language such as developing countries, less developed countries, transitioning countries, and terms of the like were condensed to the category of lower- and middle-income countries.
- Higher-income countries – Gross national income (GNI) per capita is the main indicator used by the World Health Organization to categorize countries. High-income countries' GNI is greater than $12,535 (Fleming, S., 2022). In this paper, language such as more developed, more economically developed, transitioned, and terms of the like were condensed to the category high-income countries.

Chapter Two: Literature Review

Breast Cancer Burden

Global

Breast cancer is a global health concern, impacting women and men everywhere. Female breast cancer is the most common cancer worldwide (Chávarri-Guerra et al., 2012), constituting 11.7% of all cancer diagnoses (Sung et al., 2021). In 2019, 2.66% of all female deaths around the globe were caused by breast cancer, up from 1.98% in 2000 (Institute for Health Metrics and Evaluation, 2019). Globally, female breast cancer is the most common cancer diagnosis in 2020, with an estimated 2.3 million new cases (Sung et al., 2021; Xu et al., 2021), exemplifying how there is an upward trend in new cases.

Female breast cancer accounts for 1 in 4 cancer cases and 1 in 6 cancer deaths, ranking first for incidence in the vast majority of countries (159 of 185 countries) and mortality in 110 countries (Sung et al., 2021). Xu et al. (2021) used vital registration, verbal autopsies, and cancer registries to determine that compared to 1990, global deaths of breast cancer increased by 83.95% and incidence rates increased 128.32% in 2019 (Xu et al., 2021). Breast cancer is global, but incidence, survival, and a multitude of other factors differ between lower- and middle-income countries (LMICs) and higher-income countries (HICs).

LMICs vs HICs

It has been historically assumed that cancer is a problem in high-income and industrialized countries (Confortini & Krong, 2015), but this is no longer true (Jerônimo et al., 2017). Oncological patterns have changed in the last decade, and cancers typically found in HICs, such as breast and colon cancer, are now prevalent in LMICs (Zafra-Tanaka et al., 2020).

LMICs are currently facing a double burden of disease, where they are confronted with high rates of communicable and noncommunicable diseases in the population (Preedy et al., 2010).

The GLOBOCAN refers to LMICs as “transitioning countries.” Analysis of 2020 GLOBOCAN data by Sung et al. (2021) reveals that incidence rates of breast cancer are increasing fast in South American, African, and Asian transitioning countries. The incidence of breast cancer is also rising in HICs (Sung et al., 2021). Incidence rates and mortality from breast cancer are expected to continue to rise (Justo et al., 2013; Matsumoto et al., 2020); the disparity between HICs and LMICs in terms of breast cancer mortality is also expected to widen (Matsumoto et al., 2020).

LMICs have an increasing burden of cancers as compared to HICs, represented by a much higher mortality rate (Jerônimo et al., 2017; Momenimovahed & Salehiniya, 2012; Sung et al., 2021; Torre et al., 2012). HICs account for half of worldwide breast cancer cases, yet only 38% of the deaths (Torre et al., 2012). LMICs are left representing half of the cases and 62% of the deaths (Torre et al., 2012; Vieira et al., 2017). The higher mortality associated with breast cancer is correlated to several systemic, cultural, and individual level practices and predispositions (Momenimovahed & Salehiniya, 2012).

Compared to global north countries, breast cancer is diagnosed in LMIC women at later stages (Confortini & Krong, 2015). Despite advances in medicine, breast cancer is commonly diagnosed in the advanced stages for women in LMICs (Vieira et al., 2017); this is in contrast to Northern Europe, where only 10% of breast cancer cases are diagnosed in stage III or IV (Justo et al., 2013). One study, focused on Asia, Latin America, the Middle East, and North Africa, found that more industrialized nations have greater access to early detection and treatment for breast cancer (Bridges et al., 2011). Health care systems in LMICs tend to have fewer resources

available for early detection, diagnosis, and treatment programs for breast cancer, which contributes to an increased mortality (Bridges et al., 2011; Vieira et al., 2017). If detected early, treatments for breast cancer are known to be highly effective (World Health Organization, 2021).

In 2009, only 5% of global cancer spending was directed towards LMICs (The Lancet, 2009). Policy and spending are known to increase favorable outcomes from breast cancer. Mendoza-Cervantes et al. (2019) posit that in LMICs, issues surrounding breast and cervical cancer intersect at human rights and health policy.

Latin America

Latin America underwent an epidemiologic shift because of changes in the population, such as lifestyle changes, later reproductive age, and longer life expectancy (Bain et al., 2018; Justo et al., 2013). Populations living longer will experience a higher incidence of breast cancer (Justo et al., 2013). Also, the Central and South American region has undergone an epidemiological and demographic transition brought about by rapid economic growth, and it is now experiencing a high burden of breast cancer (Sibio et al., 2016).

In Latin America, there are an estimated 1.4 million new cancer cases and 670,000 cancer deaths each year (Nuche-Berenguer & Sakellariou, 2019). Breast cancer is the most commonly diagnosed cancer and the leading cause of cancer death in Latinas (Hurtado-de-Mendoza et al., 2019; Pan American Health Organization, 2018). For Latin America, specifically, breast cancer is the most common cancer diagnosis among women (Amadou et al., 2014). In Latin America, the rates of breast cancer mortality are rising, juxtapose to the decreasing mortality rates of cervical cancer (Nigenda et al., 2016).

The cancer mortality rates in Latin America are twice that of HICs (Strasser-Weippl et al., 2015). The international benchmark for breast cancer survival is 85%; in Latin America, the

survival benchmark does not exceed 70% (Justo et al., 2013). Nuche-Berenguer & Sakellariou (2019) also estimate, based on the results of a systematic review, that there will be a 78% increase in cancer incidence and a 93% increase in cancer mortality in Latin America by 2040. With similarities to the broader LMIC statistics, the mortality statistic is in part because of screening accessibility, screening rates, and delays in diagnosis in Latin America (Amadou et al., 2014; Confortini & Krong, 2015; Nuche-Berenguer & Sakellariou, 2019). For example, "the proportion of in-situ breast cancer in Latin American countries rank between 4 to 6%, while for North America it is 17.3%, and the 5-year survival rates from 2010 to 2014 varied between 50.2% and 89.8% in LA, and from 88.2% to 90.2% in North America" (Zafra-Tanaka et al., 2020).

In Latin America, there are not enough high-quality cancer registries to accurately represent the cancer incidence of a given country (Villarreal-Garza et al., 2013). A cancer registry is utilized to collect and analyze detailed cancer data (Centers for Disease Control and Prevention, 2021). These registries are then used to understand incidence, mortality, treatment, and results of prevention/detection programs (Centers for Disease Control and Prevention, 2021). The percentage of the population represented in population-based registries is demonstrably higher in North America and Europe, 83% and 32% respectively, compared to Latin America, which has an estimated 6% inclusion (Villarreal-Garza et al., 2013). As of 2013 in Latin America, only Argentina, Brazil, Chile, Colombia, Cuba, Costa Rica, Ecuador, and Peru have developed cancer registries (Villarreal-Garza et al., 2013). The lack of trends data impacts the ability of Latin American researchers and government parties to develop and implement cancer prevention and screening programs (Goss et al., 2013).

The subsequent sections of the literature review will focus mostly on Latin America and Peru, the region and country where our work was focused.

Primary Prevention of Breast Cancer

Primary prevention is noted as the most effective cancer prevention strategy (Amadou et al., 2014). While cancer mortality has dropped over the years due to secondary prevention, incidence rates have risen due to a lack of primary prevention (White et al., 2020; Xu et al., 2021). The primary prevention of breast cancer is a public health priority for Latin America (Amadou et al., 2014). When primary prevention is mentioned in public health literature, it usually does not focus on "transforming environments and structures implicated in the etiology of breast cancer" (Confortini & Krong, 2015). Within primary prevention models, there is a focus on individual-level behaviors as the causes for increased incidence and death due to noncommunicable diseases, including breast cancer, in LMICs. Because of this, many public health interventions target only individual-level behavior rather than structural or systemic barriers to health and health care (Confortini & Krong, 2015). Working to change environmental factors and predispositions as well as health policy is just as, if not more, important than focusing on altering individual behaviors for long-term cancer reduction.

Countries in Latin America range in stages of policy implementation of breast cancer reduction strategies. Nigenda et al. (2016) states that because of prevention methods set in place by national and local policies, cervical cancer mortality rates are dropping in Latin America. While breast cancer is not caused by an infectious agent, as is cervical cancer, lessons can be learned from this decrease in mortality.

There are barriers to implementing quality primary prevention policies, such as a lack of comprehensive cancer registries (Strasser-Weippl et al., 2015). Certain policies can mitigate the present barriers. While still focused on individual-level behaviors, many Latin American countries implemented national policies regarding healthy lifestyles, where tobacco use, obesity, and harmful alcohol use were disincentivized (Strasser-Weippl et al., 2015). In the Latin American and Caribbean region, the proportion of policies based in the primary prevention of cancer increased 5-10% from 2012-2015 (Strasser-Weippl et al., 2015).

Within public health interventions, there should be an incorporation of theory (National Cancer Institute, 2005). With the socio-ecological model, multiple levels of influence, at the individual and societal levels, need to be targeted in order to have a successful program (McLeroy et al., 1988); this may involve targeting individual behavior, community culture, and systemic barriers and policy. The socio-ecological model poses that changes in the social environment can affect the individual and vice versa (McLeroy et al., 1988). Therefore, the inclusion of a variety of factors is essential to influencing broad behaviors. Focusing on individual behavior as primary prevention will be less effective than when the intervention is integrated into other societal structures (White et al., 2020).

Primary prevention strategies identified in the literature skew towards physical activity, limited alcohol consumption, and the promotion of a healthy diet (Amadou et al., 2014). White et al. (2020) describes primary prevention measures as structural and identifies routes of intervention at the population level to reduce cancer incidence. Researchers suggest that thoughtful urban planning and zoning can transform the built environment into an environment that encourages and facilitates physical activity; in turn, cancer incidence would be reduced (White et al., 2020). Another determinant of cancer incidence is exposure to carcinogens; White

et al. (2020) suggest that green chemistry should develop safe alternatives to be used in the workplace and in consumer products to eliminate those pathways. There are many ways larger institutions and structures can reduce cancer incidence, and there is a growing body of literature that suggests the environmental factors have a distinct link to increasing cancer incidence (White et al., 2020).

Secondary Prevention of Breast Cancer

Secondary prevention of breast cancer, at the individual or population level, centers on screening, early detection, and subsequent treatment to improve outcomes and reduce mortality (Nuche-Berenguer & Sakellariou, 2019; Sung et al., 2021). Early detection, through self-examinations, clinical breast examinations, and adherence to regular screenings, is key to diagnosis and improving survival when mammographic diagnosis is not feasible, but many women are unaware of these resources (Confortini & Krong, 2015; Vieira et al., 2017).

Status of Breast Cancer Screening

Mammography is an effective tool for women aged 50 years and older to be screened for breast cancer (Goss et al., 2013). However, the overall effectiveness and reliance of mammography services for population-based screening has been put into question in Latin American countries such as Peru (Posso et al., 2015). Mammography services are needed but cannot be relied upon as the sole screening method. WHO 2014 country profiles show 54% of countries report having a national mammography policy (Strasser-Weippl et al., 2015). In Latin America, 4.73 per 100,000 inhabitants have access to mammographic equipment, with a range of 0.42 in Paraguay to 12.97 in Saint Vincent and the Grenadines (Goss et al., 2013). Also, Goss et

al. (2013) found that up to 20% of the mammography equipment in Latin America requires repair.

Jerônimo et al. (2017) state that in all Latin American countries, except for Peru, women have access to clinical breast examinations through the public and private sectors. Delayed cancer diagnoses in Latin America are in part caused by screening programs that are not equitably accessible (Nuche-Berenguer & Sakellariou, 2019). In Latin America, only 5-10% of breast cancer diagnoses are in the first stage of the disease (Goss et al., 2013). Also, only 20% of the eligible population in Latin America utilizes breast cancer screening services (Goss et al., 2013).

Barriers

There is a wide assortment of barriers to screening (mammography and clinical breast exam) that affect the early diagnosis of breast cancer in Latin America (Goss at al., 2013; Jerônimo et al., 2017; Nuche-Berenguer & Sakellariou et al., 2019; Strasser-Weippl et al., 2015). Systemically, the structures of health care systems and health care financing have been identified as barriers to breast cancer screening (Goss et al., 2013). Health care costs, health care infrastructure, and delays in diagnostic testing and intervention once cancer is detected are some of the most influential systemic barriers to screening identified by Goss et al. (2013). In many Latin American countries, the health care system is disintegrated, and there are different sources of care with ranging costs (Strasser-Weippl et al., 2015). Jerônimo et al. (2017) stated that within seven Latin American countries (Bolivia, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Panama, and Paraguay), mammography is not available through public services, only through the private health sector. One example of the population having very limited access to mammograms is Peru. While Peru is setting intentions and practices into place

to improve mammography access, less than 20% of the eligible population has received a mammography in their lifetime (Matsumoto et al., 2020). In summary, health care infrastructure to perform necessary prevention, diagnosis, and treatment of breast cancer is not homogenously available in Latin American communities (Goss et al., 2013).

Individually, there are numerous barriers to screening. Nuche-Berenguer & Sakellariou (2019) concluded that low income, low education level, lack of health insurance, and single marital status were all found to be determinants of underuse of breast and cervical cancer screening services in Latin America. A lack of knowledge and awareness of breast cancer risk factors and early warning signs can be a barrier to receiving timely care, which in turn leads to worse outcomes (Bouya et al., 2018).

Breast Cancer Knowledge and Awareness

Status in Latin America and Other LMICs

Two studies were identified outside of Latin America that evaluate the level of knowledge and/or awareness of breast cancer in their population.

A systematic review of the literature, conducted by Nigerian researchers, assessed the levels of breast cancer knowledge and awareness, with 80.6% of women in the sample being aware of breast cancer in general, 60.1% of breast self-examination, and 73.9% of the importance of early detection (Olayide et al., 2017). Olayide et al. (2017) noted these knowledge and awareness levels as very high, having recently increased in Nigeria. Regardless of the seemingly high rates of knowledge and awareness, later presentation of breast cancer to medical practitioners remains (Olayide et al., 2017). This highlights the need to not only further increase

knowledge and awareness rates but to also investigate other possible contributing factors or barriers to early detection of breast cancer and presentation to medical practitioners.

Solikhah et al. (2019) conducted a large-scale population-based study in Indonesia to assess levels of breast cancer awareness in relation to risk factors, barriers, attitudes, and health behaviors related to breast cancer screening. Similar to Peru, Indonesia is an LMIC with large rural populations, and breast cancer is a very commonly diagnosed cancer in both countries (Matsumoto et al., 2020; Solikhah et al., 2019). The study conducted by Solikhah et al. (2019) included 856 Indonesian women aged 18-80 years old; participants completed a self-administered questionnaire. Results did not report statistics of awareness levels but rather the relationship between awareness levels and other factors (Solikhah et al., 2019). Education level had no significant impact on awareness level, but those in rural areas were more likely to have greater awareness than those in urban areas (Solikhah et al., 2019).

Multiple studies in Latin America cite the shortage of knowledge and awareness of breast cancer risk and early detection methods. In a study where 18 women undergoing breast cancer treatment were interviewed in Brazil, the majority of women (77.8%) detected their cancer through self-breast examination (Silva & Ruil, 2011). While these women utilized this early detection method, researchers indicated that they did not perform the self-examination correctly, which indicates a need for increased knowledge on relevant steps and procedures (Silva & Ruil, 2011). Older women in the study perform breast self-examinations more often (Silva & Ruil, 2011). Also, Silva & Ruil (2011) found a relationship between knowledge of breast self-examination and higher levels of schooling, where more schooling indicated greater knowledge and more accurate practice.

Bastiston et al. (2011) recruited 393 women in the city of Dourados, Brazil to participate in an interview and questionnaire regarding awareness and practices for the risk factors of breast cancer and demographic variables. Results of the study indicate that 86.5% of women had received some information on breast cancer and the risk factors for breast cancer are known by 54.2% of the women (Bastiston et al., 2011). Of the 54.2% of women who knew risk factors, 28.5% knew one risk factor and 2.8% knew four risk factors (Bastiston et al., 2011). Analysis revealed that knowledge of risk factors was associated with family history ($p=0.004$) and years of schooling ($p=0.01$) (Bastiston et al., 2011). Lastly, out of the women who indicated knowing risk factors, 52.2% took preventative action (Bastiston et al., 2011). Findings of Bastiston et al. (2011) indicate that the majority of knowledge on breast cancer is on early detection, specifically breast self-examination, and in this population, risk factors are not often addressed in health education campaigns.

Overall, Jerônimo et al. (2017) found that the literature in Latin America was focused on early detection, specifically breast self-examination, when addressing or measuring breast cancer awareness and knowledge rather than other risk or preventative factors.

Interventions to Promote Health Awareness

Cancer communication through visual aids, plain language, and the narrative format is documented as the preferred methods for cancer knowledge, awareness, and behavior change interventions in the Latina community (Borrayo et al., 2017; Hurtado-de-Mendoza et al., 2019). A study done by Borrayo et al. (2017) established this by randomly assigning three groups of Spanish-speaking Latinas ($N=141$) to one of three interventions, an education-entertainment narrative video, a non-narrative educational video, or printed educational materials. An education-entertainment narrative video utilizes the format of popular media to convey an

educational message and relies on social modeling for behavior change (Borrayo et al., 2017). Researchers identified a gap in the literature regarding the comparison of education-entertainment narrative videos to non-narrative interventions for breast cancer (Borrayo et al., 2017). The effectiveness of the intervention was measured with the following indicators: breast cancer knowledge, mammography self-efficacy, behavioral norms, and behavioral intentions to engage in mammography screening (Borrayo et al., 2017). Education-entertainment narrative videos were hypothesized to be effective because these messages reduce resistance to behavior change and knowledge through empathy with story characters and perceived involvement with the story (Borrayo et al., 2017). A pre- and post-test were used to evaluate the results of this study (Borrayo et al., 2017). For this study, each method disseminating education resulted in statistically significant gains (Borrayo et al., 2017). Though, the education-entertainment narrative video tested much higher in certain areas than the other two interventions, specifically when it came to mammography self-efficacy (Borrayo et al., 2017). This suggests that the narrative form of education is equal in effectiveness to the non-narrative format but has strengths where it is shown to be more effective.

Hurtado-de-Mendoza et al. (2019) developed a culturally targeted narrative video designed to improve outcomes of breast and cervical cancer in Latina women in the United States who are at risk of hereditary breast and ovarian cancer. Of the participants, 52.5% were El Salvadorian, and 15% were Peruvian. The 18-minute educational video aimed to elicit emotions, address knowledge gaps, and clarify common misconceptions related to hereditary breast and ovarian cancer and genetic counseling (Hurtado-de-Mendoza et al., 2019). Many of the knowledge and awareness items saw a significant increase after participants viewed the video, such as breast cancer genetics knowledge, genetic counseling knowledge, and the main

information knowledge scale (Hurtado-de-Mendoza et al., 2019). Researchers report that the narrative video changed misconceptions and knowledge gaps. The overall findings of this study suggest that the narrative form of video is effective in conveying health knowledge; this study is unique because it was also very effective in populations with lower health literacy (Hurtado-de-Mendoza et al., 2019). Increasing knowledge and awareness improves screening and early detection, which are proven secondary cancer prevention methods that can decrease mortality (Bouya et al., 2018).

Peruvian Context

Breast Cancer Burden

In Peru, the country in which our study was based, one fifth of deaths were caused by cancer between 2006 and 2013 (Zafra-Tanaka et al., 2020). Breast cancer is a leading cause of mortality for Peruvian women aged 15-49, only less deadly than cervical cancer in this population (Zafra-Tanaka et al., 2020). In Peru, breast cancer accounts for 10.5% of cancer incidence, 5.6% of cancer mortality in Peru (World Health Organization, 2021), and 2.58% of all female deaths (Institute for Health Metrics and Evaluation, 2019). Zafra-Tanaka et al. (2020) report that in Peru, breast cancer is the most frequent cancer in women and our results ranked it as the second cause of cancer death in adult women.

In Peru, there are 4-to-5-month delays in presentation to doctor to receive a diagnosis; delays longer than 12 weeks are considered to affect stage and consequentially outcomes and survival (Amadou et al., 2014; Goss et al., 2013). In 2017, 75% of the breast cancer diagnoses in Peru had already progressed to stage III or IV (Duggan et al., 2017). A separate review noted that 40-50% of all patients in Peru are diagnosed with metastatic phases III or IV (Justo et al., 2013).

Many of the preventable deaths from breast cancer can be attributed to delayed diagnosis and lack of primary prevention (Justo et al., 2013; Amadou et al., 2014).

Cancer Control Policies and Programs

Breast cancer must be addressed within a human rights and policy framework (Mendoza-Cervantes et al., 2017). Policy regarding health care and health care access is vital to achieving equity amongst the population, as health care access and utilization are essential to the early detection and treatment of breast cancer (Bridges et al., 2011; Vieira et al., 2017). Insurance access is key to health care utilization. Strasser-Weippl et al. (2015) identified that from 2008 to 2013, health insurance program affiliations rose from 53% to 65% in Peru.

A top priority of Peruvian cancer control policy is the reduction of breast and cervical cancer incidence (Mendoza-Cervantes et al., 2017). In 2012 the Peruvian government stated its support for a National Cancer Control Programs (NCCP), and in 2013, Peru launched the NCCP Plan Esperanza (Vidaurre et al., 2015). Peru is one of the few countries in Latin America that has developed and implemented an NCCP (Matsumoto et al., 2020; Strasser-Weippl et al., 2015). The goal of Peru's Plan Esperanza is to provide comprehensive coverage for cancer care to its most vulnerable populations as well as strengthen public sector initiatives for early detection and treatment (Vidaurre et al., 2015). Primary prevention was also noted as a priority, resulting in the passage of healthy lifestyle policies in Peru as they related to physical activity, smoking, and alcohol (Strasser-Weippl et al., 2015).

Coupled with the launch of Plan Esperanza was a government investment of $290 million to supplement treatment costs of those with lower income (Mendoza-Cervantes et al., 2017). Strasser-Weippl et al. (2015) report that as of December 2014, more than 106,000 patients with cancer were included in the Plan Esperanza, of whom 88,000 were treated at the National Cancer

Institute of Neoplastic Diseases in Lima, Peru. The out-of-pocket costs were reduced for these patients, from 58% in 2009 to 7% in 2014 (Strasser-Weippl et al., 2015), and the services were more accessible to low-income patients who had access to Lima. For the services to be fully accessible and the resources decentralized, cancer centers need to be established in rural areas. Plan Esperanza opened the first rural cancer clinic in 2015 (Strasser-Weippl et al., 2015). The centralization of services is still a prominent barrier to Peru's NCCP (Strasser-Weippl et al., 2015).

Screening and Early Detection

In Peru, 57% of women diagnosed with breast cancer are diagnosed with stage III and IV disease (Bain et al., 2018). The late diagnosis of breast cancer leads to poorer outcomes, less survival, and more expensive treatment (Bain et al., 2018).

Mammography services are not cost-free and are highly inaccessible in Peru (Jerônimo et al., 2017; Sibio et al., 2016). Plan Esperanza was meant to increase accessibility to early detection services such as clinical breast exams and mammographies (Mendoza-Cervantes et al., 2017). These intentions aside, less than 20% of the eligible population in Peru has received a mammography in their lifetime (Matsumoto et al., 2020). To increase service screening utilization, efforts are needed outside of the city centers (Matsumoto et al., 2020). Also, public education is an important component of early detection (Yip et al., 2008). Based on available resources, it was suggested that Peru prioritizes clinical breast exams for the early detection of breast cancer (Matsumoto et al., 2020; Yip et al., 2008).

Nongovernmental organizations have taken the initiative to bring breast cancer screening to underserved populations in Peru. One example is CerviCusco. CerviCusco is a nongovernmental organization that provides primary and secondary prevention services for

cervical cancer (Matsumoto et al., 2020) and is beginning breast cancer services based on previous success. Through community outreach, education, and engagement, CerviCusco is guiding women to have a clinical breast exam, and follow-up measures (such as an ultrasound) are necessary (Matsumoto et al., 2020).

Barriers to Screening

Similar to the whole of Latin America, Peru faces many barriers to breast cancer screening. As stated, the centralization of services is a barrier to access (Strasser-Weippl et al., 2015). There are 55 mammography machines in Peru, and they are centered in metropolitan areas; this is much less than is needed for adequate coverage of the population (Bain et al., 2018). An especially vulnerable population in Peru are Indigenous peoples. Indigenous peoples face an array of barriers, such as language, health literacy, and other cultural barriers, in addition to the ones experienced by the broader population (Strasser-Weippl et al., 2015). Health literacy is an extremely important factor to address in vulnerable populations. Those with low health literacy rates are known to have more worse health outcomes, higher health care costs, and a higher risk of mortality (Mazor et al., 2021). These negative outcomes relate directly to cancer prevention, as the impacted populations are less likely to undergo cancer screening and understand the risk of cancer (Mazor et al., 2012). Accurate health literacy statistics on the population is vital for the development of effective health education materials and screening services (Collins et al., 2019). Even with low literacy rates, there are effective intervention methods, such as narrative-style educational videos (Hurtado-de-Mendoza et al., 2019).

In summary, there are a variety of factors, including health care infrastructure, that affect one's ability to access necessary prevention, diagnosis, and treatment of breast cancer in Peru (Goss et al., 2013).

Health Care as a Human Right

International bodies are beginning to use the terminology "rights-based approach to health," which is grounded in the right to health (Gostin et al., 2020). The right to health is specifically cited in multiple international human rights instruments. The International Covenant on Economic, Social, and Cultural Rights Article 12 states, "The States Parties to the present Covenant recognize the right of everyone to the enjoyment of the highest attainable standard of physical and mental health." (United Nations, 1966). Article 25(1) of the Universal Declaration of Human Rights states that "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control." (United Nations, 1948). The WHO Constitution (1946) envisages "…the highest attainable standard of health as a fundamental right of every human being." (World Health Organization, 2017).

As a member state of the United Nations, Peru has obligations to ensure the rights of citizens and adopt and apply legal and institutional frameworks to facilitate the enjoyment of all human rights (United Nations, 1948). The inability to obtain adequate primary and secondary prevention of adverse breast cancer outcomes violates an individual's right to health. Specifically, the inability to access health services is a direct violation of Article 25 of the Universal Declaration of Human Rights. This is not the only instance of Peru violating the right to health. According to Amnesty International, Peru has the highest mortality per million due to COVID-19 (Amnesty International, 2022). The high deaths are in part due to the lack of hospital capacity and resources, such as oxygen (Amnesty International, 2022).

A rights-based approach to health and health care access, integrated through policy and programs, must prioritize those most in need first (World Health Organization, 2017). In this case, Peruvian women without access to screening and early detection programs would be prioritized, such as the indigenous and those in rural areas, as well as a broad initiative for primary prevention of breast cancer. Through the rights-based approach, equity in health can be promoted and, in time, enjoyed by Peruvians.

Chapter 3: Manuscript

Abstract

Breast cancer is the most common cancer diagnosis world-wide and the second leading cause of cancer death for Peruvian women. Increased adverse effects and mortality from breast cancer in Latin America, and in Peru specifically, is in part caused by delayed diagnosis and treatment. In Peru, 50-75% of breast cancer diagnoses have already progressed to phase III or IV. To address this disparity, a pre- post-test intervention was conducted by a group of United States based researchers in collaboration with CerviCusco, a Peruvian non-profit organization committed to improving health and quality of life of Peruvian women through primary and secondary cancer prevention, to obtain baseline data on breast cancer knowledge and awareness for women in Cusco, Peru and evaluate the effectiveness of an educational intervention (a 2.5-minute animated video and pamphlet). Seventy-five self-identifying adult women who understood Spanish or English were recruited for the pre-test, and 31 were retained for the intervention and post-test. Results indicated that knowledge and awareness significantly increased in relation to risk factors (p-value=0.017) and confidence in self-breast examinations (p-value=0.001), but not early warning signs (p=0.10) and local resource utilization (p-value=0.246). The results of this study, limited in generalizability, provide baseline data on knowledge and awareness to inform future interventions with our partner organization and others. The study also validates the use of the educational video and pamphlet to inform on risk factors of breast cancer. Results indicate a need to improve access to local resources and educate on early warning signs differently. Closing the gap in knowledge and awareness in the population is the first step to reducing the breast cancer mortality disparity that is fueled by systemic and structural barriers to accessing and utilizing care.

Introduction

Breast cancer is a global health concern, impacting women and men everywhere. Female breast cancer is the most common cancer worldwide, constituting 11.7% of all cancer diagnoses (Sung et al., 2021). In 2019, 2.66% of all female cancer deaths around the globe were caused by breast cancer, up from 1.98% in 2000 (Institute for Health Metrics and Evaluation, 2019). Female breast cancer accounts for 1 in 4 cancer cases and 1 in 6 cancer deaths, ranking first for incidence in the vast majority of countries (159 of 185 countries) and mortality in 110 countries (Sung et al., 2021). Breast cancer is global, but incidence, survival, and a multitude of other factors differ between lower- and middle-income countries (LMICs) and higher-income countries (HICs). Oncological patterns have changed in the last decade, and cancers typically found in HICs, such as breast and colon cancer, are now prevalent in LMICs (Zafra-Tanaka et al., 2020). In 2009, only 5% of global cancer spending was directed towards LMICs (The Lancet, 2009). Mendoza-Cervantes et al. (2017) posit that in LMICs, breast and cervical cancer are issues at the intersection of human rights and health policy.

LMICs have an increasing burden of cancers as compared to HICs, represented by a much higher mortality rate (Jerônimo et al., 2017; Momenimovahed & Salehiniya, 2012; Sung et al., 2021; Torre et al., 2012). HICs account for half of worldwide breast cancer cases, yet only 38% of the deaths (Torre et al., 2012); LMICs are left representing half of the cases and 62% of the deaths (Torre et al., 2012; Vieira et al., 2017). The higher mortality associated with breast cancer is correlated to several systemic, cultural, and individual level practices and predispositions (Momenimovahed & Salehiniya, 2012).

Despite advances in medicine, breast cancer is commonly diagnosed in the advanced stages for women in LMICs (Vieira et al., 2017); this is in contrast to Northern Europe, where

only 10% of breast cancer cases are diagnosed in stage III or IV (Justo et al., 2013). One study, focused on Asia, Latin America, the Middle East, and North Africa, found that more industrialized nations have greater access to early detection and treatment for breast cancer (Bridges et al., 2011). Health care systems in LMICs tend to have fewer resources available for early detection, diagnosis, and treatment programs for breast cancer, which contributes to an increased mortality (Bridges et al., 2011; Vieira et al., 2017). If detected early, treatments for breast cancer are known to be highly effective (World Health Organization, 2021).

Breast cancer is the most diagnosed cancer and the leading cause of cancer death in Latinas (Hurtado-de-Mendoza et al., 2019). For Latin America specifically, breast cancer is the most common cancer diagnosis among women (Amadou et al., 2014). The international benchmark for breast cancer survival is 85%; in Latin America, the survival benchmark does not exceed 70% (Justo et al., 2013). The cancer mortality rates in Latin America are twice that of HICs (Strasser-Weippl et al., 2015).

Breast cancer is a leading cause of mortality for women aged 15-49 in Peru, only less deadly than cervical cancer in this population (Zafra-Tanaka et al., 2020). Breast cancer accounts for 10.5% of cancer incidence and 5.6% of cancer mortality in Peru (World Health Organization, 2021). In Peru, there are 4-to-5-month delays between presentation to doctor and receiving a diagnosis; delays longer than 12 weeks are considered to affect stage and consequentially outcomes and survival (Amadou et al., 2014; Goss et al., 2013). In 2017, 75% of the breast cancer diagnoses in Peru had already progressed to stage III or IV (Duggan et al., 2017). A separate review noted that 40-50% of all patients in Peru are diagnosed with metastatic phases III or IV (Justo et al., 2013). Many of the preventable deaths from breast cancer can be attributed to delayed diagnosis and lack of primary prevention (Justo et al., 2013; Amadou et al., 2014).

Mammography services are not cost-free and are highly inaccessible in Peru (Jerônimo et al., 2017; Sibio et al., 2016).

To reduce cancer mortality, accessible and effective screening services need to be established and utilized as screening is known to be an effective tool in reducing deaths from breast cancer (Nuche-Berenguer & Sakellariou, 2019).

Health care costs, health care infrastructure, and delays in diagnostic testing and intervention once cancer is detected are some of the most influential systemic barriers to screening identified by Goss et al. (2013). Individually, there are numerous barriers to screening. Low income, low education level, lack of health insurance, and single marital status were all found to be determinants of underuse of breast and cervical cancer screening services in Latin America (Nuche-Berenguer & Sakellariou, 2019).

An especially vulnerable population in Peru are Indigenous peoples. Indigenous peoples face an array of barriers, such as language, health literacy, and other cultural barriers, in addition to the ones experienced by the broader population (Strasser-Weippl et al., 2015). In summary, there are a variety of factors, including health care infrastructure, that affect one's ability to access necessary prevention, diagnosis, and treatment of breast cancer in Peru (Goss et al., 2013).

The complexities of the disproportionate incidence of breast cancer and of related mortality in Peruvian women can be analyzed through a human rights framework. International bodies are beginning to use the terminology "rights-based approach to health," which is grounded in the right to health (Gostin et al., 2020). The right to health is specifically cited in multiple international human rights instruments (United Nations, 1966; United Nations, 1948; World Health Organization, 2017).

As a member state of the United Nations, Peru has obligations to ensure the rights of citizens and adopt and apply legal and institutional frameworks to facilitate the enjoyment of all human rights (United Nations, 1948). The inability to obtain adequate primary and secondary prevention of adverse breast cancer outcomes violates an individual's right to health.

A rights-based approach to health and health care access, integrated through policy and programs, must prioritize those most in need first (World Health Organization, 2017). Through the rights-based approach, equity in health can be promoted and, in time, enjoyed by Peruvians.

Methods

Study Design

A pre- and post-test quantitative study design was utilized to measure baseline breast cancer awareness and evaluate the effectiveness of a culturally appropriate educational intervention on breast cancer awareness among women in Cusco, Peru. The intervention included educational materials in the form of a video and a pamphlet, see Appendix A and Appendix B.

Study researchers collaborated to create educational materials. SO, CP, and PB developed a 2.5-minute animated video outlining risk factors and symptoms of breast cancer. YF and VH created a pamphlet with information on how to conduct a self-breast exam as well as how to access breast cancer screening resources provided by CerviCusco. CerviCusco provides clinical breast examination, ultrasounds, and services to address cervical cancer to the local community (CerviCusco, 2022).

Emory University-based researchers worked in close collaboration with CerviCusco health care workers to coordinate participant recruitment and the dissemination of pre- and post-

surveys and other program materials. Virtual sessions were held with CerviCusco health care workers to train on recruitment techniques, the survey instruments, and to receive feedback on the survey and educational materials in relation to their cultural appropriateness and translation. Iterative changes were made throughout the development of these materials based on feedback. Team meetings were held to discuss biases, preconceptions, and thought processes throughout this study to achieve research reflexivity at all stages. The study was submitted to Emory University's Institutional Review Board approval and deemed exempt from review (STUDY00002920). This study was also approved by the Emory Winship Cancer Institute Protocol Review and Monitoring Board.

Multidisciplinary Partnership Overview

CerviCusco, a non-profit, community-based clinic in Cusco, identified a need for local baseline data on breast cancer awareness to tailor a public health message to women in the region. The clinic leveraged an existing partnership with an academic program in the Southeastern United States, Emory University, to design and conduct a pilot assessment of breast cancer awareness among women in and around Cusco, Peru.

An interdisciplinary research team of students from nursing, public health, global health, and international relations programs, under the guidance of a nursing faculty and a field mentor, identified Breast Cancer Awareness Measure (BreastCAM), an eight-question survey instrument that has been validated in cross-culture settings (Linsell et al., 2010; Rakkapao, et al., 2016; Al-Khasawneh, et al., 2016). Using the American Association of Colleges of Nursing's Guiding Principles for Academic-Practice Partnerships (AACN, 2012), the team collaborated with the clinic to design study protocol, translate the survey, and train local health care workers in survey administration.

Study Population

Women were eligible for study participation if they self-identified as adult women and understood either Spanish or English. Verbal consent was obtained from all participants after the consent form was verbally read to each participant by CerviCusco health care workers. Seventy-five women consented to the study and completed the pre-test. Thirty-one participants were retained from the pre-test to participate in the online post-test after viewing educational materials. All participants remained anonymous throughout the pre- and post-test, only disclosing limited demographic information.

Sampling and Recruitment

Volunteer sampling techniques were used to recruit women. Women were approached for study participation in large public areas in Cusco, Peru, primarily heavily frequented markets and commercial areas. Participant recruitment was greatly affected by the ongoing COVID-19 pandemic. CerviCusco health care workers could not rely on patrons of the clinic to recruit. The clinic saw very few patients during surges of COVID-19 because many people were postponing routine care to cut down costs and many were limiting travel.

Seventy-five women were recruited, consented, and participated in the baseline survey. CerviCusco health care workers were provided with paper copies of the consent form and survey instrument (in Spanish and English). They verbally read each question to the participants and noted their answers. All pre-test data was collected in August 2021 over the course of nine days. After completing the pre-test, participants were given flyers outlining how to access the educational materials online and complete the post-test. The flyer directed participants to a Microsoft Form where the educational materials and survey were embedded. While there was no

observation of participants participating in the intervention, watching the video through and viewing the pamphlet were required portions of the Form.

Data Collection

Survey Instrument

The BreastCAM survey has been validated cross-culturally to measure breast cancer knowledge and awareness (Linsell et al., 2010; Rakkapao, et al., 2016; Al-Khasawneh, et al., 2016). The thirty-two-question survey instrument, BreastCAM, was revised and translated to more appropriately resonate with the study population. For example, a question referencing the awareness of the United Kingdom's National Health Service resources for breast cancer screening was revised to ask if there was an awareness of local resources available for breast cancer screening. Two demographic questions were added to the survey to better understand the population without revealing personal or identifying information. Demographic data collected were age and location of residence (urban or rural). Three members of the research team translated (SO, CP), back translated (YF), and adjusted the BreastCAM survey instrument for cultural appropriateness (SO, CP, YF).

BreastCAM has eight domains, two qualitative portions and four portions that have multiple parts, either multiple choice or utilize a Likert scale. The questions focus on awareness of early warning signs of breast cancer, the frequency of self-examinations and response, local resources, and risk factors for breast cancer. See Appendix C for the complete set of questions on the survey instrument.

Survey Components

The revised BreastCAM survey instrument measures four main competencies related to breast cancer awareness: early warning signs of breast cancer, the frequency of self-examinations

and response, local resources, and risk factors for breast cancer. There are also two questions in the demographic data section. Two questions specifically ask on warning signs of breast cancer. Two questions focus on self-examinations. One question asks the participants if they are aware of local breast cancer screening resources. Three questions are focused on perceived risk factors of developing breast cancer.

Early Warning Signs. Question 1 of BreastCAM asks the following in an open-ended format: “First of all, please would you name as many early warning signs of breast cancer as you can think of:” CerviCusco health care workers then noted the qualitative responses with as much detail as possible. Question 1 sets the stage for Question 2. Question 2 is a multi-part closed-ended multiple choice question. The question asks if the participant thinks that any of the following are warning signs of breast cancer, with the answer choices yes, no, or I don’t know: a lump or thickening in your breast, a lump or thickening under your armpit, bleeding or discharge from your nipple, the pulling in of your nipple, a change in the position of your nipple, a rash on or around your nipple, redness of your breast skin, a change in the size of your breast or nipple, a change in the shape of your breast or nipple, pain in one of your breasts or armpit, and dimpling of the breast skin.

Frequency of Self-Examinations. Question 3 is broken into three parts. 3a asks, “How often do you check your breasts?” with the answer choices, rarely or never, at least once every 6 months, at least once a month, and at least once a week. 3b asks, “Are you confident you would notice a change in your breasts?” with the answer choices not at all confident, not very confident, fairly confident, and verry confident. 3c asks, “Have you ever been to see a doctor about a change you have noticed in one of your breasts?” with the answer choices yes, no, and never noticed a change.

Question 4 is open ended and asks, “If you found a change in your breasts, how soon would you contact your doctor?”

Local Resource Utilization. Question 6 focuses on local resource awareness and utilization. 6a asks, “As far as you are aware, are there local resources available for breast cancer screening?” 6b asks, “Have you ever been invited for breast cancer screening by local health organization?” 6c asks, “Have you ever had breast screening at local health organizations?” the answer choices for all parts of Question 6 were, yes, no, and don’t know.

Risk Factors. There are three questions focused on risk factors of breast cancer, a multiple-choice question, a qualitative question, and a question utilizing a Likert scale. Question 5 asks the participant to determine who is more at risk of developing breast cancer in the next year, a 30-year-old woman, a 50-year-old woman, a 70-year-old woman, or a woman of any age.

Question 7 is open-ended and asks, “What things do you think affects a woman’s chance of developing breast cancer?”

Question 8 asks, “How much do you agree that each of these can increase the chance of developing breast cancer?” The question utilizes a Likert scale with the answer choices strongly disagree, disagree, not sure, agree, and strongly agree. The prompts for this question are: having a past history of breast cancer, using HRT (Hormone Replacement Therapy), drinking more than 1 unit of alcohol a day, being overweight (BMI over 25), having a close relative with breast cancer, having children later on in life or not at all, starting your periods at an early age, having late menopause, and doing less than 30 mins of moderate physical activity 5 times a week.

Demographic Information. The demographic questions asked in this survey were designed to maintain anonymity. Participants were given the option to report their age. They

were also given the option to say which best describes where they live, urban (cities and towns), rural (outside of the city), or other (describe).

Pre- and Post-Test

There was an average of 5.4 days (min=0; max=18) between each participant completing the pre- and post-test. It took an average of 15.2 minutes to view the educational intervention and complete the post-test (min=4; max=41).

Data Management

Paper copies of the pre-tests and consent forms were stored in a secure physical location until being scanned and uploaded to a secure cloud drive. The post-test responses were cataloged on a secure cloud-based drive affiliated with Emory University.

Data Analysis

Researchers quantitatively and qualitatively analyzed the survey responses. A combination of descriptive statistics, paired t-tests, and Wilcoxon tests were conducted to analyze the quantitative data by researchers (SO). Descriptive statistics were utilized to examine the frequency of responses for the pre- and post-test responses as well as the age, area of residence, health seeking behavior, and awareness and utilization of local breast cancer resources. Summary scores were calculated for variables regarding risk factors and early warning signs. The summary scores were calculated by recoding the responses to 1=correct and 0=incorrect for indiscrete variables and summing over to create a discrete variable as the score. For the risk factors Likert scale question, each of the nine items are associated with an increased risk of breast cancer. For continuous variables, the mean scores from the pre- and the post-test were compared against each other with a paired t-test. For categorical variables, the Wilcoxon signed rank test was used. The threshold of significance was set at $p < 0.05$ and two-sided

analyses were conducted. Researchers conducted all analysis with IBM SPSS Statistics, Version 28.0.1.0 (142).

Qualitative data was gathered for three questions and responses were categorized and coded by researchers (SO, CP, YF) for integration into the quantitative data set. Responses from Question 1, asking about early warning signs, were categorized into six categories, physical discoloration, physical appearance, levels of pain, lumps/nodes, I don't know, and other. Responses from Question 4, asking about response to noticing a change in your breast, resulted in five categories, immediate, week, monthly, 2 weeks, and depends. Question 7, asking about risk factors, resulted in nine codes, genetics, age, lifestyle, medical intervention, mental health, physical trauma, other, pain and lumps, and I don't know. Qualitative responses were coded, and their frequency was reported.

Results

Participants Demographics

The mean age for the participants was 39 years old (n=72). Ninety percent of the participants live in an urban rather than a rural setting.

Regarding individual health seeking behavior, 41.3% of participants stated they had rarely or never done a self-breast examination. A full breakdown of participants' breast self-exam frequency is in Table 1.

Regarding the awareness and utilization, of local breast cancer screening resources, 94.7% had never been invited to use these resources and 93.3% of women had not utilized these resources (Table 1).

Early Warning Signs

Participants were asked if eleven items were early warning signs of breast cancer or not. Table 2 highlights the frequency distribution for each item on the scale in the pre- and post-test as well as a summary score. The summary score represents the average number of correct answers from each participant. In the pre-test, the average score was 7.64 out of 11, and increased to 9.26 out of 11 in the post-test. The p-value was determined by a Wilcoxon test. The p-value for this comparison was not statistically significant (p=0.10).

Self-Breast Examination Confidence

At the time of the pre-test, 64% of participants were either fairly confident or very confident that they would notice a change in their breasts. At the post-test, this percentage increased to 100%, indicating a statistically significant difference through a Wilcoxon test (p-value <0.001). The results are highlighted in Table 3.

Local Resource Utilization

When participants were asked in the pre-test if they were aware of local resources for breast cancer screening, 24% said yes. During the post-test, 51.6% of participants stated that they were aware of local resources. This change was not statistically significant (p-value= 0.246). Results are highlighted in Table 4.

Risk Factors

Table 5 displays participants perception of age-associated risk of developing breast cancer at pre- and post-test. In both the pre- and post-test, the majority of participants stated that a woman of any age was most likely to develop breast cancer, 77.3% and 61.3%, respectively.

Participants were asked if nine items were associated with an increased risk of developing breast cancer or not. Table 6 represents the frequency distribution for each item on the scale in the pre- and post-test as well as a summary score. The summary score represents the

average number of correct answers from each participant. In the pre-test, the average score was 4.05 out of 9, and increased to 5.06 out of 9 in the post-test. A paired t-test done between the means of the pre- and post-test resulted in statistically significant results. The p-value was 0.017.

Discussion

This study aimed to determine the baseline breast cancer awareness of women in Cusco, Peru and evaluate the effectiveness of an educational interventions on breast cancer knowledge and awareness. Before our work, baseline breast cancer awareness data were not available for this population, and with the prioritization of breast cancer by local organizations and policymakers, it was vital to understand the knowledge status of the population. Data gathered during this study can inform breast cancer programs and educational interventions by CerviCusco and other nongovernmental or governmental organizations in the region. Our study assessed knowledge and awareness of breast cancer in relation to risk factors, early warning signs, self-breast examination confidence, and local resource utilization, as well as demographic information.

Our study revealed that awareness related to breast cancer risk factors saw a statistically significant change between the pre- and post-test. The impact this educational intervention had on knowledge of breast cancer risk factors is substantial. The results not only validate the pieces of the intervention tailored to those competencies, but also the method of intervention, a narrative form educational video and pamphlet. We believed when developing the educational video as dialogue between mother and daughter would have a greater connection to the audience based on common forms of media, research, and conversation with experts living in the region, and this might have strengthened the delivery of the educational video intervention. The use of

an educational intervention to increase breast cancer knowledge and awareness in Hispanic women has been supported by previous research (Borrayo et al., 2017; Hurtado-de-Mendoza et al., 2019). Also, the effect of the intervention on breast cancer knowledge is consistent with Borrayo et al. (2017), a study done to compare narrative educational videos to other methods in increasing breast cancer knowledge in Latinas. Borrayo et al. (2017) found that all interventions significantly increased knowledge, but the narrative video had a greater impact on this population.

These results are important to public health as an increased awareness of risk factors of breast cancer can lead to a decreased prevalence of the disease. While effective cancer prevention methods are systemic and cultural, changes confined to an individual can still have a substantial impact on one's risk for breast cancer. The effectiveness of the intervention in increasing this awareness is the first step for the community to see relief from this undue burden.

Similar interventions, such as one done by Hurtado-de-Mendoza et al. (2019), previously validates the use of narrative educational videos in Hispanic women populations. While the population of the referenced study was not confined to Latin America, 15% of participants were from Peru. Hurtado-de-Mendoza et al. (2019) increased knowledge in multiple sections, highlighting how a narrative-style educational video can tackle multiple competencies in one intervention. Similarly, the results of this study indicate that multiple segments of the educational intervention were successful in increasing knowledge and awareness. The gap in research filled by our study was that this specific population of women in Cusco, Peru have not been included in previous studies. While there was no direct feedback on the acceptability of the intervention or its delivery, it can be inferred that because of the improvement of knowledge, the format was accepted to some degree.

Regarding early warning signs of breast cancer, there was a change in knowledge and awareness, albeit not statistically significant. Being cognizant of early warning signs of breast cancer is vital to early diagnosis, and therefore, increased survival (Nuche-Berenguer & Sakellariou, 2019; World Health Organization, 2021). Having this knowledge and awareness is crucial in being able to enjoy the human rights associated with health and health care access. Being able to identify abnormal changes in one's body and breast is an empowering tool that can lead to increased early health care utilization. Improving positive outcomes from breast cancer, the most common cancer in Peruvian women and the second cause of cancer mortality (Zafra-Tanaka et al., 2020), can change families, neighborhoods, and communities for the better. The unnecessary burden of breast cancer is disproportionately impacting this population because of various structural and systemic factors (Momenimovahed & Salehiniya, 2012). Increasing knowledge and awareness of early warning signs can counteract some of the effects of systemic barriers to health.

Out of the sample, 50.6% of women engaged in self-breast examinations monthly or more often at baseline. While the same question was asked during the post-test, the researchers found it to be unlikely that during the short follow-up period, behavior would be able to be quantified in a meaningful way as different. While the survey did not probe into the methods of self-breast examination (and the associated efficacy of the methods), even if not performed with standardized methods, an anomaly can be detected. A Brazilian study recruited 18 women undergoing breast cancer treatment and 77.8% of them detected their cancer through self-breast examinations, aside from the researchers indicating the methods were "incorrect" (Silva & Ruil, 2011).

While the main objective of the study was not to direct people to CerviCusco's services, it was highlighted as an option in both of the intervention materials. There was not a significant increase in awareness of local breast cancer screening resources, which implies a need to be more direct when mentioning local services available for breast cancer screening. The animated, narrative video focused on early warning signs and risk factors while the infographic focused on self-breast examination practices and local resources. The results of this study, while not completely generalizable, validate the use of the video and pamphlet to inform breast cancer risk factors and indicate a need to address breast cancer early warning signs and access to local resources in a different way.

Our study showed that very few women are aware of local breast cancer screening resources, very few have utilized those local resources, and nearly half of the sampled population preformed a self-breast examination monthly or more often. The tool utilized, BreastCAM, did not probe further into the techniques being used for self-breast examinations. The educational intervention included best practices for self-breast examinations, but because of the lack of questions in BreastCAM, there is no data on the quality or effectiveness of the self-breast examinations being performed by women in the study. According to post-test participants, they would notice a change in their breast; however, our study revealed that the confidence level of women in noticing a change in their breast increased from 64% to 100%.

Breast cancer awareness within the population should be placed into the broader context of barriers and differential access to preventative services, early detection, and treatment of breast cancer in Cusco, Peru as well as in LMICs.

Women in Cusco, Peru deserve to have the same access to the prevention, detection, and treatment of breast cancer as those elsewhere in Latin America and others around the world.

There are many systemic barriers to receiving these services. These barriers and lack of services do not start in Cusco, but rather in the differential access in HICs and in LMICs.

Strengths and Limitations

A strength of this study is the multidisciplinary partnership that was engaged to conduct this study. There were multiple perspectives from researchers as well as the inclusion of on the ground voices into the creation of the educational materials and in the translations of survey materials. Despite this strength, there were many limitations in this study. Researchers were not able to collect identifying information for participants, such as name, education level, contact information, and previous medical history. Because of this, researchers had to rely on the flyers with information on how to access the intervention and the post-test and could not reach out directly to encourage or remind them. Also, researchers did not do a second follow-up after the post-test to see how the information was retained. There were many constraints to the study present because of COVID-19. Travel was limited due to COVID-19 and to not further encourage travel and risk exposure, the intervention and the post-test were conducted online and through the same medium and directly after one another. While we were still able to retain 41.33% of our study population, many could have been lost due to challenges with reliable internet access. According to 2020 World Bank data, 65.252% of Peruvians use the internet (The World Bank, 2022). Only having women with consistent internet access in the post-test can leave out important populations. Also, questions regarding health seeking behavior could not be evaluated in the pre- pos-test format because there was not time between the pre- and post-test for behaviors to change. The survey accounted only for action rather than intention. Lastly, the inclusion criteria were limited to women. Men are an important population to reach regarding

breast cancer since they have higher mortality rates due to associated stigma and lack of early detection (NCI Staff, 2019).

Future Research and Implications

Baseline knowledge and awareness data is a foundational element of research. Future researchers can utilize the baseline breast cancer data gathered by this study to inform further investigations and future educational interventions and health policy.

For a more comprehensive idea of how effective the educational intervention was, additional data on the retention of breast cancer knowledge and awareness in this population should be gathered after post-test. Going back to the participants for an additional follow-up would be beneficial to gauge information retention over time as well as health seeking behavior.

While the educational intervention was in-part validated by the results of the study, more direct community involvement in the creation or editing of educational materials could yield even more significant results in more competency areas. Focus group discussions among women to test educational materials before implementing the intervention, in relation to cultural appropriateness, understandability, and appeal, before doing another iteration of this study would address this.

CerviCusco is currently using the educational video in their clinic waiting room on a cycle with videos created by others and that cover different health education topics. While not enrolled in the study, women in Cusco, Peru are still being exposed to the educational video, and we cannot collect data on how much information they absorb from most likely passively watching the video. The hope is that the knowledge will continue to be disseminated throughout the community.

The participatory research methods and strategies used in this educational intervention can serve as a model for future research and collaboration among public health professionals and health care workers in both Peru and the United States. Emory University and CerviCusco have strengthened their partnership and will continue to build upon this work.

Human Rights Implications of Results

As a member state of the United Nations, Peru has obligations to ensure procedural rights and adopt and apply legal frameworks and institutional frameworks to protect against damages that impact the ability of citizens to enjoy all human rights (United Nations, 1948). The inability to obtain adequate primary and secondary prevention of adverse breast cancer outcomes violates an individual's right to health. Specifically, the inability to access health services is a direct violation of Article 25 of the Universal Declaration of Human Rights.

A rights-based approach to health and health care access, integrated through policy and programs, must prioritize those most in need first (World Health Organization, 2017). In this case, Peruvian women without access to early screening and detection programs would be prioritized, such as the Indigenous and those in rural areas, as well as a broad initiative for primary prevention of breast cancer. Through the rights-based approach, equity in health can be promoted and, in time, enjoyed by Peruvians.

Conclusion

Delayed early detection, limited health care access, and increased mortality related to breast cancer experienced by women in Cusco, Peru and other Latin American countries are vital disparities to address. There are many systemic barriers to receiving these services. These barriers and lack of services do not start in Cusco, but rather in the differential access in HICs and in LMICs. The literature informed educational intervention developed as part of this study

was successful in increasing breast cancer knowledge and awareness in terms of risk factors and self-confidence in noticing a change in one's breast. The results of this study, while not completely generalizable, validate the use of the video to inform breast cancer risk factors and indicate a need to address breast cancer early warning signs and access to local resources in a different way. While there was a significant change in knowledge and awareness based on pre- and post-test data, there is a need to build off of these data and methods to further the work done in this community. The need to address these disparities can be viewed through a rights-based approach to health and health care. Women in Cusco, Peru deserve to have the same access to the prevention, detection, and treatment of breast cancer as those elsewhere in Latin America and others around the world. Affecting change can start with data collection and education in these affected communities.

Declaration of Conflicting Interests

The authors have no conflict of interest to disclose that are relevant to this study.

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Table 1. Participant Characteristics at Baseline

Baseline Data		Mean (SD) or N (%) N= 75*
Demographic Information		
Age (years)		39 (11.79)
Area of Residence	Urban (cities and towns)	66 (90.4%)
	Rural (outside of city)	7 (9.6)
Health Seeking Behavior Information		
Frequency of self-breast examinations	Rarely or never	31 (41.3%)
	At least once every 6 months	6 (8.0%)
	At least once a month	22 (29.3%)
	At least once a week	16 (21.3%)
Visited a doctor about a change you have noticed in one of your breasts	Yes	24 (33.8%)
	No	30 (42.3%)
	Never noticed a change in my breast	17 (23.9%)
Awareness and Utilization of Local Breast Cancer Resources		
Invited for breast cancer screening by local health organization	Yes	4 (5.3%)
	No	71 (94.7%)
Utilized breast screening at local health organization	Yes	5 (6.7%)
	No	70 (93.3%)

*The N for the baseline survey as 75. Missing data was minimal. Age n=72. Location of home n=73. Visited a doctor n=71.

Table 2. Knowledge and Awareness of Early Warning Signs for Breast Cancer Among Women in Cusco, Peru

		Pre-Test Responses (N=75)			Post-Test Responses (N=31)			
Overarching Question	Sub-Question	N (%)			N (%)			
		Yes	No	Don't Know	Yes	No	Don't Know	
Can you tell me whether you think any of these are warning signs of breast cancer or not?	Do you think a lump or thickening in your breast could be a sign of breast cancer? (n=75) (n) %	68 (90.7%)	3 (4%)	4 (5.3%)	31 (100%)	0 (0%)	0 (0%)	–
	Do you think a lump or thickening under your armpit could be a sign of breast cancer?	66 (88%)	6 (8%)	3 (4%)	31 (100%)	0 (0%)	0 (0%)	–
	Do you think bleeding or discharge from your nipple could be a sign of breast cancer?	54 (72%)	4 (5.3%)	17 (22.7 %)	31 (100%)	0 (0%)	0 (0%)	–
	Do you think the pulling in of your nipple could be a sign of breast cancer?	39 (52%)	16 (21.3 %)	20 (26.7 %)	22 (71%)	6 (19.4%)	3 (9.7%)	–

	Do you think a change in the position of your nipple could be a sign of breast cancer?	26 (34.7%)	23 (30.7 %)	26 (34.7 %)	18 (58.1%)	10 (32.3%)	3 (9.7%)	–
	Do you think a rash on or around your nipple could be a sign of breast cancer?	45 (60%)	21 (28%)	9 (12%)	24 (77.4%)	4 (12.9%)	3 (90.3)	–
	Do you think redness of your breast skin could be a sign of breast cancer?	59 (78.7%)	12 (16%)	4 (5.3%)	29 (93.5%)	1 (3.2%)	1 (3.2%)	–
	Do you think a change in the size of your breast or nipple could be a sign of breast cancer?	54 (72%)	14 (18.7 %)	7 (9.3%)	25 (80.6%)	4 (12.9%)	2 (6.5%)	–
	Do you think a change in the shape of your breast or nipple could be a sign of breast cancer?	46 (61.3%)	12 (16%)	17 (22.7 %)	21 (67.7%)	7 (22.6%)	3 (9.7%)	–
	Do you think pain in one of your breasts or armpits could be a sign of	62 (83.8%)	8 (10.8 %)	4 (5.4%)	28 (90.3%)	1 (3.2%)	2 (6.5%)	–

	breast cancer? (n=74)							
	Do you think dimpling of the breast skin could be a sign of breast cancer?	54 (72%)	11 (14.7 %)	10 (13.3 %)	27 (87.1%)	3 (9.7%)	1 (3.2%)	–
Summary score (number of correct answers for early warning signs of breast cancer out of 11)		Average pre-test "score"			Average post-test "score"			p-value*
		7.64			9.26			0.10

*The two-sided p-value was determined by comparing the average number of correct responses out of 11 (the number of questions in the scale) between the pre- and post-test for the 31 participants that completed both using a paired t-test.

Table 3. Frequency of Breast Self-Examinations Among Women in Cusco, Peru

Variable	Pre-Test Responses (N=75)				Post-Test Responses (N=31)				p-value *
Question Text	N (%)				N (%)				
	Not at all confident	Not very confident	Fairly confident	Very confident	Not at all confident	Not very confident	Fairly confident	Very confident	
Are you confident you would notice a change in your breasts?	5 (6.7%)	22 (29.3%)	26 (34.7%)	22 (29.3%)	0 (0%)	0 (0%)	0 (0%)	31 (100%)	<.001

*p-value was calculated with Wilcoxon signed rank test. Z=-4.335[b]

Table 4. Local Breast Cancer Resource Utilization Among Women in Cusco, Peru

Variable	Pre-Test Responses (n=75)			Post-Test Responses (n=31)			p-value*
As far as you are aware, are there local resources available for breast cancer screening?	N (%)			N (%)			
	Yes	No	Don't Know	Yes	No	Don't Know	
	18 (24 %)	55 (73.3 %)	2 (2.7%)	16 (51.6%)	10 (32.3 %)	5 (16.1%)	0.243

*p-value calculated with Wilcoxon signed rank test. Z=-1.166[b]

Table 5. Knowledge and Awareness Women Most at Risk for Breast Cancer Among Women in Cusco, Peru

Variable		Pre-Test Responses (N=75)	Post-Test Responses (N=31)
Overarching Question	Sub Question	Frequency	Frequency
In the next year, who is most likely to develop breast cancer?	A 30 year old woman	13.3%	25.8%
	A 50 year old woman	8.0%	9.7%
	A 70 year old woman	1.3%	3.2%
	A woman of any age	77.3%	61.3%

Table 6. Knowledge and Awareness of Risk Factors Among Women in Cusco, Peru

Variable	Pre-Test Responses (N=75)					Post-Test Responses (N=31)					
	N (%)					N (%)					
How much do you agree that each of these can increase the chance of developing breast cancer?	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree	
Having a past history of breast cancer	–	8 (10.7%)	7 (9.3%)	56 (74.7%)	4 (5.3%)	2 (6.5%)	4 (12.9%)	1 (3.2%)	15 (48.4%)	9 (29%)	-
Using HRT (Hormone Replacement Therapy)	–	13 (17.3%)	26 (34.7%)	36 (48%)	–	2 (7.1%)	2 (7.1%)	11 (39.3%)	11 (39.3%)	2 (7.1%)	-
Drinking more than 1 unit of alcohol a day	–	32 (42.7%)	9 (12%)	32 (42.7%)	2 (2.7%)	2 (6.7%)	5 (16.7%)	3 (10%)	14 (46.7%)	6 (20%)	-

Being overweight (BMI over 25)	–	17 (22.7%)	11 (14.7%)	46 (61.3%)	–	1 (3.3%)	5 (16.7%)	2 (6.7%)	16 (53.3%)	6 (20%)	-
Having a close relative with breast cancer	–	7 (9.3%)	4 (5.3%)	51 (71.8%)	9 (12.7%)	2 (6.6%)	1 (3.4%)	–	14 (48.3%)	12 (41.4%)	-
Having children later on in life or not at all	–	28 (37.8%)	20 (27%)	26 (35.1%)	–	1 (3.3%)	2 (6.7%)	5 (16.7%)	19 (63.3%)	3 (10%)	-
Starting your periods at an early age	–	38 (51.4%)	21 (28.4%)	15 (20.3%)	–	2 (6.7%)	15 (50%)	6 (20%)	7 (23.3%)	–	-
Having a late menopause	–	36 (48.6%)0	25 (33.8%)	13 (17.6%)	–	2 (6.9%)	7 (24.1%)	9 (31%)	11 (37.9%)	–	-
Doing less than 30 mins of moderate physical activity 5 times a week	–	51 (68.9%)	9 (12.2%)	14 (18.9%)	–	1 (3.3%)	13 (43.3%)	4 (13.3%)	10 (33.3%)	2 (6.7%)	-
Summary score (number of correct answers for risk factors of breast cancer out of 9)	Average pre-test score					Average post-test score					p-values *
	4.05					5.06					.017

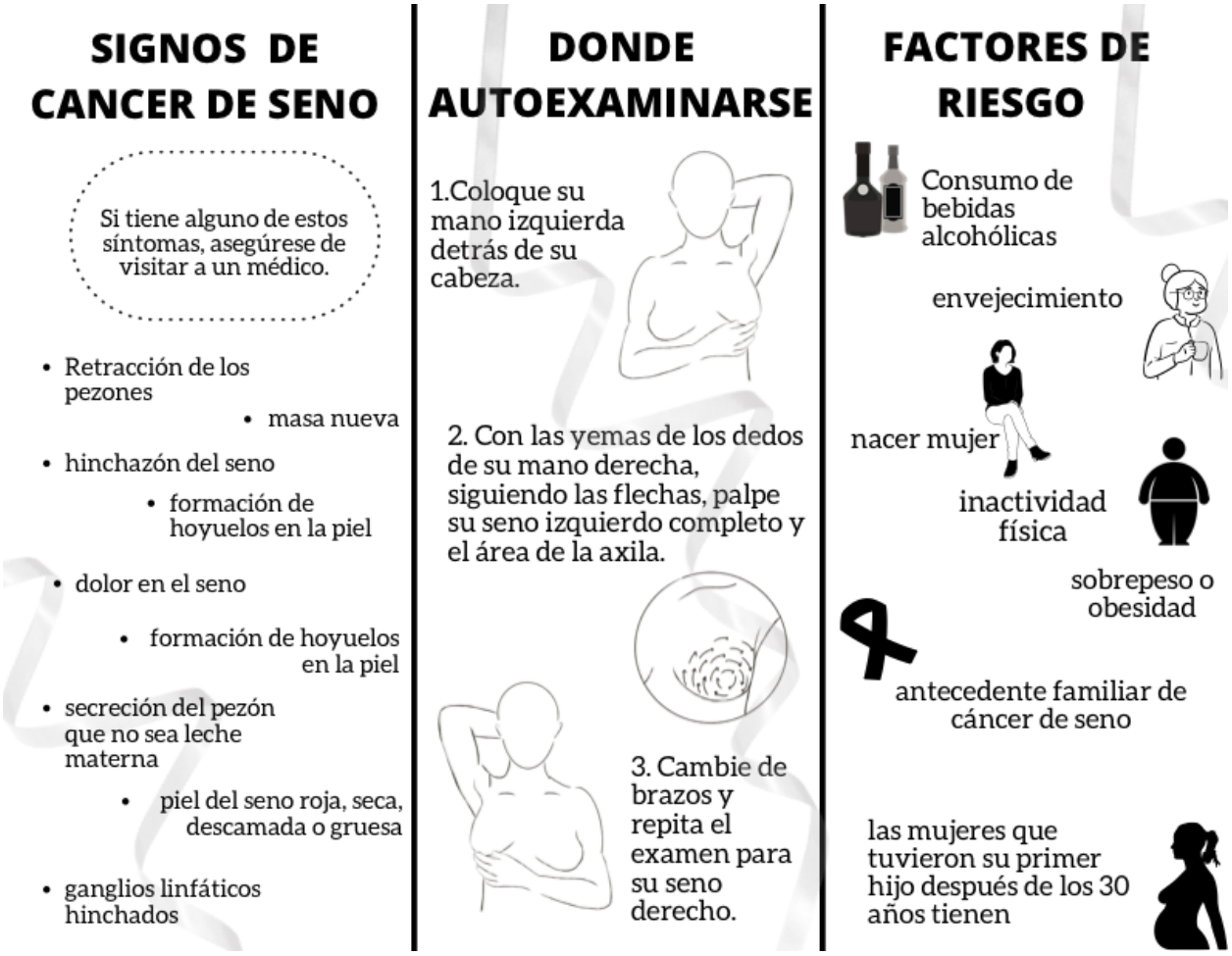
*The two-sided p-value was determined by comparing the average number of correct responses out of 9 (the number of questions in the scale) between the pre- and post-test for the 31 participants that completed both, using a paired t-test. Combined variable was created by strongly agree and agree being counted as correct, and the other responses as incorrect.

Appendix A

The linked video is the animated educational video created by researchers (SO, CP, PB) that was used as part of the intervention. Online Link: https://youtu.be/OYUMxviHQEI

Appendix B

The below material is the pamphlet created by researchers (YS, VF) that was part of the intervention.



LA RECOMMENDACIÓN

Si usted siente algo inusual con sus senos, por favor programe un examen clínico de seno con un profesional médico.

En un examen clínico de mama, un profesional médico examinará las mamas en busca de cualquier signo de cáncer de mama, entre otros problemas de mama.

Cuando las mamografías no están disponibles, los exámenes clínicos de las mamas son una buena opción para detectar el cáncer de mama.

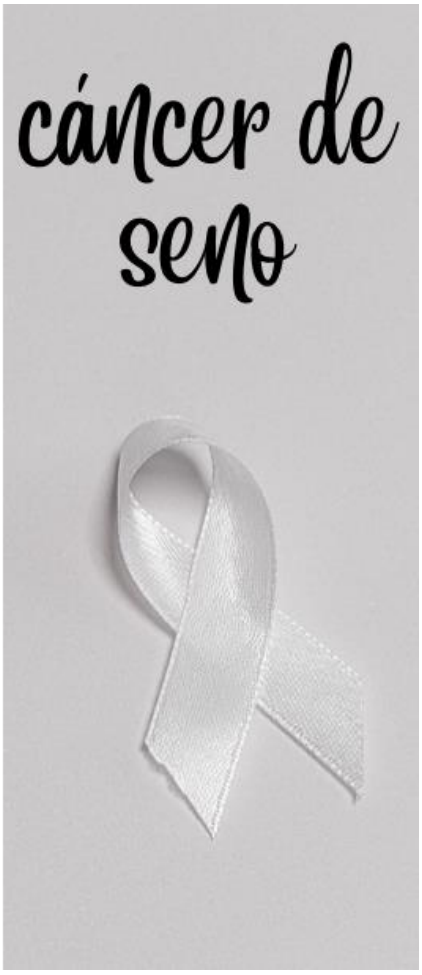
Cervi Cusco

Para consultas y inquietudes, llame al **+51 84 274453.**

La dirección es Los Saucos B-2, Cusco 08006, Peru.

Escanéame por nuestro página !

EMORY UNIVERSITY



Appendix C

The below document is the translated BreastCAM survey instrument used in data collection for this research.

La Medida de La Consciencia del Cáncer de Seno

This survey instrument (Breast CAM) was developed by Cancer Research UK, King's College London and University College London in 2009 and validated with the support of Breast Cancer Care and Breakthrough Breast Cancer.

1. Favor de apuntar síntomas que puedan indicar señales de cáncer de seno

2. ¿Puede decirme cuáles de lo siguiente son señales de preocupación del cáncer de mama y cuáles no son señales?

	Sí	No	No sabe
¿Piensa que un bulto o hinchazón en el pecho puede ser una señale de cáncer de seno?	☐	☐	☐
¿Piensa que un bulto o hinchazón en el pecho o en la axila puede ser una señale de cáncer de seno?	☐	☐	☐
¿Piensa que hemorragia o secreción del pezón puede ser una señale de cáncer de seno?	☐	☐	☐
¿Piensa que si el pezón está invertido puede ser señal del cáncer de seno?	☐	☐	☐
¿Piensa que un cambio en la posición del pezón puede ser una señale de cáncer de seno?	☐	☐	☐
¿Piensa que un sarpullido en o cerca del pezón puede ser una señale de cáncer de seno?	☐	☐	☐
¿Piensa que el enrojecimiento de la piel del pecho puede ser una señale de cáncer de seno? ¿Piensa que un cambio en el tamaño del pecho o pezón puede ser una señale de cáncer de seno?	☐	☐	☐
¿Piensa que un cambio en el forma del pecho o pezón puede ser un señale de cáncer de mama?	☐	☐	☐
¿Piensa que el dolor en el pecho o en la axila puede ser un señale de cáncer de mama?	☐	☐	☐
¿Piensa que si hay un hoyuelo en el pezón puede ser señal de cáncer de seno?	☐	☐	☐

3a. ¿Con que frecuente se revisa echos? los p

Pocas veces o jamás	Por lo menos cada 6 meses	Por lo menos una vez al mes	Por lo menos una vez a la semana
☐	☐	☐	☐

3b. ¿Está segura que puede notar una diferencia en sus pechos?			
Nada de seguridad	Poca seguridad	Algo de seguridad	Bastante seguridad
☐	☐	☐	☐

3c. ¿Alguna vez ha visitado a un doctor sobre un cambio que ha notado en unos de sus pechos?		
Sí	No	Nunca he notado una diferencia en alguno de mis pechos
☐	☐	☐

	4. ¿Si nota una diferencia en sus pechos, que tan pronto puede contactar a su doctor?

5. En el próximo ano, ¿Quién tiene más riesgo de desarrollar cáncer de seno?	
Una mujer de 30 años	☐
Una mujer de 50 años	☐
Una mujer do 70 años	☐
Una mujer de cualquier edad	☐

	Si	No	No se
6a. Por lo que usted sabe, ¿hay recursos locales disponibles para la detección del cáncer de seno?	☐	☐	☐
Si sabe de un lugar, ¿a qué edad se le dio cuenta por primera vez de este recurso?			☐
Si sabe de un lugar, ¿percibe estos recursos como accesibles para usted?			☐
6b. ¿Alguna vez ha sido invitada a al detección del cáncer de seno por organizaciones de salud locales?	☐	☐	☐
6c. ¿Alguna vez se a hecho exámenes de detección del cáncer de seno en organizaciones de salud locales?	☐	☐	☐

	7. ¿Qué piensa que son las cosas que afecta la probabilidad de tener cáncer de seno?

8. ¿Qué tanto está de acuerdo que lo siguiente puede aumentar la probabilidad de tener cáncer de seno?

	Completamente en desacuerdo	En desacuerdo	Dudoso	De acuerdo	Completamente de acuerdo
Tener una historia de cáncer de seno	☐	☐	☐	☐	☐
Usar terapia de remplazo hormonal	☐	☐	☐	☐	☐
Beber más de una bebida alcohólica por día	☐	☐	☐	☐	☐
Ser obeso	☐	☐	☐	☐	☐
Tener familiar con cáncer de seno	☐	☐	☐	☐	☐
Tener hijos más tarde en la vida/no tener hijos	☐	☐	☐	☐	☐
Empezar el período joven en la vida	☐	☐	☐	☐	☐
Tener menopausia tarde					
Hacer menos de 30 minutos de ejercicio moderado 5 veces por semana	☐	☐	☐	☐	☐

La Medida de La Consciencia del Cáncer de Seno

Preguntas Demográficas

This survey instrument (Breast CAM) was developed by Cancer Research UK, King's College London and University College London in 2009 and validated with the support of Breast Cancer Care and Breakthrough Breast Cancer.

1. ¿Cuántos años tienes? (en años)	
__ __ __	___ Prefieren no decir

2. ¿Cuál describe mejor dónde vives? *Compruebe lo que se aplica*			
Urbano (ciudades y pueblos)	Rural (fuera de la ciudad)	Otros (describen) _____	Prefieren no decir
☐	☐	☐	☐

Chapter 4: Conclusion and Recommendations

Summary of Main Findings

This study aimed to determine the baseline breast cancer awareness of women in Cusco, Peru and evaluate the effectiveness of an educational interventions on breast cancer knowledge and awareness. Baseline breast cancer awareness data is not available for this population, and with the shift to address breast cancer and cervical cancer by local organizations and policy, rather than just cervical cancer, it is vital to understand the population in this way. As stated by Matsumoto et al. (2020), CerviCusco is beginning breast cancer outreach in Cusco, Peru, diverting from a sole focus on cervical cancer. Data gathered during this study can inform breast cancer programs by CerviCusco and other nongovernmental or governmental organizations in the region.

Our study assessed knowledge and awareness of breast cancer in relation to risk factors, early warning signs, self-breast examination confidence, and local resource utilization, as well as demographic information.

Awareness related to breast cancer risk factors saw a significant change between the pre- and post-test. These results are important to public health as an increased awareness of risk factors of breast cancer can lead to a decreased prevalence of the disease. While effective cancer prevention methods are systemic and cultural, changes confined to an individual can still have a substantial impact on one's risk for breast cancer. The effectiveness of the intervention in increasing this awareness is the first step for the community to see relief from this undue burden.

Regarding early warning signs of breast cancer, there was a measurable albeit not statistically significant change in knowledge and awareness. Being cognizant of early warning signs of breast cancer is vital to early diagnosis, and therefore, increased survival (Nuche-

Berenguer & Sakellariou, 2019; World Health Organization, 2021). Having this knowledge and awareness is crucial in being able to enjoy the human rights associated with health and health care access. The unnecessary burden of breast cancer is disproportionately impacting Peruvian women because of various structural and systemic factors (Momenimovahed & Salehiniya, 2012). Increasing knowledge and awareness of early warning signs can counteract some of the effects of systemic barriers to health.

Out of the sample, 50.6% of women engaged in self-breast examinations monthly or more often at baseline. While the survey did not probe into the methods of self-breast examination (and the associated efficacy of the methods), even if not performed with standardized methods, an anomaly can be detected.

While the main objective of the study was not to direct people to CerviCusco's services, it was highlighted as an option in both of the intervention materials. There was not a significant increase in awareness of local breast cancer screening resources. This result implies a need to be more direct when mentioning local services available for breast cancer screening. The animated, narrative video focused on early warning signs and risk factors while the infographic mainly focused on self-breast examination practices and local resources. The results of this study, while not completely generalizable, validate the use of the video to inform on risk factors of breast cancer and indicate a need to address early warning signs and access to local resources in a different way.

The demographic data collected can be of great importance in developing future educational interventions. Our results indicate that very few are aware of local breast cancer screening resources, very few have utilized those local resources, and nearly half of the sampled population preforms a self-breast examination monthly or more often.

The impact on knowledge of breast cancer risk factors and confidence in self-breast examinations validates the pieces of the intervention tailored to those competencies and the method of intervention, a narrative form educational video and pamphlet. The gap in research filled by this study was that this specific population of women in Cusco, Peru have not been included in previous studies. While there was no direct feedback on the acceptability of the intervention or its delivery, it can be inferred that because of the improvement of knowledge, the format was accepted to some degree.

Breast cancer awareness within the population should be placed into the broader context of barriers and differential access to preventative services, early detection, and treatment of breast cancer in Cusco, Peru as well as in other lower- and middle-income countries (LMICs). Women in Cusco, Peru deserve to have the same access to the prevention, detection, and treatment of breast cancer as those elsewhere in Latin America and others around the world. There are many systemic barriers to receiving these services. These barriers and lack of services do not start in Cusco, but rather in the differential access in high-income countries and in LMICs.

Strengths and Limitations

A strength of this study is the multidisciplinary partner that was built to conduct this study. There were multiple perspectives from researchers as well as the inclusion of on the ground voices into the creation of the educational materials and in the translations of survey materials. Despite this strength there were many limitations in this study. Researchers were not able to collect identifying information for participants, such as name, education level, contact information, and previous medical history. Because of this, researchers had to rely on the flyers with information on how to access the intervention and the post-test and could not reach out

directly to encourage or remind them. Also, researchers did not do a second follow-up after the post-test to see how the information was retained. There were many constraints to the study present because of COVID-19. Travel was limited due to COVID-19 and to not further encourage travel and risk exposure, the intervention and the post-test were conducted online and through the same medium and directly after one another. While we were still able to retain 41.33% of our study population, many could have been lost due to challenges with reliable internet access. According to 2020 World Bank data, 65.252% of Peruvians use the internet (The World Bank, 2022). Only having women with consistent internet access in the post-test can leave out important populations. Also, questions regarding health seeking behavior could not be evaluated in the pre- and post-test format because there was not time between the pre- and post-test for behaviors to change. The survey accounted only for action rather than intention. Lastly, the inclusion criteria were limited to women. Men are an important population to reach regarding breast cancer since they have higher mortality rates due to associated stigma and lack of early detection (NCI Staff, 2019), and they were not included in this study.

Implications for Future Research and Programs

Baseline knowledge and awareness data is a foundational element of research. Future researchers can utilize the baseline breast cancer data gathered by this study to inform future public health educational interventions and health policy.

For a more comprehensive idea of how effective the educational intervention was, additional data on the retention of breast cancer knowledge and awareness in this population should be gathered after post-test. Going back to the participants form an additional follow-up would be beneficial to gauge information retention over time as well as health seeking behavior.

While the educational intervention was in-part validated by the results of the study, more direct community involvement in the creation or editing of educational materials could yield even more significant results in more competency areas. Focus group of women to test educational materials on, in relation to cultural appropriateness, understandability, and appeal, before doing another iteration of this study would address this.

Implications to Partners

CerviCusco is currently using the educational video in their clinic waiting room on a cycle with videos created by others and that cover different health education topics. While not enrolled in the study, women in Cusco, Peru are still being exposed to the educational video, and we cannot collect data on how much information they absorb from most likely passively watching the video. The hope is that the knowledge will continue to be disseminated throughout the community.

The participatory research methods and strategies used in this educational intervention can serve as a model for future research and collaboration among public health professionals and health care workers in both Peru and the United States. Emory University and CerviCusco have strengthened their partnership and will continue to build upon this work.

Emory Global Health Institute (EGHI) provided minimal finding to conduct this research. While appreciated by all involved as it allowed for the project to take place, an additional study to expand on data gathered would require more funding than EGHI has to offer. Emory University and CerviCusco are now further connected and regardless of funding structure, the organizations can continue their partnership and build upon their work.

Implications to Global Health Partnerships

CerviCusco, a non-profit, community-based clinic in Cusco, identified a need for local baseline data on breast cancer knowledge awareness to tailor a public health message to women in the region. The clinic leveraged an existing partnership with an academic program in the Southeastern United States to design and conduct a pilot assessment of breast cancer awareness among women in and around Cusco, Peru.

An interdisciplinary research team of students from nursing, public health, global health, and international relations programs, under the guidance of a nursing faculty and a field mentor, identified Breast Cancer Awareness Measure (BreastCAM), a thirty-two-question survey instrument that has been validated in cross-culture settings (Linsell et al., 2010; Rakkapao, et al., 2016; Al-Khasawneh, et al., 2016). Using the American Association of Colleges of Nursing's Guiding Principles for Academic-Practice Partnerships (AACN, 2012), the team collaborated with the clinic to design study protocol, translate the survey, and train local health care workers in survey administration.

The partnership between Emory University and CerviCusco can be used as a model to serve others engaging in international multidisciplinary partnerships with higher education institutions and local non-profit organizations. The framework used in this global health program can be levered to continue to engage in this work in a contextually and culturally appropriate way. Because the partnership between Emory University and CerviCusco was successful, the partnership will continue, and future data collection and educational interventions will be developed on the basis of these results.

Human Rights Implications of Results

As a member state of the United Nations, Peru has obligations to ensure procedural rights and adopt and apply legal frameworks and institutional frameworks to protect against damages that impact the ability of citizens to enjoy all human rights (United Nations, 1948). The inability to obtain adequate primary and secondary prevention of adverse breast cancer outcomes violates an individual's right to health. Specifically, the inability to access health services is a direct violation of Article 25 of the Universal Declaration of Human Rights.

A rights-based approach to health and health care access, integrated through policy and programs, must prioritize those most in need first (World Health Organization, 2017). In this case, Peruvian women without access to early screening and detection programs would be prioritized, such as the indigenous and those in rural areas, as well as a broad initiative for primary prevention of breast cancer. Through the rights-based approach, equity in health can be promoted and, in time, enjoyed by Peruvians.

Conclusion

Delayed early detection (Bain et al., 2018), limited health care access (Strasser-Weippl et al., 2015), and increased mortality related to breast cancer experienced by women in Cusco, Peru and other Latin American countries (Zafra-Tanaka et al., 2020) are vital disparities to address. There are many systemic barriers to receiving these services (Bridges et al., 2011; Vieira et al., 2017). These barriers and lack of services do not start in Cusco, but rather in the differential access in HICs and in LMICs (Jerônimo et al., 2017; Momenimovahed & Salehiniya, 2012; Sung et al., 2021; Torre et al., 2012). The literature informed educational intervention developed as part of this study was successful in increasing breast cancer knowledge and awareness in terms of risk factors and self-confidence in noticing a change in one's breast. While there was a

significant change in knowledge and awareness based on pre- and post-test data, there is a need to build off of these data and methods to further the work done in this community. The need to address these disparities can be viewed through a rights-based approach to health and health care. Women in Cusco, Peru deserve to have the same access to the prevention, detection, and treatment of breast cancer as those elsewhere in Latin America and others around the world. Affecting change can start with data collection and education in these communities.

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