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Examining the Role of Knowledge and Cultural Values on Utilization of Mammograms Among a Sample of Saudi Women

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EXAMINING THE ROLE OF KNOWLEDGE AND CULTURAL VALUES ON UTILIZATION OF MAMMOGRAMS AMONG A SAMPLE OF SAUDI WOMEN

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Afrah Saif

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Robert Stempel College of Public Health and Social Work

This dissertation, written by Afrah Saif, and entitled Examining the Role of Knowledge and Cultural Values on Utilization of Mammograms Among a Sample of Saudi Women, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

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Florida International University, 2021

DEDICATION

To every woman fighting breast cancer – Your strength inspires all of us, and your stories keep us determined to fight.

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ABSTRACT OF THE DISSERTATION

EXAMINING THE ROLE OF KNOWLEDGE AND CULTURAL VALUES ON UTILIZATION OF MAMMOGRAMS AMONG A SAMPLE OF SAUDI WOMEN

by

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Breast cancer is the most frequent malignant tumor that threatens the lives of women globally. In Saudi Arabia, breast cancer incidence was observed among younger and premenopausal women due to diagnosis at advanced stages. The late diagnosis results in poor prognosis and poor outcomes. The survival rates in Saudi women with breast cancer are low. This can be attributed to several reasons such as lack of knowledge and barriers embedded in cultural values. However, low rates of breast cancer screening account for the increasing number of breast cancer detected at much higher stages in Saudi Arabia and resulting deaths, making it challenging to offer successful treatment.

This study was conducted to assess knowledge and cultural values related to breast cancer and mammography screening among Saudi women in Saudi Arabia. Additionally, it explored how knowledge and cultural values of Saudi women may act as barriers to mammogram screening.

The study used an explanatory mixed-method design: quantitative through the administration of a survey instrument; and qualitative through the application of focus groups.

The sampling pool consisted of the universe of the twelve largest general hospitals in the Eastern Province in Saudi Arabia. They included four government-owned, four privately owned, and four under military jurisdiction. A matrix was constructed, inclusive of the twelve hospitals above; using this matrix, six hospitals were drawn randomly from the matrix.

The mean ±SD of knowledge about breast cancer was 5.53±2.38, with significant differences found regarding educational level and occupational status. There were 71.7% heard about mammogram screening, and 83.3% reported that mammogram screening was important. The mean± SD of religious health fatalism was 21.6 ±4.19, and that of breast cancer, barriers, and recommendations to encourage participation in mammogram screening was 10.3±1.98, 40.8±9.73, and 10.76±3.77, respectively.

There was inadequate knowledge among women regarding breast cancer, with a high score of barriers. Religious beliefs affected the knowledge of women and acted as a barrier to screening. Both the level of knowledge and barriers also affected the practice of women for mammogram screening.

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Chapter I

Background and Significance

Breast cancer (BC) was considered the most frequent malignancy threatening women's lives worldwide and the leading cause of cancer deaths (Bray et al., 2018; Parkin et al., 2005). Incidence rate of BC vigorously increases in the last years of women's lives, reported among 4.7 million women (23%) worldwide (Parkin et al., 2005; Jemal et al., 2011). The mortality rate increased among women with breast cancer and reached up to 502,000 deaths (World Health Organization, 2010). According to the World Health Organization (WHO), the incidence rate of breast cancer is likely to increase at an alarming rate worldwide over the next decade (Parkin et al., 2005). Additionally, the incidence rate of breast cancer highly increased among women who resided in low-and middle-income countries (Editorial, 2009).

In 2017 BC in Saudi Arabia, was considered as the second leading cause of cancer death after lung cancer (Alrashidi, Ahmed, & Alshammeri, 2017). Approximately 30% of new cases of breast cancer were diagnosed every year in Saudi Arabia, which may increase in the upcoming decades due to the rapid growth of the Saudi population and the increase in life span (Yaghmour et al., 2020). The increased incidence of BC was observed among younger and premenopausal Saudi women who were diagnosed at advanced stages (Khan et al.,2015; Abolfotouh et al., 2015). The late diagnosis was the most common reason leading to a poor prognosis in Saudi women (Alotaibi et al., 2018). Therefore, early diagnosis/detection

of breast cancer would have a crucial role in controlling and managing the disease, which would result in a better survival rate (Khakbazan, et al., 2014). Additionally, early diagnosis might decrease the morbidity and mortality rate and could prevent from 20% to 40% of deaths (Lenner, & Jonsson, 1997). Also, early diagnosis/detection of breast cancer has been shown to improve the outcome and, in turn, the quality of life of women (Allen et al.,2010).

Varied strategies were recognized to detect breast cancer in the early stages, such as regular breast self-examination and mammography screening (Sherma, & Hossfeld, 1977). Mammography screening utilization for breast cancer was inversely associated with a death rate reduction in that the mortality rate among women with breast cancer decreased by 23% using mammography screening (Saggu et al., 2015; Elmore et al., 2005). The National Comprehensive Cancer Network in the United States recommended that women should access mammography screening annually, especially those above 40 years and women with a previous family history of breast cancer (National Cancer Institute, 2010). In the United States, the National Cancer Institute ,2016) of; the National Institutes of Health (NIH) recommended utilizing mammography screening every- one to two years. The recommendations for initial age for mammography screening vary. The National Cancer Institute recommended that women should start screening at 40 years of age and maintain regular screening annually at age 45 and above (Oeffinger et al., 2015). The United States Preventive Services Taskforce recommended that women should start mammography screening before the age of 50 years, and women at high-risk start biennial screening from 50 to 74 years (USPSTF, 2016).

In Saudi Arabia, underutilization of mammography was reported among women and low participation rates in other preventive activities (Khan et al., 2015). The noncompliance rate of mammography among Saudi women reached 89% in 2015, despite the availability of free healthcare services (Gonzales et al., 2018). Also, El Bcheraoui et al., 2015) reported that 92% of women did not utilize mammography screening. The high percentage of underutilization of mammography was attributed to poor knowledge and incorrect beliefs among women regarding screening methods (Sung et al., 1997). Also, cultural norms regarding women's interaction with males, modesty, and the privacy of their bodies might restrict women's access to mammography screening, according to Azaiza, & Cohen, (2006).

The rationale of the Study

Breast cancer (BC) is a major health problem among women worldwide and is considered the second leading cause of cancer deaths in Saudi Arabia (Ibrahim et al., 2009). The prevalence of breast cancer is high in developing and developed countries and causes above 60% of death among women often attributed to population aging, growth, and major lifestyle changes (Jemal et al., 2011). In Saudi Arabia, breast cancer affected 14.5% of both males and females according to Al-Eid, & Garcia, (2012).

Among Saudi Arabia's regions the highest incidence of breast cancer has been reported in the Eastern region (Al-Eid, & Garcia, 2012). This variation in incidence might be attributed to the differentiation in the diagnosis stage and lack of

availability of advanced oncology care. (Al-Eid, & Garcia, 2012). In early stages, cancer is typically localized, meaning it is limited to a specific organ and has not spread to any other parts of the body. While, in advanced stages the cancer is typically regional with cancer cells spreading to all nearby lymph nodes, tissues, and organs (Young et al., 2001). The incidence of breast cancer in Saudi Arabia is estimated to increase 350% by 2025 due to socio-demographic changes and late diagnosis (Ibrahim et al., 2009; Babay, 2004).

Late diagnosis in Saudi Arabia has adversely impacted breast cancer prognosis and increased the risk of poor prognosis and outcomes (Howlader et al., 2012). While best outcomes could be achieved by early diagnosis/detection before the appearance of cancer symptoms via diagnosing the patient using mammography screening, the majority of women in Saudi Arabia present for diagnosis at late-stage of breast cancer (Richards et al., 1999; Al-Eid, & Manalo, 2011). However, Saudi women are diagnosed at older ages, 50 and above, which increase the risk of late-stage breast cancer (Al-Eid, & Garcia, 2012).

Survival rates are affected by the age of diagnosis. Few younger women in Saudi Arabia were diagnosed at the age of 40 years and below, which is considered as a crucial prognostic factor for survival among women, as reported by (Elkum et al., 2007). Survival rates among Saudi women with breast cancer were low and attributed to the absence of a standard nationwide breast screening program, which results in limited availability of screening services (Dandash, & Al-Mohaimeed, 2007).

Studies indicate that women's knowledge about breast cancer and screening services is highly associated with seeking medical help and delayed presentation with advanced stages which is linked to knowledge deficiency and the absence of benefit from any therapy (Ferlay et al., 2007) Although mammography screening (MS) is provided free of charge in SA, it remains underutilized as a screening tool due to lack of knowledge about the importance of early diagnosis and benefits of mammogram screening (Abdel-Salam et al., 2020). Very low utilization, 3% to 8% of mammography screening was reported earlier Saudi studies (Ravichandran et al., 2011); Al-Wassia et al. (2017)

Lack of knowledge/awareness among Saudi women regarding mammography screening was the most frequently reported reason leading to delay of diagnosis and presentation at an advanced stage of diagnosis. Barriers restricting women from accessing mammography screening were frequently observed among Saudi women, such as incorrect belief about screening services, cultural norms, and modesty violation. in addition, barriers included knowledge about risk factors of breast cancer, economic barriers in the healthcare system, and personal barriers, such as limited utilization of mammography screening (Alshahrani et al., 2006).

Few studies have investigated the importance of knowledge and cultural values on utilizing mammography screening among Saudi women residing in the Eastern region (Khobar, Dammam, Dhahran). Additionally, previous studies did not comprehensively examine barriers restricting women in the Eastern region of Saudi Arabia from accessing mammography screening. Few studies have explored

motivators in encouraging Saudi women to utilize mammograms and to increase the uptake of mammography screening.

Significance of the Study

Breast cancer remains a major health concern among women worldwide and the second most frequently affecting morbidity and mortality in Saudi women, which contributed to a shortening in life expectancy. Early diagnosis/detection for breast cancer has the potential to provide a good prognosis, reduce mortality, and improve survival outcomes. A mammogram, an X-ray of the breast, is considered as the best way to detect breast cancer in its early stages. Regular diagnosis using mammography screening facilitated the provision of effective treatment and decreased the risk of breast cancer in previous studies. Assessing the level of knowledge among Saudi women in the Eastern region will result in greater awareness about breast cancer and its risk factors. Knowledge about mammography screening will help researchers to identify the most common barriers and motivators behind accessing and utilizing preventive measures. Additionally, the current study will assist in identifying adequate health programs that encourage and motivate women to face these barriers and increase the uptake of mammography screening. Increasing the knowledge and awareness of Saudi women toward the importance of early diagnosis for breast cancer and the benefits of mammography screening would increase mammography utilization and decrease the incidence of mortality. Findings from this study have the potential to guide the Ministry of Health (MOH) to develop intervention programs that will significantly mobilize women to undergo screening practices.

Literature Review

Knowledge and Attitudes of Women Regarding Utilizing Mammography Screening

Several studies about knowledge and attitudes about mammography screening have been conducted worldwide, in Germany, Sweden, Indonesia, Ethiopia, Turkey, and among immigrant women from different countries (Somali, Latina, and Hmong) and residing in the United States.

Dreier et al., (2012) conducted a systematic literature review to investigate knowledge, attitudes, and participation rate in mammography screening in Germany. Twelve studies were identified and these reported that most women knew about the risk factors associated with breast cancer and were also aware of the option of free screening. In other studies, women received information about the benefits of mammography screening and the prevalence of false-positive/negative results in mammography screening test. A 2007 study found that despite higher educational level and private health insurance women reported low participation rate 54% in mammography screening program. Additionally, one-third of women who did not participate in that program, attended a mammography screening outside the program.

Schnoor et al., (2013) conducted a cross-sectional study in Germany to explore reasons behind non-participation of most women in mammography screening. Medical reasons and personal attitudes were the two most common given reasons; in addition, they did not receive sufficient information about the benefits and harms of mammography screening.

Lagerlund et al., (2000) used a case-control study to assess knowledge, belief, and attitudes of women towards mammography screening in Sweden. It was reported that participation rate was high among women who were highly worried about breast cancer and a high score of perceived benefits. Low knowledge about mammography screening was considered one of the most important factors for non-attendance/nonparticipation of women. Therefore, it was concluded that increased women awareness and knowledge toward the importance of mammography screening would increase the rate of uptake/participation.

Nagler et al., (2016) performed a community-engaged qualitative study among women from three immigrant communities (Somali, Latina and Hmong) and residing in the United States. Using a grounded theory approach, it was reported that immigrant women had low levels of awareness of mammograms. Similarly, Anwar, Tampubolon et al., (2018) reported that low percentage of the Indonesian women (5%) knew about mammography screening and 12% practiced breast self-examination. A higher level of awareness was highly associated with higher educational level and household expenditure. Additionally, having health insurance, social participation, and shorter distance to screening facilities were considered the factors associated with increasing mammography screening awareness and participation.

Lera et al., (2020) conducted a community based cross-sectional study among women aged between 20 and 65 years in Wolaita Sodo, Ethiopia, to evaluate their rate of breast self-examination and associated factors. The majority of participants (60.9%) were between 20 to 65 years old and only 8.2% were aged below50 years. The number of women who considered breast self-examination as an early

detection method of breast cancer exceeded the number of those who knew about any method of detection by nearly six times. Additionally, women who had women who had breastfed from 13 to 24 months examined their breasts 2.43 times more than women who breast fed for varied other periods. Working women practiced breast self-examination three times more than those who did not work. This study concluded that an increased awareness in girls regarding breast cancer examination was essential to encourage them to utilize screening and improve breast cancer outcomes.

Dündar et al., (2006) carried out a cross sectional study among Turkish women from the rural Western area of Manisa, aged 20 to 64 years, to assess their knowledge about breast cancer and the uptake rate of breast self-examination and mammography screening. Most women had low educational levels (49.2%) and more than half (67.6%) were married. A higher percentage of the participants had heard about breast cancer (76.6%), but only 56.1% had good knowledge of breast cancer. Almost half received information regarding breast cancer from healthcare providers. There was a significant association between high knowledge level of breast cancer with mammography screening practices and breast self-examination (P=0.007 and P= 0.011, respectively). Women who perceived higher benefits from breast self-examination and exhibited higher confidence, were more likely to conduct breast self-examination. The researchers found no correlation between Turkish women's ages, family history of breast cancer, family type, friends' educational level, health insurance, and breast self-examination.

In general, studies previously mentioned found that higher educational levels and health insurance was associated with higher levels of knowledge of breast cancer. More knowledge was associated with significant improvements in mammography practice and breast self-examination, also supported by other studies (Lagerlund et al., 2000; Eun-Hyun, 2003).

Knowledge and Attitudes in the Middle East

Studies of utilization, knowledge and attitudes of breast cancer screening have been conducted in Iran, United Arab Emirates, Egypt, Yemen, Jordan, Oman, and Lebanon. These studies included topics on barriers to screening, clinical breast examination, breast self-exams, and interventions to increase knowledge and utilization.

Khazir et al., (2019) conducted a cross-sectional study among Iranian women which reported that most participants showed a mean age of 49.26 (±7.79) years and 30.85% of them had undergone mammography screening. Higher mammography utilization was significantly observed among women with a previous history of breast cancer in their families and perceived fewer barriers ($P < 0.001$). The authors recommended more training/educational programs to encourage women accessing mammography screening.

Elobaid et al., (2014) carried out a cross-sectional study in Al-Ain, United Arab Emirates (UAE), among women older than 40 years of age to assess their knowledge, attitudes, and practices toward mammography screening using the Breast Cancer Awareness Measure (CAM). The study results showed that most

women lacked knowledge about clinical breast examination as a technique for breast cancer screening. Almost half (44.8%) never had undergone a clinical breast examination, and 44.1% were not aware of this technique. Approximately one-third of participants incorrectly explained the presence of symptoms, such as a breast lump. The study reported a need for health educational interventions to alert women to the importance of breast screening in the early stages. In Qatar, despite the fact that women showed accurate knowledge of breast screening, they had lower participation (23.3%) and also lower mammography screening (22.5%), compared to the participation rate among women in UAE, as reported by Bener et al., (2009). Emirati women aged 49 years and over reported good practices of breast self-examination, compared to young women. Among women who had good practices 81.6% received instructions by healthcare professionals. In Egypt, only 14.5% of women resident rural knew about mammography as a screening tool for detecting breast cancer and only 13.2% knew about breast self-examination (Hassan et al., 2017).

Bawazir et al., (2019) carried out a cross-sectional study among women who attended primary health care centers (PHCs) in Yemen. Approximately half of participants had a satisfactory knowledge level of breast cancer, only 1.6% of women had not undergone mammography screening earlier, and 30.3% practiced breast self-examination. There was a significant association ($P = 0.01$) between demographic characteristics, such as social status, occupational status, educational level, and knowledge about mammography practices. Use of clinical breast examination

was highly associated with age and low level of knowledge about self-breast examination ($P < .015$).

Taha et al., (2014) conducted a study among 2363 women who lived in a low-income area in Jordan to assess the effect of educational sessions through visits at home and offering mammography screening without any fees with the purpose of changing women's knowledge and practices toward breast screening. Most women 625 (26.45%) 40 years and older engaged in a free mammography screening and after six months, 596 out of 625 women were revisited to participate in a post-test for an assessment of changes in their knowledge and practices. The study results showed that women's knowledge significantly increased ($P < 0.001$) after the educational sessions Additionally, a significant improvement ($P < 0.001$) regarding knowledge and practices about breast self-examination was observed among women during the six-month follow-up. Among women who utilized mammography screening, 77% had received a voucher while only two women had not received a voucher. It was observed that the follow-up encouraged women to use the voucher for mammography screening (83%), compared to those who did not receive the follow-up (67%). It was concluded that home educational sessions about breast cancer and the necessity of its screening in early detection, and providing a mammogram voucher, effectively promoted knowledge and practices of women in rural areas toward breast cancer and mammography screening. These findings were supported by Anderson et al., (2003) who reported that public awareness could help in earlier detection of breast cancer.

Al-Azri et al., (2020) conducted a cross-sectional study among Omani women attending the Sultan Qaboos University Hospital (SQUH) and showed that 385 of the Omani women who participated in the study, 92.1% believed that breast cancer was a treatable disease if detected and diagnosed early. Additionally, 46.8% believed that they were at a high risk of breast cancer if a relative had breast cancer. Approximately 81.1% had awareness of availability of breast cancer screening in Oman, 83.8% never had undergone a screening, and 48.5% showed awareness of where to go to for breast cancer screening. The study results showed that women's attitudes toward breast cancer screening were affected by their previous experiences regarding breast cancer screening and their willingness to participate in future breast cancer screening. These findings were in accordance with a previous study from Lebanon which reported that Muslim women believed that there was no treatment for breast cancer when diagnosed (Azaiza, & Cohen 2006).

The above Middle Eastern studies generally found low participation rates in mammography screening. Earp et al., (2002) suggested that primary care centers and interventions, including home visits, can improve the number of women who participate in mammography screening (Mauad et al., 2009), especially in low-income areas. Further, offering free or low-cost mammography screening, and providing transportation can effectively increase mammography screening' access among women who live in low-income areas (Earp et al., 2002). Utilization of mammography screening also increased the likelihood of early detection of breast cancer (Anderson et al., 2003).

Knowledge and Attitude in the Kingdom of Saudi Arabia

Yaghmour et al., (2020) carried out a cross-sectional study in Al-Qunfudah, Saudi Arabia among women, aged 18 years and older to assess their knowledge, attitude, and practice towards breast cancer screening using a self-administrated questionnaire. Almost all participants had heard about breast cancer; a very low percentage (5.9%) had not heard of mammography screening. Most showed a high awareness level of breast self-examination (93.6%), but lower awareness regarding clinical breast examination and mammography screening (63.1%, and 65.5%, respectively). Forty-three percent of participants practiced breast self-examination correctly. There was a significant association between women's ages, marital status, and current work and knowledge about mammography screening (P=0.04, P=0.04, and P=0.04), respectively). In addition, there was a strong significant correlation between age and undergoing mammography screening (P=0.001). It was concluded that women in Al-Qunfudah, Saudi Arabia had insufficient knowledge, awareness and practice toward mammogram, and hence educational health intervention would be required to encourage women to access mammography screening.

Studies in Saudi Arabia also reported low levels of knowledge among women regarding mammography screening (Alotaibi et al., 2018; Aljohani et al., 2016); performance or practice of breast cancer examination was slightly higher than that reported among women in Abha, Saudi Arabia, by Mahfouz et al., (2016). Additionally, several studies carried out in Al Hassa, Buraidah, Abha, Jeddah, and Riyadh in SA reported low knowledge and awareness among women and poor attitude regarding breast cancer and screening methods, risk factors, and cancer preventive

practices (Amin, et al., 2009; Dandash, & Al-Mohaimeed, 2007; Mahfouz et al., 2016; Sait et al., 2010; Ravichandran et al., 2011).

Eastern Region of Saudi Arabia

Al-Wassia et al., (2017) conducted a study in different geographical regions of Saudi Arabia including Northern, Southern, Western, Eastern, and Central regions. It was reported that most of the respondents had an excellent knowledge of mammograms, 19% had very good knowledge, 22% had a fair knowledge, while 36% of them had poor knowledge. Among women who reported excellent knowledge, 78% correctly knew how to obtain a mammogram. Approximately 72% of women knew that mammography was the standard method for detecting breast cancer and 60% reported that women should undergo mammography screening every one to two years. There was a significant association (*P*-value=0.001) between mammography screening knowledge and socio-demographic characteristics of age, marital status, economic status, number of children, educational level, residence, and previous history among family members. Additionally, the authors reported that single, elderly women above 60 years, those with low educational levels and low income had a low knowledge score. On the other hand, women with more than one child, those with a previous family history, and residents in the eastern and central regions of Saudi Arabia, had the highest knowledge scores. These results correspond with another study conducted in Jeddah, Saudi Arabia in which women also displayed poor knowledge of mammography screening (Radi, 2013).

Moreover, Hagi, & Khafaji's (2013) study found a strong association between high educational level and better mammography screening among Saudi women. Despite widely available and free mammography screening and widespread knowledge of breast cancer through educational campaigns in Saudi Arabia, numerous Saudi women had low rates of mammography screening, as reported by El-Bcheraoui et al. (2015); Hagi, & Khafaji (2013). Poor/lack of knowledge concerning mammography screening may be associated with mammography underutilization, according to Mamdouh, El-Mansy et al., (2014). In the Eastern region of Saudi Arabia, 6.5% of Saudi women never received a mammography screening, according to Rehmani et al., (2013).

Rasheed, & Al-Sowielem (2013) carried out a descriptive cross-sectional study among Saudi women attending primary health care centers in Al-Khobar, Saudi Arabia. Of these approximately 48% had poor knowledge of breast cancer. Breastfeeding, postmenopausal hormone, and smoking were identified by 85% of the participants' women as common risk factors associated with breast cancer. A quarter of women knew about mammography screening as the best effective screening method for detecting breast cancer, 44.6% practiced breast self-examination, and 44.1% received information about breast cancer and mammography screening from television. Knowledge level among women was significantly associated with demographic characteristics, such as age, educational level, and occupational status ($P < 0.05$). The authors concluded that most women had low knowledge level about breast cancer and mammogram, therefore more educational health programs were

required to increase women's awareness and knowledge about breast cancer and motivate them to access mammography screening.

Amin et al. (2009) conducted a similar study in Al-Hassa, Saudi Arabia and reported that most women had poor knowledge toward breast cancer and its associated risk factors regardless of their educational level. Consequently, there was underutilization of mammography screening. Similar results were reported in Riyadh, SA by Alam (2006), who found that women with higher education showed a higher knowledge level toward breast cancer and screening methods. Higher knowledge level was associated with breast self-examination practice; however, this practice was observed to be uncommon among 41.2% of women in Riyadh, SA.

Aldabal, & Koura (2016) conducted a cross-sectional study in Al-Khobar in Eastern Saudi Arabia of women aged 25 years and older attending five primary health care centers. They found only 7% of the participants had moderate to high risk factors related to breast cancer. Using contraceptive pills, obesity, breastfeeding (less than one year), age of puberty (below 12 years), history of breast cancer among their relatives (second degree), menopause, and using hormone therapy were the reported risk factors among women (51.2%, 42.8%, 24.3%, 18.7%, 9.5%, 9.3%, and 8%, respectively). Breast self-examination method was the most common method used for early detection of breast cancer among women (44.6%), while only 16.3% underwent mammography screening, and the lowest percentage (11.6%) followed clinical examination. The results indicated that greater attention was required to increase the uptake of breast screening in SA. Increase in the

percentage of participants with a previous family history of breast cancer was attributed to the higher rate of consanguineous marriages in the Eastern province, as interpreted by El-Mouzan et al., (2007).

Studies conducted in Saudi Arabia reported low percentages of women utilizing mammography screening (Jahan et al., 2006; Central Department of Statistics and Information, 2010). When compared with the Eastern province where 16.3% of women utilized screening, only 10% in the remainder of SA utilized mammography. This might be attributed to educational level and knowledge about mammography screening. Although the Ministry of Health provides free mammography screening to Saudi women not covered by medical insurance, low utilization is commonly observed in Saudi Arabia.

Lack of knowledge about mammography screening, its benefits and importance of early detection, were considered the major barriers to the utilization of mammography screening, according to Pearlman et al., (2008). Not just in SA but also restricting women around the world generally. Additionally, research has shown that there are motivators to encourage women to use mammogram. The second part of the literature review covers the most common barriers and motivators in international research, the Middle East, and Saudi Arabia.

Motivators and Barriers Limiting Women's Utilization of Mammography Screening

Motivators encouraging women to utilize mammography screening and barriers limiting screening were studied in Palestine, Iran, Malaysia, Switzerland, Germany, South America and among immigrants in the United States.

Nazzal et al., (2016) conducted a cross-sectional study among healthcare workers in Palestine to assess the motivators and barriers behind mammography screening. Study results showed that majority of participants (95.1%) had accurate knowledge regarding breast cancer and mammography screening and most respondents were within the age of risk of 46 years. Additionally, about half of the participants (50%) reported having only one mammogram, while 21% had regularly scheduled mammograms. Approximately 89.6% of them reported that early detection of breast cancer is the most common motivator for mammography screening as its perceived benefits were very important in controlling and managing this disease. The second motivator was reported by 84.4% of participants who believed that mammography could significantly detect breast cancer before symptoms appeared. On the other hand, being busy was the most common barrier preventing them from screening (46.7%), followed by absence of perceived susceptibility (41.5%). Also, Shirzadi et al., (2020) reported barriers among Iranian women related to their mammogram utilization, such as fear control, improper competency of mammography centers, lack of awareness of mammography, priority of mammography, and feeling of losing family support.

Hassan et al., (2015) carried out a study in Malaysia among Asian women, aged between 40 and 47 years, who attended opportunistic mammography screening in a private Malaysia hospital. It was reported that most of the participants were Chinese (70.1%), while all of them (99.2%) had less than 2% ten-year breast cancer risk. The motivators recorded among women were high educational level (secondary school education), and having family, friends, and doctors recommend

mammography. While fear of pain from mammography and the perception of not being at risk were the most observed barriers among participants. It was concluded that women in the age group of 40-47 years had low risk of breast cancer and would benefit from awareness programs to improve uptake of mammography screening at older ages.

Labrie et al., (2017) conducted a cross-sectional survey in Switzerland among women, 30 to 49 years old. High fear, perceived susceptibility, ego-involvement, geographical location, and age were the major predictors of screening intentions ($P \leq 0.05$, $P \leq 0.05$, $P \leq 0.001$, $P \leq 0.001$, and $P \leq 0.001$, respectively) among women who were not eligible yet for screening program. On the other hand, knowledge about breast cancer, educational level, and perceptions of risk did not show any significant effect. It was concluded that differential strategies were required to reach different ages and allow women to make informed decisions toward mammography. Labrie et al., (2020) performed a cross-sectional study in Germany to examine the role of cultural affiliation and screening programs availability as drivers of mammogram practices among women aged 30 to 49 who weren't eligible for screening. Screening program availability and cultural affiliation were the most cited motivators for screening practices/ perceptions. Also, women who requested a mammogram perceived more benefits from screening.

Huaman et al., (2011) conducted a study in Peru, South America by adapting Champion's scale to measure perceived susceptibility for breast cancer and assess barriers for mammography screening among women aged from 40 to 65 years. A significant association was found between mammogram screening utilization and

barriers (P<0.001). Women's ages and their knowledge about mammograms were independently associated with mammography screening utilization. Development of reliable and valid instruments were required to more accurately measure women's beliefs about breast cancer and mammography screening.

The following studies explored barriers and motivators among immigrants in the United States. Lee-Lin et al., (2007) carried out a descriptive study in the United States among Chinese immigrant women aged 40 years and above to assess their knowledge and beliefs about mammography screening practices (susceptibility, perceived risk factors, benefits, and cultural and most common barriers). Approximately 86% of the participants had only one mammogram and almost half of them (48.5%) had a mammogram within the past year. Barriers included a low level of knowledge about breast cancer, and mammography screening guidelines, as well as perceived low susceptibility to breast cancer were reported among most of the respondents. The most common motivators were having a family member diagnosed with breast cancer, having insurance covering a mammography screening, and having lower perceived barriers for screening. Yu et al., (2005) carried out a study among Chinese women in Michigan to explore the association between culturally based attitudes and breast cancer screening program. The study results showed a positive correlation between cultural affiliation and breast cancer screening behavior which was considered the strongest motivator. Adunlin et al., (2019) further studied immigrant women in the U.S. to explore the most common motivators and barriers for breast cancer screening. Lack of knowledge, high costs, lack of insurance coverage, and immigration status were the most common personal

barriers for seeking breast cancer screening. Additionally, system barriers were reported such as insensitivity to patient needs, poor access to services, and lack of interpreter services. On the other hand, knowledge about breast cancer, social networks, doctor recommendation, and access to information sources were the most relevant motivators. In addition, resource availability and cultural norms were considered as other facilitators for screening at the personal and system levels. The most common predictor to prevent these barriers was health insurance coverage. A study of immigrant women in Canada found similar barriers to the ones found in the U.S. (Ferdous et al., 2018). The most common barriers were culture; language; low income; lack of knowledge, education, and effective communications; preference of female doctor; and embarrassment.

Raymond et al., (2014) and Wells et al., (2017) conducted studies among African American women in the U.S. and reported that psychological barriers, pain, fear, discomfort, knowledge-related barriers, and the financial (logistical) barriers were the most common observed among African/Black women. Additionally, Wu et al., (2008) and Lee-Lin et al., (2012) reported similar barriers to mammography screening among Asian women resident in American and added more cultural barriers and misinformation.

Other barriers related to mammography screening (psychological/knowledge, logistical, culture/immigration-related, personal, and social/interpersonal barriers) were reported in several studies. For example, Medina-Shepherd & Kleier (2012) and Wu et al. (2008) reported concern about radiation exposure,

embarrassment, and lack of understanding of procedure. Further, Medina-Shepherd and Kleier (2012) noted that most women were not aware of how to engage in the process and thought that they were too old. Wu et al., (2009) reported that most Asians women in the U.S. (Indians, Chinese, Koreans and Filipinos) felt discomfort with male technicians, undressing, inconvenient clinic times, and lengthy waiting times (Husaini et al., 2005) and reported fear and/or concern about pain, absence of symptoms, and distrust of medical tests/mammogram. Husaini et al. (2005) added that African American women indicated they received a negative mammogram experience, logistical lack of time, time limitations, or culture/immigration-related religious reasons.

Ho et al., (2005) reported other barriers related to mammography screening, such as: fear of results, thinking screening was unnecessary, or lack of information on age to initiate mammogram examinations. Ho et al., (2005) added that most women expressed problems with transportation, insurance coverage, finding a doctor, and never had a mammogram. Additionally, Ho et al. (2005) and Husaini et al. (2005) reported social/interpersonal, and lack of doctor order/recommendation as common reported barriers preventing women from mammogram screening.

When examining barriers to mammography Adams et al. (2001) reported lack of prioritization/procrastination and forgetfulness, not knowing where to go, did not think about it, and perceived lack of susceptibility to breast cancer. Adams et al., (2001) added that most women in the study indicate that they did not want to know if they had cancer, or member in their family had breast cancer; others said

they did not think mammography screening save lives, no one they know talks about mammography screening, and it takes too long to get an appointment. Champion & Springston (1999) reported lack of understanding of scheduling, costs, lack of child-care, and technicians did not treat them with respect.

In general, these studies concluded that cultural affiliation and breast cancer screening behaviors were considered the strongest motivators among immigrants in the US (Yu et al. 2005). Ho et al. (2005) noted that fear of cancer, thinking screening was unnecessary, lack of knowledge about the age at which to begin screening, lack of knowledge about doctors; specialties, transportation issues, personal age, insurance coverage, social/interpersonal behaviors, and lack of doctor recommendation were the most common reported barriers preventing women from mammogram screening (Ho et al., 2005). Nazzal et al. (2016) concluded that more educational programs were required to remove barriers and increase cultural values toward mammography screening and the importance of early detection. Also, they recommended increasing the availability of screening services to help in improving compliance for mammography screening. Physicians who recommended mammography screening was considered a strong motivator (Hassan et al., 2015).

The Middle East

Al-Azri et al., (2020) conducted a cross-sectional study to explore barriers toward breast cancer screening among Omani women attending the Sultan Qaboos University Hospital (SQUH). The study reported severe barriers related to breast cancer screening among Omani women, such as fear of breast cancer diagnosis and

treatment (40.8% and 52.1%, respectively), as well as embarrassment of a breast diagnosis/examinations (46.6%). Additionally, other perceived system-related barriers were reported including, the availability of only male doctors, non-Arabic speaking doctors, and an absence of recommendations of doctors (46.6% and 38.7%, and 46.3%, respectively). Moreover, most women worried about long appointment times, believed that they were not at the target age for breast cancer screening, experienced difficulty in communication, and indicated lack of advertisement for breast cancer screening in the newspaper or TV (44.1%, 42.7%, 38.7%, and 32.3%). Besides, lack of specialized clinics for screening, other concerns reflected distance to service indifference from local health centers, lack of transportation, and doctors lack of clarity when explaining mammography screening (32.0%, 29.1%, 25.6%, 24.9%, and 22.3%). The authors recommended implementation of national strategies of breast cancer screening to improve Omani women awareness of screening, the importance of early diagnosis, and elimination of cultural, practical, and personal-related barriers.

Another study, also conducted among Omani women, reported psychosocial stressors to breast cancer screening, such as isolation; worries about death, cancer metastasis, and side effects of treatment; fear of cancer interfering with their family responsibilities and daily life (Al-Azri et al.,2014). In contrast, other studies reported that breast cancer diagnosis could be a motivator for improving women's behaviors to utilize breast cancer screening (Azami-Aghdash et al.,2015).

Mamdouh et al. (2014) conducted a cross sectional study among Egyptian women to explore the possible economic systems and personal barriers to

mammography screening. Regarding personal barriers, it was reported that 81.8% of participant women did not seek care until they were ill, 69.2% believed that medical checkups were not worthy, 49.3% fear of discovering cancer, and 39.1% were embarrassed by breast examinations. Other reported personal barriers were fear of screening pain, exposure to radiation, beliefs that cancer has no cure, mammography screening is not important, and their family may refuse screening (25.7%, 25.5%, 12.3%, 7.8%, and 6.1%, respectively. Similar results were also reported by Thompson et al., (2006) and Flynn et al., (2007). In terms of economic barriers, most women reported that they were aggravated by the high costs related to the services (64.6%), difficulties with transportation (44.1%), and long wait time for an appointment (26%). These results agreed with these previous studies (Davis et al.,1996; Fatimi & Avan, 2002; Paskett et al.,2004). Concerning health system barriers, most Egyptian women reported that they did not seek mammography screening until the doctor recommended it (77%), lack of privacy (71.4%), lack of female nurses or doctors (42.9%), remoteness of this service (38.1%), and the doctor did not explain mammography procedure (29.1%). The authors also noted that women with no family history of breast cancer, low education, low income, and poor knowledge of breast cancer risks were also less likely to pursue screening. Increasing awareness of breast cancer risks becomes a motivator for women to seek mammography screening. These findings were in accordance with a previous study (Sim et al., 2009) which reported that there was no association between family history and the rate of breast screening.

A cross sectional study in Jordan to explore the most common barriers related to screening service (Abu-Helalah et al.,2015) reported a mean age of 46.8±7.8 years, 34.9% reported self-examination, 16.8% reported doctor examination, and low percentages (8.6%) reported periodic mammography screening. Approximately 3.8% of above participants underwent mammography screening at least one time, while majority of them (87.6%) had never undergone breast cancer screening. The most common motivator for conducting a screening were perceived benefits (50%), followed by family history of breast cancer (23.1%), perceived severity (21.2%), with only 5.8% of participants reporting advice from their relatives or friends. On the other hand, the most common barriers were fear of results (63.8%), lack of support from surrounding environment (59.7%), cost issues (53.4%), and religious beliefs (51.1%). Residence played a pivotal role in the screening rate with city residents reporting a higher rate of mammography screening than those who live in towns or villages, which was supported by other studies (Spaczyński et al.,2010). Abu-Helalah et al. (2015) showed absence of regular systematic mammography screening in Jordan, which was supported by other studies (Nur, 2010; Gang et al.,2013). Additionally, low uptake of this service, negative perceptions, and poor knowledge about breast cancer and mammography screening were reported among women in Jordan. The same study reported a positive association between higher educational level and economic status with undergoing mammography screening These findings were supported by a study conducted among Arab women in Qatar (Donnelly et al.,2014). DU et al., (2011), and Jing, (2011) which attributed the negative impact of low educational level on screening practice to lack

of comprehension of health information, as well as limited communication skills. The authors recommended providing health promotion programs, especially in rural areas to remove current barriers related to mammography screenings.

A study by Marzouq & Floyd (2019) assessed Kuwaiti women's knowledge, attitudes, and barriers towards breast cancer and mammography screening and found that most women revealed low levels of knowledge and awareness of breast cancer; in addition, lower-social economic status and low educational level were common barriers limiting them from receiving mammography screening. These results agreed with previous studies (Pape et al.,2016; Huang et al.,2011), while another study reported that women with a tertiary education showed a higher level of knowledge of breast cancer and willingly engaged in breast self-examination and seeking screening (Lawal et al.,2015). Most participants in the above study believed that breastfeeding protected women from developing breast cancer. This result was similar in several studies which found an association between breastfeeding failure and increasing rate of breast cancer cases (Bener et al., 2009; Donnelly et al., 2014; Elobaid et al., 2014; Granado et al.,2013). Additionally, Laval et al reported that most participants believed that there was strong linkage between genetic history and developing breast cancer. This finding was also reported in Bamidele et al., (2017) who indicated the genetic nature of developing breast cancer and added that most women felt that they were not at a high risk of breast cancer if they did not have symptoms.

Marzouq et al. (2019) added that most women in Kuwait thought that they would develop breast cancer after screening even if absent before the test. This

finding was similar to results in a previous study where women believed that radiation may cause breast cancer (Bener et al., 2009). Additionally, most women believed that avoiding maleficent behaviors, such as envy, jealousy, or spiteful behaviors, could be protective from developing breast cancer (Qamar, 2013). Most Kuwaiti women lacked knowledge about mammography screening, stemmed from fear of pain and discomfort of breast physical examination which they heard from friends who received mammography screening. This barrier was reported in several studies in different countries (Mathers et al.,2013; Murphy et al., 2015). Other fears were fear of what would happen during mammography screening, fear of discovering cancer, lack of trust in the diagnosis, and lack of trust toward the physician's ability to explain the screening image which also played on their fears (Davie, 2007). Most Muslim women entertained a fatalistic attitude of trust in Allah Almighty if He wanted them to develop breast cancer. Hasnain et al., (2014). In rural communities negative testimony from family or friends and poor literacy were other strong barriers preventing women in Kuwait from utilizing mammography screening. Moreover, having a family and job were also considered potential barriers preventing women attendance at screening. The above findings were corroborated by previous studies (Thomas et al.,2005; Pape et al., 2016; Malhotra et al.,2016).

Kingdom of Saudi Arabia

Eastern, Western, Northern, and Central Region

There are four main geographical regions in Saudi Arabia. Each region varies in climate, population size, and women's socio-demographic characteristics. Each area was examined separately to assess the impact of geographical location

on women's socio-demographic conditions, their use of the mammogram, and explore the common motivators and barriers that were associated with mammography screening utilization.

In Saudi Arabia, Abdel-Salam et al. (2020) conducted a cross-sectional study among women aged between 41 and 75 years in Aljouf region, located in the north of Saudi Arabia, using a structured questionnaire. The study examined risk factors related to developing breast cancer, such as late menopause (18.7%), women whose first pregnancy was after the age of 30 years (18%) and women who had early menarche (14.9%). Regarding the most common barriers preventing women from screening attendance, there were some personal barriers, such as lack of information about mammography screening; fear of exposure to radiation, discovering breast cancer, of cancer treatment; and insufficient time for screening (69.5%, 67.4%, 62.9%, 62.2%, and 61.9%, respectively). The economic barriers included taking sick leave from work and the expense of mammography in private medical institutions (40% and 37.8%, respectively). In terms of health system barriers, the most common were fear of diagnosis errors, length of appointments, and required recommendation from the doctor. (62.6%, 57%, and 52.7%, respectively). Additionally, income level played a crucial role in predicting barriers towards screening. Therefore, it was reported that it was essential to address these barriers and improve women's awareness toward mammography screening which increased its uptake among Saudi women in Aljouf region. Another study concluded in Saudi Arabia reported that cultural norms regarding how women's behavior with men other than their husbands, strengthened barriers limiting women's use of mammography

screening (Azaiza et al., 2006). These results were further supported by Abdel-Aziz et al., (2018); Gürdal et al., (2012); Ahmed et al., (2005).

Al-Wassia et al. (2017) conducted a cross sectional study among Saudi women residents in five regions of Saudi Arabia including Northern, Southern, Western, Eastern, and Central. Most of the participants were from the western region (35%), followed by 31% resident in the central region, 21% from the eastern region, and the lowest percentage was from the northern and southern region (7%). Regarding the most reasons/barriers restricting women to obtain mammography screening were their beliefs that the breast examination was not essential, worried about the results, not wanting anyone to see/touch their body, especially the private areas, did not know where to go, examination was painful, and women feared radiation exposure (31%, 25%, 11.8%, 11.7%, 10.9%, and 9.7%, respectively). Women's concerns prior to getting a mammography appointment, included worried about the results, fear of pain, would not be able to sleep, embarrassment, felt indifferent, and did not want to go for screening (45.5%, 15.7%, 11.1%, 10.3%. 10%, and 7.5%, respectively).

Alshahrani et al. (2019) carried out a cross-sectional questionnaire-based study among Saudi women who attending five primary health care centers in Najran, Southwestern of Saudi Arabia. It was reported that lack of knowledge about the screening methods was considered the most common barrier limiting women from utilizing mammography screening. Additionally, women reported that they did not receive training about breast self-examination (20.6%). Over one fourth

(26.4%) failed to receive a breast self-exam due to absence of a female physician. Over half (57%) of the women reported that they had no idea about mammography screening, 11.4% stated that it is harmful, 9.4% said that it was painful, and 8.6% reported lack of facilities. These findings were supported by another study conducted in Abha, southwest of Saudi Arabia (Mahfouz et al., 2013) and in Al Hassa in the eastern region of Saudi Arabia (Amin et al., 2009).

Al-Zalabani et al., (2018) conducted a center-based cross-sectional study in Madinah, Saudi Arabia among women aged 15 years and older who attended primary health care centers. The most reported barriers among women were their incorrect belief that mammography screening is painful and fear of exposure to more radiation, which appeared to decrease mammography practicing by 56% and 48%, respectively. Additionally, poor communication with the mammography personnel and their incorrect beliefs that mammography screening was shameful for them, also reduced getting a mammogram. On the other hand, another previous study reported most of motivators behind increasing use of mammography, such as family members' encouragements, husband's nationality, physicians' recommendations, and regular checkups (Han et al., 2000). In the same study, it was reported that age, higher level of education, a positive history of breast cancer among their family or friends, and high economic status were considered the most motivators for undergoing mammography screening and was positively associated with increasing the uptake of mammogram (Yusof et al.,2014; Amoran and Toyobo, 2015).

Dandash & Al-Mohaimeed (2007) carried out a cross-sectional study among 376 female teachers in Al-Qassim, Saudi Arabia. The study results showed that the

most reported risk factors among women were using female sex hormones and non-breastfeeding, and most women believed that cancer would lead to death (fatalism), which were considered strong barriers for breast screening and treatments. Another study was conducted in Al-Khobar city, Saudi Arabia reported that fear of physical diagnosis prevented women from utilizing mammography screening (Dardas & Taha, 2013).

Additionally, other studies were carried out in different regions of Saudi Arabia (Al Madina Al Munawara and Riyadh both in the northern region) reported several barriers restricting Saudi women from accessing mammography screening. Most women revealed their fear of finding abnormality, lack of assurance in the breast screening examination, forgetfulness, modesty or embarrassment, lack of knowledge and no symptoms (Yakout et al.,2014; Yousuf, 2015; Habib et al.,2010; Al-Khamis, 2016; Hussein et al.,2013). Another study conducted in Saudi Arabia showed that 92.3% of women thought that they did not need a mammogram until physicians recommended it (Ravichandran et al., 2011). Most Saudi physicians felt uncomfortable to perform? breast cancer examination that adversely affected the uptake of mammography screening among women, according to Al-Amoudi et al., (2010). Other barriers limiting Saudi women to utilize mammography screening, such as of knowledge about the correct way and the proper time for proceeding with screening, which increased their unease. Additionally, fear of risk they impose, lack of knowledge about mammography screening, most physicians did not encourage women for utilizing breast screening. Most women postponed screening due to inherited misconceptions, while others sought screening if they had breast lump.

Other women considered mammography screening as a stigma and reported their fear of "catching breast cancer," which might have been attributed to advanced stage diagnosis of breast cancer (Abdelhadi, 2008; Kashgari & Ibrahim, 1996; Saeedi et al.,2014).

AlJunidel et al., (2020) conducted a cross-sectional study at the King Khalid University Hospital (KKUH) among women who attended the primary health care clinics and reported that the majority of women in Saudi Arabia did not undergo mammography screening due to their fear of the disease itself. Additionally, the results showed their fear of having breast cancer, fear of pain, annoyed with the high costs, long duration of the screening, and misconceptions. All these barriers were considered a significant risk factor for not-undergoing mammography screening. Abolfotouh et al. (2015) reported that 54.9% of women did not know the way for breast examination and 45% distrusted themselves to do this examination. Women with high education level, working, and had a previous family history of mammography showed lower perceived barriers and achieved high score regarding benefits and motivations.

In the north of Saudi Arabia, the Al-Jouf region some personal barriers were reported through a cross-sectional questionnaire-based study, such as lack of information about mammography screening, fear of exposure to radiation, fear of discovering breast cancer, and fear of cancer treatments, and insufficient time for screening a. Also, other economic barriers and health system barriers were reported, such as fear of diagnosis errors, appointments took too much time, and needed a recommendation from the doctor (Abdel-Salam et al., 2020). In the northern,

southern, western, eastern, and central regions, the most common barriers were their beliefs that the breast examination is not essential, worried about the results, not wanting anyone to see/touch their body, examination was painful, fear of radiation exposure, and embarrassment (Al-Wassia et al., 2017). In Najran, southwestern Saudi Arabia, a cross-sectional questionnaire-based study reported lack of knowledge about the screening methods and lack of training about breast self-examination, failed to receive a breast self-exam due to absence of female physician were the common reported barriers (Alshahrani et al., 2019). A center-based cross-sectional study reported that poor communication with the mammography personnel was the common barrier among women in Al- Madinah (Al-Zalabani et al., 2018). Fear of diagnosis was reported among women in Buraidah, northcentral region and in Al-Khobar, eastern region of Saudi Arabia (Dandash and Al-Mohaimeed, 2007; Dardas & Taha, 2013). The next part covers the gaps in these previous studies.

Gaps in the Previous Studies

Several gaps were found in the previous studies and are discussed below. They included little differentiation in educational and economic status, methods that did not allow generalization to the population, sampling from a nonrepresentative area, and cultural issues

Lack of differentiation in educational level and economic status among the respondents was found in a study conducted in Al-Madinah, Saudi Arabia where participants were all recruited from primary healthcare centers (Al-Zalabani et al.,

2018]). Respondents would have had similar educational levels and economic status.

The use of research methods which used convenience sampling for regions and respondents which did not allow for generalization of the results was found in Al-Wassia et al. (2017).

A study conducted in Aljouf area where the participants were selected from Aljouf only, not from the entire Saudi Arabia, so the results could not be generalized (Abdel-Salam et al., 2020). Finally, some cultural nuances could not be accommodated due to translation of the questionnaire to the Arabic version (Yaghmour et al., 2020).

This dissertation sought to address gaps in the literature, exploring whether primary barriers to mammography screening result, as is hypothesized, from lack of knowledge and other cultural barriers that hamper mammogram practice. It addressed the investigation of low mammography screening by adopting an innovative mixed methods research approach that employed quantitative and qualitative procedures. A Mixed Methods approach had not been undertaken in research reported in Saudi Arabia in this area.

Theoretical Framework

Despite the many years since the publication of the Health Belief Model, it was found helpful in guiding the development of the central questions for investigation in this research study as well as the construction of the survey administered to study participants. The HBM has been critical to research in health promotion since it particularly addresses what motivates an individual to obtain health information and change behavior, hence it

was used here in guiding our investigation into women's beliefs, attitudes and behavior that promote breast cancer screening.

Health Belief Model

Darvish pour et al., (2018) applied the Health Belief Model (HBM) in mammography screening behaviors and reported that the most predictor of not receiving a mammogram was perceived barriers. Khazir et al., (2019) used the HBM to predict mammography screening and reported that more attention was required to promote screening methods. Also, mammography screening' barriers should be understood by healthcare managers to implement more effective programs promoting mammography among women. Taymoori & Habibi, (2014) used the HBM to assess the mammography predictors and perform mammography behaviors. Self-efficacy and perceived susceptibility had the higher impact on utilizing mammography. Family history and social status significantly affected mammography screening. The high efficacy of the HBM as a theoretical framework to study mammography behaviors and provide the foundation for intervention programs are required to increase the uptake of mammography screening.

Dissertation Goal and Specific Aims

The goal of the dissertation was to provide a foundation for designing hospital interventions in the eastern region of Saudi Arabia. Within this broad goal, a mixed methods approach was utilized to investigate the three aims listed below. Each aim fulfills a sequential step in the overall goal of the study, as outlined by Health Belief Model (HBM), and illustrated in the following pages (Figure1).

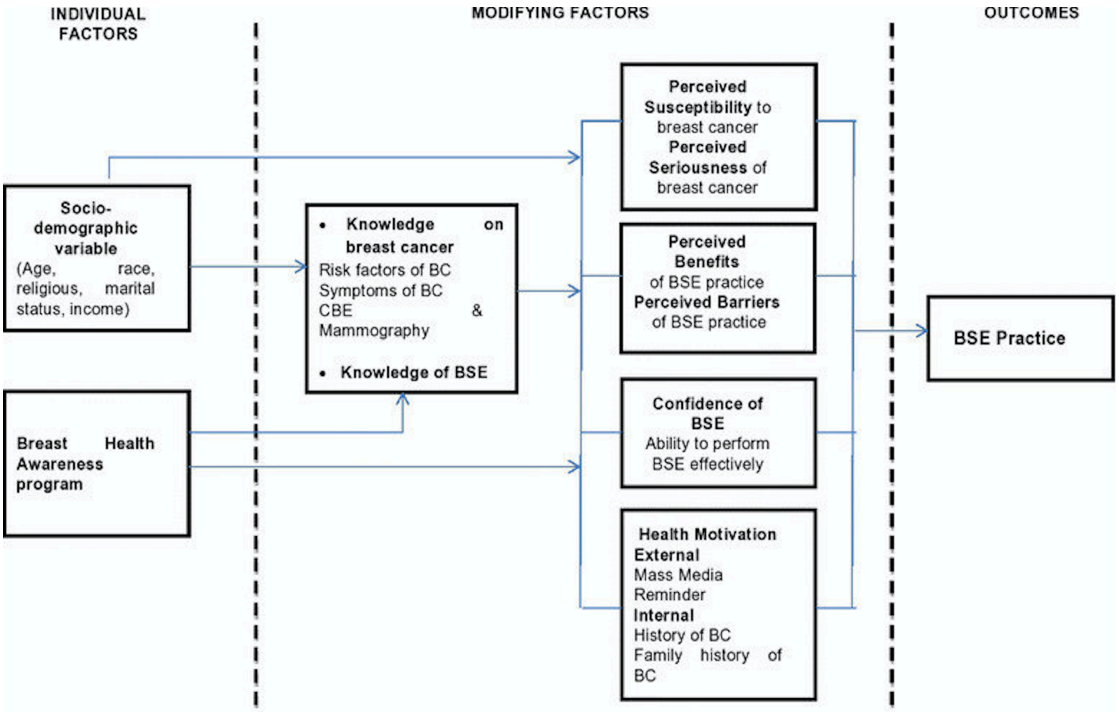

Figure 1:Health Belief Model (HBM)

Specific Aims

AIM 1: Assess knowledge and cultural values related to breast cancer among Saudi women in Saudi Arabia.

AIM 2: Assess knowledge and cultural values related to mammography screening among Saudi women in Saudi Arabia.

AIM 3: Explore how knowledge and cultural values of Saudi women may act as barriers to mammogram screening.

In postulating the above aims, it was recognized that the recommended prevention approach for breast cancer health was through early detection, hence the mammogram provided the most appropriate procedure for early detection. Globally, initiatives that have encouraged annual mammograms for women 35 years and older have resulted in a significant decrease in the morbidity and mortality rates from the condition among women. In Saudi Arabia, this has not been the case. The proposed study will examine whether primary barriers to early detection indeed, result, as we hypothesized, from lack of knowledge and other cultural barriers that hampered early detection.

Chapter II

Methods

This chapter explains in detail the procedures followed for recruitment, data collection, and data analysis. The first part of the chapter explains the study's research design. It describes the sampling strategies, followed by the description of the study, and finally, the demographic characteristics of the study sample. The third part includes procedures for all data collection, the instruments used to operationalize the research variables, and describes the participants' recruitment procedures. The fourth and final part presents the data analysis plan and statistical procedures.

Approach

Mixed Methods Research Design

A non-probability sampling design was used to administer the cross-sectional survey. The survey was followed by the implementation of focus groups. The non-probability design consisted of the universe of the twelve largest general hospitals in the Eastern Province in Saudi Arabia categorized by organizational jurisdiction. They included four government-owned (public), four privately owned, and four under military jurisdiction, which are located in the three major cities of Dammam, Khobar, and Dhahran. A matrix was constructed, inclusive of the twelve hospitals above; using this matrix, six hospitals were drawn randomly from the matrix in establishing the six hospitals. This study addressed gaps in breast cancer research by investigating the lack of knowledge and other

cultural barriers underlying utilization of low mammography screening among Saudi women. The research design followed a mixed method approach that employed quantitative and qualitative procedures.

The study focused exclusively on adult women who attended the selected hospitals. The study design remained central to the value of the study and was vital in drawing participants' information and comments which strengthened the data obtained from the survey and enabled the participants of the current study to explain the survey findings in focus groups and interviews (see (see Figure 2).

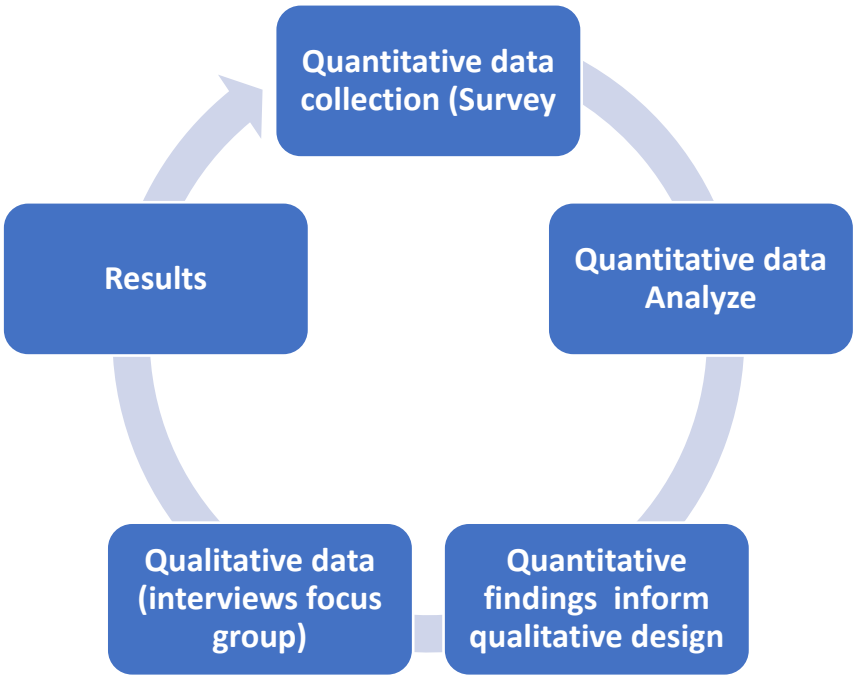

Figure 2:Explanatory Sequential Mixed Method Design

The study's method and instruments, including the survey, focus groups, and qualitative interviews, were approved by the Institutional Review Board (IRB) of Florida International University (IRB-20-0052). In appendix C.

Survey data selection

All hospitals within the jurisdiction were included on a matrix and from those, twelve hospitals met the selection criteria (refer to Table 1 below). From these, six (half) were randomly drawn. Once the six selected hospitals were randomly drawn, all the adult women aged 20 to 60 years old in attendance at the selected hospitals on recruitment days were invited to participate in the study. Six hundred volunteered and met the study's inclusion criteria

Table 1:All Hospitals Included in Selection Matrix: location, type, size (1000 + beds)

Number	Hospital name	Location	Private hospital (15)	Military hospital (4)	Governmental Hospital (5)	Selected Hospital	Hospital size	General
1	Al Habib Hospital	Al Khobar	✓	✗	✗	✓✓	✓	✓
2	Dammam Medical Complex	Dammam	✗	✗	✓	✓✓	✓	✓
3	Saudi German Hospital-Dammam	Dammam	✓	✗	✗	✓✓	✓	✓
4	Fakhry & Dr.ahmed algarzaie Hospital	Al Khobar	✓	✗	✗	✗	✗	✗
5	Procare Hospital	Al Khobar	✓	✗	✗	✗	✗	✗
6	Arrawdha General Hospital	Dammam	✓	✗	✗	✗	✗	✗
7	Dar As-Salama Hospital	Al Khobar	✓	✗	✗	✗	✗	✗
8	Enaya Hospital	Dammam	✓	✗	✗	✗	✗	✗
9	Eye Specialist Hospital	Dhahran	✗	✗	✓	✗	✗	✗
10	King Fahad Specialist Hospital	Dammam	✗	✗	✓	✗	✗	✗
11	King Fahad University Hospital	Al Khobar	✗	✗	✓	✓✓	✓	✓
12	Mouwasat Hospital	Dammam	✓	✗	✗	✗	✗	✗
13	Maternity and Children Hospital	Dammam	✗	✗	✓	✗	✗	✗
14	Al Yousif Hospital	Al Khobar	✓	✗	✗	✗	✗	✗

15	**Tadawi General Hospital**	Dammam	✓	✗	✗	✗	✗	✗
16	**Gama Hospital (Former Astoon)**	Dhahran	✓	✗	✗	✗	✗	✗
17	**Johns Hopkins Aramco Hospital**	Al Khobar	✓	✗	✗	✗	✗	✗
18	**Mohammad Dossary Hospital**	Al Khobar	✓	✗	✗	✗	✗	✗
19	**Almana General Hospital**	Al Khobar	✓	✗	✗	✗	✗	✗
20	**Security Forces Hospital Dammam**	Dammam	✗	✓	✗	✗	✗	✗
21	**Almana General Hospital**	Dammam	✓	✗	✗	✗	✗	✗
22	**Airbase Hospital**	Al Khobar	✗	✓	✗	✓✓	✓	✓
23	**King Fahad Military Medical City**	Dhahran	✗	✓	✗	✓✓	✓	✓
24	**Imam Abdulrahman Al Faisal Hospital Dhahran**	Dammam	✗	✓	✗	✗	✓	✓

As shown in Table 1, all twenty-four hospitals in Al Khobar, Dammam, and Dhahran cities in Saudi Arabia were organized as follows: fifteen private, five public(government), and four military. Of the 24 included in above Table 1, only twelve hospitals met the selection criteria of the study. Of these, six hospitals were chosen randomly: Al Habib Hospital (Al Khobar) and Saudi German Hospital (Dammam) private; Airbase Hospital (Al Khobar) and King Fahad Military Medical City (Dhahran) military; Dammam Medical Complex (Damman) and King Fahad University Hospital (Al Khobar) government. One-hundred questionnaires were administered at each of the randomly selected hospitals for a total of 600 questionnaires.

Permission and full access were obtained from all eligible hospitals and approval was received from the Institutional Review Board (IRB) of Florida International University prior to conducting the study.

Ethnographic Observation

Following two ethnographic observations at each hospital, the researcher created table that identified the best time periods for patient recruitment to the study. The best times for the study and the best locations were identified using an ethnographic observational approach, taking into account participant diversity, size and organizational structure of the hospital, and the allowable time of recruitment at the hospitals. Observations were conducted primarily among adult women who attended the selected hospital on the days of recruitment. There was no definite time for hospital recruitment, as patients came when they felt sick or needed to seek health counselling. Most women visited the hospital in the morning, but others attended in the afternoon or evening. Therefore, recruitment was conducted at each of these three time periods of the day (morning, afternoon, and evening). This recruitment strategy allowed the researcher to include more diverse groups of women, compared to recruitment conducted at only one time period of the day. Recruitment at each hospital was conducted during above three-time periods until the target sample size was reached.

Moreover, both ethnographic observations and the literature review suggested the importance of a female researcher whenever researching women, hence,

the author conducted all research steps to include recruiting participants to the survey and focus groups.

Sample Recruitment of Study Participants.

For Aims 1 and 2, all women participants attending the six selected hospitals during the recruitment period were encouraged to participate in the study. The researcher presented and explained the study to prospective women participants. Only women aged 20 to 60 years old were eligible to participate. Women who participated in the focus groups were invited from the pool of recruited participants, as guided by the study protocol.

Questionnaire Design and Measures

After reviewing the published literature and guided by the Health Belief Model, a structured questionnaire was developed based on questions adopted from previously validated breast cancer knowledge and mammography published surveys (Al-Wassia et al. 2017; Donnelly et al. 2013; Lim et al., 2014; Amin et al. 2009; Nageeb et al. 2018),which examined participants' knowledge of breast cancer and knowledge of mammography and mammography practice. Questions were adapted from questionnaires as found applicable to our population and their cultural relevance (Al-Wassia et al. 2017; Donnelly et al. 2014; Lim et al 2014; Amin et al. 2006 ; Nageeb et al. 2018). Additionally, pertinent questions were added to identify Saudi women's knowledge and cultural values which may act as barriers in obstructing mammogram screening. Selected questionnaire items adopted from the above

sources were translated into Arabic language by an expert on this subject, followed by a back-translation into English to ensure reliability.

The final version of the questionnaire was structured into the following sections: socio-demographic characteristics, knowledge of breast cancer, mammography use, knowledge of mammography practice, cultural values and their impact on mammography practice, and barriers to the utilization of mammography screening in Saudi Arabia. Participants were asked to choose one option for each question unless otherwise indicated. The final questionnaire included 107 questions, which were iteratively and thoroughly reviewed in order to produce the clearest and most accurate version possible.

The first section, demographic characteristics, included nine items on age, educational level, current work status, individual monthly income, monthly family income, marital status, marriage age, and number of children. The second section included items on family history of breast cancer, chronic conditions (obesity, thyroid, asthma, etc.), weight and height, weight (normal, underweight, overweight), use of birth control pills, medication/hormones, (if age above 50 years). This section also included items concerning smoking, type of smoking, previous history of breast cancer among friends, family members, and relatives. The third section included 15 items and assessed participants' knowledge about breast cancer; 13 items used 3-point Likert Scale response when asking participants about their knowledge of breast cancer, two items asked about the most common causes of breast cancer and where participants would go if they suspected having breast cancer. The fourth

section included 15 items that assessed participants' knowledge about the practice of mammogram screening.

The fifth section of the survey included ten items specifically addressing women 35 years old and older to assess their mammogram experience, two of these using 3-point Likert Scale responses and eight using 5-point Likert Scale responses. The sixth section included nine items on religious health fatalism using 5-point Likert Scale responses, strongly agreed, agreed, unsure, disagreed, or strongly disagreed. The next seventh section included seven items that assessed participants' beliefs about breast cancer using Likert Scale responses of strongly agreed, agreed, unsure, disagreed, or strongly disagreed. The following section included twenty-three items on barriers limiting survey participants to engage in mammogram screening program using Likert Scale responses: strongly agreed, agreed, unsure, disagreed, or strongly disagreed. The next part included nine items on encouraging participation in mammogram screening programs. Participants answered the first six items using Likert Scale responses of strongly agreed, agreed, unsure, disagreed, or strongly disagreed. The last three were close ended items on their preference in getting reminders for mammogram screening dates. The last section of the questionnaire included six multiple choice questions on respondents' main source of health information. The Health Belief Model guided item selection for the survey questionnaire and overall, the theoretical model guided the underlying construction of the survey. Selected Items from the health belief model, are shown in Table 2. For a more detailed description of items, please find the entire survey in Appendix A.

Table 2:Health Belief Model Constructs

HBM constructs	Questionnaire items	Example Questionnaire
Perceived susceptibility	Weight and height, weight (normal, underweight, overweight), use of birth control pills, medication/hormones, history of breast cancer, chronic conditions (obesity, thyroid, asthma, etc.) and previous history of breast cancer among friends, family members, and relatives, knowledge of breast cancer and its causes.	"Please indicate which chronic condition(s) you have." "How would you rate your health? "What is your weight" "What is your Height "Did your mother, sister, any of your female relatives or daughters have breast cancer?"
Perceived severity	opinions on mammography experience	"Does a mammogram take a very long time?" "Is mammogram screening painful?" "Is it embarrassing to go for a mammogram?" "Does having a mammogram change the appearance of the breast?"
Perceived benefits	Items on encouraging participation in mammogram screening programs	"How would you like to be reminded of mammogram screening dates?" "How do you feel before a mammogram appointment?"
Perceived barriers	current work status, individual monthly income, monthly family income, religious health fatalism	"What best defines your current work status?" "Your Monthly Income? "Your Average Family Monthly Income?
Cues to action	respondents' source of health information, knowledge of mammogram screening	"Have you heard about mammogram screening? " "From where or whom did you hear about mammogram screening?" "When do you think a woman should start having mammograms?" "Does mammography help with the early detection of any type of breast cancer?"

Questionnaire Reliability and Validity

In order to assess the validity and reliability of the questionnaire, a pilot study was conducted among 40 participants to measure the internal consistency of

the questions. Validity was measured with five sections that included religious health fatalism, beliefs about breast cancer, barriers to participating in mammogram screening, encouragement in mammogram screening, and sources of health information. The section pertaining to religious health fatalism comprised 9 items with a 5-point Likert Scale with response categories ranging from "strongly disagree" (1) to "strongly agree" (5). The religious health fatalism scale had a Cronbach Alpha of 0.893 or 89.3% indicating a very good internal consistency. The items pertaining to the beliefs about breast cancer used a 5-point Likert Scale with response categories ranging from "strongly disagree" (1) to "strongly agree" (5) and had a Cronbach Alpha of 0.681 or 68.1% indicating a generally acceptable internal consistency. Questions pertaining to barriers to participating in mammogram screening consisted of 23 items using a 5-point Likert Scale with response categories ranging from "strongly disagree" (1) to "strongly agree" (5) and had a Cronbach Alpha of 0.880 or 88.0% indicating a very good internal consistency. The section on encouragement to obtain mammogram screening included 6 items with 5-Likert Scale response categories ranging from "strongly disagree" (1) to "strongly agree" (5) and had a Cronbach Alpha of 0.685 or 68.5%, indicating a generally acceptable internal consistency. Finally, the section on sources of health information consisted of 6 items with 5-point Likert Scale response categories ranging from "never" (1) to "always" (5) and had a Cronbach Alpha of 0.680 or 68.0% indicating a generally acceptable internal consistency.

Table 3:Reliability results

SN	Domain	No. of Items	Cronbach Alpha	(%)	Perceived Rating
1	Religious health fatalism	09	0.893	89.3%	Very good
2	Beliefs about breast cancer	07	0.681	68.1%	Acceptable
3	Barriers to participate mammogram screening	23	0.880	88.0%	Very good
4	Encouragement in mammogram screening	06	0.685	68.5%	Acceptable
5	Sources of health information	06	0.680	68.0%	Acceptable
6	**Total**	**51**	**0.922**	**92.2%**	**Excellent**

The overall reliability analysis based on 51 items was 0.922 Cronbach Alpha or 92.2% which indicated excellent internal consistency. Participants included in the pilot study were excluded from the final data analysis, as shown in Table 3 and Figure 3.

Figure 3:: Eight Components of Data Quality

Sample

Adult women between the ages of 20 to 60 years, who attended selected hospitals during recruitment stage, and agreed to participate were included in the current study. Recruitment efforts were conducted during three times periods at each hospital, as noted previously, until reaching the targeted sample size. All participants were informed about needs and goals of the survey and how it would help in understanding knowledge and cultural barriers in utilization of mammograms among women in Saudi Arabia. Moreover, they were informed that this understanding is essential to the design of an appropriately tailored, culturally relevant intervention that would speak to the views and needs of Saudi Arabian women. Finally, they were encouraged to ask questions regarding either the survey or the focus group, publicly or privately via email or cellphone to the researcher. All participants received a copy

of the IRB-approved consent to read and sign. Once this was done, the researchers distributed the survey for the participants to fill out and remained in place to answer any questions from the participants.

After completion of the survey, participants were asked to drop it in the collection box by the hospital doors. Only the researchers had access to the box to maintain confidentiality at all times. The researcher collected and transferred only completed surveys to a sealed envelope and locked them in a cabinet at the hospital until data entry.

Sample Size Considerations

For a target population of 4.9 million women for the planned survey analysis, sample needs to be at least n>385, with a confidence level of 95%, and sampling error of +/-5%. The number of participants was estimated using sample size calculations to conduct the planned health and needs assessments. Sample size calculations yielded a sample size of 600 participants adequate for the proposed statistical analysis which was set to result in a confidence level of 95% at an alpha level of 5%. Sample of 600 produces a sampling error rate of +/-4% around the estimate of sample proportion of 0.5. Recruitment was conducted for two days until number of participants reached the expected sample size for each hospital as proposed by the sampling design criteria.

Survey Data Analysis

The SPSS statistical software (SPSS 20, Chicago, IL, USA) was used for data cleaning and entry by one researcher, and all data entries were cross validated

by a third researcher. Frequencies and percentages were used to describe participants' socio-demographic characteristics. Means and medians for continuous variables are presented in Chapter 3, with standard deviations or interquartile ranges, respectively. For categorical variables, the researcher calculated proportions and compared them using prevalence ratios and 95% confidence intervals.

Analysis of data obtained to test Aims 1 and 2 were performed through data quality checks first, then descriptive statistics, i.e., means and standard deviations for continuous variables and measures of frequency for categorical ones. This was followed by univariate tests, such as chi-square and t-test were used to evaluate the relationships between categorical and continuous predictors with mammography screening. Finally, simultaneous multivariable logistic regression was used to conduct adjusted analysis on the relationship between multiple predictor variables and the main outcome. The researcher evaluated the preselected factors, i.e., cultural values, knowledge, socio-demographics, and values with the dependent variables CBE practices mammography screening.

The analysis accounted for the three types of hospitals (Govt., Private, and military). Chi-square tests were applied to assess whether relationships between health status and demographic variables, hospital organizational structure, and family history was independent. One-way ANOVA or two-sample t-tests were used to compare mean scores of covariates between the levels of dependent variables. For data with an abnormal distribution, non-parametric tests were applied. A p-value of 0.05 was considered statistically significant. (Greenland et al. 2016)

Multivariable logistic regression analysis was utilized to test the association between the predictor variables and outcome variables. (Gibbons & Mann. 2011).

Focus Groups

Aim 3 examined and explored survey findings through focus groups. The researcher intended to confirm revealed data or uncover elements that were not revealed through the quantitative survey data by conducting focus groups. For this aim, the researcher examined data obtained from seven focus groups with 40 participants on barriers related to knowledge and cultural values of Saudi women toward mammogram screening. Survey findings were used to guide the development of focus group questions. This process also included the author's group observations and field notes that recorded the group's social dynamics. Therefore, the data were generated in the group setting and collected in the same group setting.

Focus Group Guide

The first draft of the focus group guide was developed by applying and following different procedures reviewed for this purpose; among which were suggestions included in the manual for implementing the Health Belief Model.

First, these guided the first draft of the questions formulated for the focus group guide which once developed were pilot tested by a small panel that included experts and student volunteers. Most questions in the focus group guide were about Saudi women's knowledge and cultural values which the panel considered could act as barriers limiting their access to mammography screening. Second, after the

preliminary guide was drawn, experts from Florida International University and health professionals were invited to review it. In addition to reviewing the preliminary focus group guide, experts were also asked about their views on Saudi women preferences and receptivity toward participating in the focus group. Third, the final version of the open-ended focus group guide final was pilot tested in a small group that included five women, who were asked to comment on the focus group guide, especially its format, clarity, length, and readability. Furthermore, these women were asked to add comments and recommendations for improving the preliminary focus guide. Finally, all suggested changes were incorporated into the final version of the focus group guide it was adopted as suggested by Al-Wassia et al. (2017); Donnelly et al. (2014); Lim et al. (2014); Amin et al. (2006); Nageeb et al. (2018). As shown in Appendix B, the final guide included nine open-ended questions on participants' opinion about the causes of breast cancer (genetics, nutrition, environmental factors, evil eye and envy, God's punishment, magic, bad luck, or cancer as contagious). The next question asked participants a hypothesized situation, if suspect of having breast cancer, where would they go with choice of doctors, sheikhs, or the alternative medicine. The third question asked for agreement or disagreement on different scenarios frequently cited by other women when they have a health problem. For example: "they pray to Allah's and thy will to be done; they trust Allah, not doctors to heal them." Other comments include, "if a person has enough faith, healing will occur without doctor's having to do anything;" or, "sometimes Allah allows people to be sick for a reason;" "whatever illness they have, Allah has already planned it." Additionally, they were asked what breast cancer screening meant to

them, and to share what they thought were the most frequent difficulties faced by women when accessing mammograms. Among these, for example, were family approval, transport arrangement, or getting an appointment. Answers to the latter were used to identify major obstacles limiting women in getting mammogram services and motivators that encouraged them to utilize screening facilities. Finally, they were asked their suggestions to ease their access to regular mammography screening and the existence and availability of whatever services in their communities they found would increase women's awareness of the importance of mammography screening and its utilization.

Focus Group Procedures

Each focus group took about 60-90 minutes and had 5-6 participants which allowed sufficient time for everyone to share their opinions. The researcher facilitated and moderated each focus group.

Participation in focus groups was voluntary. In order to recruit participants to the survey, recruitment signs were posted on all open areas of the randomly selected hospitals. Additionally, all recruitment information was spread via WhatsApp group. Snowball sampling procedures were employed as needed in obtaining respondents. Among those who volunteered were housewives, teachers and workers from various sectors. They represented various neighborhoods (rich, middle, and poor) and military sectors. Once participants were recruited, seven focus groups were conducted which varied in size with each group consisting of 6-5 participants. After full consent was obtained, seven, hour to an hour and a half focus

groups were conducted; all were digitally audio-recorded and transcribed verbatim with the participants' consent. Then the transcribed data analyzed and coded into themes alluding to barriers and incentives related to knowledge and cultural values on the utilization of mammograms by Saudi Women.

Focus Group Data Analysis

All textual data from focus groups and interviews were transcribed in the native language (Arabic) by the investigator and were reviewed by only one reader to ensure content accuracy. The corrected and revised transcripts were translated and then entered into NVivo qualitative data analysis Software by the researcher for thematic analysis, according to Creswell (2017). The data were ordered by the researcher using open and axial coding, which also refined the analysis.

The emergent themes were discussed and examined by two doctorate level researchers All codes were verified by two interpreters.

For Aim 3 the analysis focused on consistency of themes; primarily exploring and examining themes and processes associated with Saudi women's knowledge and cultural values that could act as barriers restricting them from utilization of mammogram screening.

Summary

This chapter illustrated the approach followed in recruiting participants for data collection in the already presented two-pronged mixed methods research design that called for conducting a large survey and seven focus groups. A non-probability

sampling design was used to administer the cross-sectional survey, the non-probability design consisted of the universe of the twelve largest general hospitals in the Eastern Province in Saudi Arabia (four government-owned (public), four privately owned, and four under military jurisdiction), which are located in the three major cities of Dammam, Khobar, and Dhahran. A matrix was constructed, inclusive of the twelve hospitals above, and six hospitals were drawn randomly from the matrix in establishing the six hospitals. The study focused exclusively on adult women who attended the selected hospitals. Concerning survey data selection, the selected hospitals (private, public sector, and military jurisdiction) vary in size, but these differences were not considered for establishing the selection criteria. Once the six selected hospitals were randomly drawn, all the adult women aged 20 to 60 years old that were in attendance at the selected hospitals on recruitment days were invited to participate in the study. The best times and the best locations for recruitment were identified using an ethnographic approach, that accounted for diversity of participants, size of the hospital, and best recruitment time at each hospital. Participants' recruitment was conducted during these three time periods daily (morning, afternoon, and evening), allowing the researcher to recruit more diverse groups of women.

A structured questionnaire was developed and translated into the Arabic language by a trained native speaker, followed by a back-translation into English to ensure reliability the questionnaire consisted of nine sections, briefly discussed below. The first section included demographic characteristics of participants; the second included items on family history of breast cancer including health conditions;

the third included 15 items on knowledge about breast cancer; The fourth assessed participants' knowledge about the practice of mammogram screening through fifteen items; the fifth included ten items for those aged 35 and older; the sixth included nine items on religious health fatalism using 5-point Likert Scale responses. The seventh included seven items that assessed participants' beliefs about breast cancer using Likert Scale responses, that included twenty-three items on barriers limiting women's participation in mammogram screening programs. The next part included nine items regarding encouraging participation in mammogram screening programs, and the final part included one multiple choice question about the main source of health information. The researcher collected and transferred only completed surveys to a sealed envelope and locked them in a cabinet at the hospital until data entry using SPSS statistical software (SPSS 20, Chicago, IL, USA).

Lastly, the first draft of the focus group was developed by applying and following different procedures. First, reviews of the Health Belief Model guided the writing and pilot testing of the first set of questions. This led to developing the first draft of the focus group guide, which consisted of preliminary questions and corresponding pilot-tested items, drawn by a small panel including both experts and student volunteers. Most questions included in the focus group guide were regarding Saudi women's knowledge and cultural values as barriers limiting their access to mammography screening. The final version of the open-ended focus group guide was pilot tested in a small group that included five women, who were asked to review the focus guide in reference to its format, clarity, length, and readability. Each focus group took between one and two hours and had 5-6 participants which allowed sufficient time

for everyone to share their opinions. All focus group data were transcribed by the investigator and were reviewed by one reader to ensure content accuracy. Upon completion of above steps, the corrected and revised data were entered into NVivo qualitative data analysis Software by the researcher for thematic analysis. However, the study's method and instruments, including the survey, focus groups, and qualitative interviews, were approved by the Institutional Review Board (IRB) of Florida International University (IRB-20-0052). In appendix C.

Chapter III

Quantitative Data Results

This chapter illustrates the initial treatment of the data and presents descriptive statistics of participants' demographic characteristics, health status, and family history of breast cancer. Moreover, this chapter identifies and presents salient survey findings that assessed knowledge and cultural values related to breast cancer and mammography screening among the targeted study population, addressing Aims 1 and 2. Although the data analytic plan was presented in Chapter 2, part of this discussion is repeated below in order to facilitate the reading and interpretation of the analysis presented here. Means and medians of continuous variables are presented with their respective standard deviations or interquartile ranges. Prevalence ratios and 95% confidence intervals are reported for categorical variables.

The analysis accounted for the three types of hospitals (government., private, and military). Chi-square analyses were conducted to assess whether relationships between health status and demographic variables, hospital organizational structure, and family history achieved statistical significance. One way ANOVA or independent t-tests were used to compare mean scores of the dependent variables by categorical independent variables. For data with non-normal distributions, non-parametric tests were applied. A p-value of 0.05 was considered statistically significant. (Greenland et al. 2016). Multivariable logistic regression analysis was utilized to test the association between the predictor variables and outcome variables. (Gibbons &Mann. 2011)

Results

Socio Demographic Characteristics

Table 4:Socio Demographic Characteristics

Study data	Overall N (%) (N=600)	<35 years N (%) (N=349)	≥35 years N (%) (N=251)	χ^2	P-value §
Type of hospital					
• Government	200 (33.3%)	95 (47.5%)	105 (52.5%)		
• Private	200 (33.3%)	132 (66.0%)	68 (34.0%)	16.617	**<.001** **
• Military	200 (33.3%)	122 (61.0%)	78 (39.0%)		
Name of Hospital					
• King Fahad University Hospital	100 (16.7%)	51 (14.6%)	49 (19.5%)		
• Dammam Medical Complex	100 (16.7%)	43 (12.3%)	57 (22.7%)		
• Saudi German Hospital	100 (16.7%)	73 (20.9%)	27 (10.8%)	45.158	**<.001** **
• Al Habib Hospital	100 (16.7%)	60 (17.2%)	40 (15.9%)		
• King Fahad Military Hospital	100 (16.7%)	44 (12.6%)	56 (22.3%)		
• Airbase Hospital	100 (16.7%)	78 (22.3%)	22 (8.8%)		
Educational level					
• Diploma or below	249 (41.5%)	107 (30.7%)	142 (56.6%)	40.386	**<.001** **
• University or higher	351 (58.5%)	242 (69.3%)	109 (43.4%)		
Occupational status					
• Employed	209 (34.8%)	125 (35.8%)	84 (33.5%)		
• Not Employed***	347 (57.8%)	183 (52.4%)	164 (65.3%)	26.605	**<.001** **
• Student	44 (7.3%)	41 (11.7%)	3 (1.2%)		
Marital status					
• Unmarried****	164 (27.3%)	117 (33.5%)	47 (18.7%)	16.099	**<.001** **
• Married	436 (72.7%)	232 (66.5%)	204 (81.3%)		
Age at marriage					
• Not married	115 (19.2%)	103 (29.5%)	12 (04.8%)		
• <25 years	339 (56.5%)	173 (49.6%)	166 (66.1%)	57.685	**<.001** **
• ≥25 years	146 (24.3%)	73 (20.9%)	73 (29.1%)		
Number of children					
• No child	206 (34.3%)	176 (50.4%)	30 (12.0%)		
• 1 – 3	224 (37.4%)	158 (45.3%)	66 (26.3%)	247.142	**<.001** **
• >3	170 (28.3%)	15 (4.3%)	155 (61.8%)		
Monthly income (riyals)*****					
• <2,000	306 (51.0%)	186 (53.3%)	120 (47.8%)		
• 2,000 – 8,000	135 (22.5%)	87 (24.9%)	48 (19.1%)	10.072	**.006** **
• >8,000	159 (26.5%)	76 (21.8%)	83 (33.1%)		
Family monthly income (riyals)					
• <8,000	151 (25.2%)	71 (20.3%)	80 (31.9%)		
• 8,000 – 15,000	198 (33.0%)	115 (33.0%)	83 (33.1%)	12.445	**.006** **
• >15,000	163 (27.2%)	106 (30.4%)	57 (22.7%)		
• I don't know	88 (14.7%)	57 (16.3%)	31 (12.4%)		

Perceived family economic status					
• Excellent	163 (27.2%)	107 (30.7%)	56 (22.3%)		
• Good	256 (42.7%)	152 (43.6%)	104 (41.4%)	9.931	**.019 ** **
• Fair	168 (28.0%)	85 (24.4%)	83 (33.1%)		
• Poor	13 (2.2%)	5 (1.4%)	8 (3.2%)		

§ P-value has been calculated using Chi square test.
** Significant at p<0.05 level.
*** Not Employed but looking for work, Housewife, at home and Retired
**** Unmarried single, divorced, and Widowed.
****1,000 riyals= 266 dollars

Table 4 presents demographic characteristics for Saudi women by age group (<35 years vs ≥35 years). Hospital types were equally represented: government (33.3%), private (33.3%) and military hospital (33.3%). The researcher was successful in recruiting an equal number of participants from each hospital (n= 100), as initially proposed. Hence, each hospital consisted of 200 participants to include King Fahad University Hospital (government hospital), Saudi German Hospital (private hospital), Al Habib Hospital (private hospital), Dammam Medical Complex (government hospital), King Fahad Military Medical City (military hospital) and Airbase Hospital (military hospital) (16.7% each, respectively). With respect to demographic characteristics approximately 60% described themselves as professionals; over half (57.8%) were not active in the labor force and nearly three quarters (72.7%) were married. Furthermore, 56.5% reported getting married at 25 years or younger; 34% had no children and the rest had at least one child (Table 1). With regards to monthly income, more than a half (51%) had less than 2,000 (riyals) of monthly earning, while 33% indicated 8,000 – 15,000 (riyals) of family monthly income. Additionally, 42% of participants perceived their family economic status as good, while 28% indicated fair and 27.2% said excellent.

However, for a Saudi family, the average monthly income in the eastern province in 2018 was (14,902) riyal or $3,980, but less than one-third of our sample had achieved. Monthly average income for an individual person was (2,150) riyal or $573. (General Authority for Statistics, Saudi Arabia 2018). As expected, comparisons between the young age group (<35) and older age group (35+), were found to be significant (p<.05) on a number of demographic characteristics. Younger women were more likely than older women to be represented at private hospitals (66% vs 34%), more likely to have university degrees (69.3% vs 43.4%), to be unmarried (33.5% vs 18.7%), to have no children (50.0% vs 12.0%), and to report excellent/good economic status. Older women were more likely than younger women to be unemployed[1] (65.3% vs 52.4%) and to be married (81.3% vs 63.5%). Younger women were more likely to report the lowest income (53.3%), while older women reported the highest income category (33.1%). Family monthly income, however, showed the opposite: 30.4% of younger women reported the highest income level of >15,000 compared to older women who reported 22.7% and older women more likely to report the lowest income level (31.9%).

General Health of Participants

Table 5:General Health and Family History of Breast Cancer

Variables	Overall N (%) (N=600)	<35 years N (%) (N=349)	≥35 years N (%) (N=251)	$\chi 2$	P-value §
Family history of Breast cancer					
• Yes	121 (20.2%)	62 (17.8%)	59 (23.5%)	2.989	.084

[1] For decades, Saudi Arabia had one of the lowest female labor force participation rates in the world. In 2018, the share of Saudi women who had a job or were actively looking for one was 19.7 percent of the adult population of women with Saudi. However, most of old women they are married and depend on their husbands as a source of income.

• No	479 (79.8%)	287 (82.2%)	192 (76.5%)		
If Yes (n=121):					
Degree of relationship with Breast cancer					
• First degree[2]	35 (28.9%)	11 (18.0%)	24 (40.0%)		
• Se[3]cond degree	59 (48.8%)	37 (60.7%)	22 (36.7%)	8.671	**.013 ****
• T[4]hird degree	27 (22.3%)	13 (21.3%)	14 (23.3%)		

§ P-value has been calculated using chi-square test.
** Significant at p<0.05 level.

Table 5 describes women's family history of breast cancer by age group. The prevalence of women with a family history of breast cancer is 20.2%; of these, the highest percentage (48.8%) reports a second degree of relationship with family members who report breast cancer history. The association between age and degree of relationship is significant ($\chi 2=8.671$; p=.013).

[2] A parent, brother, sister, or child

[3] The aunts, uncles, grandparents, grandchildren, nieces, nephews, or half-siblings of an individual.

[4] is calculated according to the civil law system.

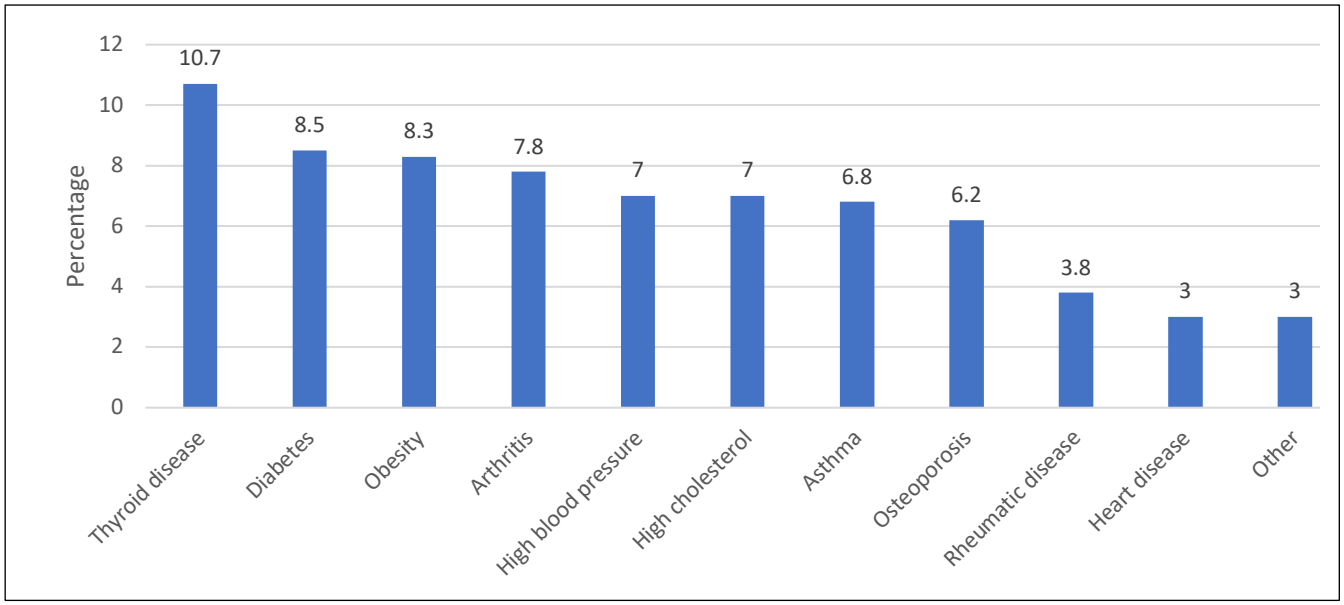

Figure 4:Associated Chronic Diseases of Women (N=600)

Figure 4 indicates that the participants are healthy, in general, reporting chronic conditions for the sample. Among the most frequently reported chronic conditions are thyroid disease (10.7%), followed by diabetes (8.5%) and obesity (8.3%) with heart disease a distant 3%. Generally, participants are healthy

Assessment of Specific Aims

Aim 1: Assess knowledge related to breast cancer and mammography screening

Table 6:Assessment of Knowledge About Breast Cancer

Statement		Correct Answer (%)
1.	The most frequently occurring cancer in women is breast cancer	486 (81.0%)
2.	Breast cancer is more common in 65-year-old women than 40-year-old women	159 (26.5%)
3.	Heredity may play a role in the development of breast cancer	395 (65.8%)
4.	Contraceptive hormones may increase the risk of developing breast cancer	246 (41.0%)
5.	Being overweight or obese increases the risk of developing breast cancer	212 (35.3%)

6.	Breastfeeding may decrease the risk of breast cancer development	429 (71.5%)
7.	Bearing one's first child under the age of 30 protects from breast cancer	63 (10.5%)
8.	Women over the age of 70 rarely get breast cancer†	109 (18.2%)
9.	Late menopause may increase the risk of breast cancer	122 (20.3%)
10.	Breast cancer is caused by bacterial infections†	80 (13.3%)
11.	Annual Mammograms are recommended at age of 40 and above for early detection	479 (79.8%)
12.	The irritation of a tight bra can over time cause breast cancer†	234 (39.0%)
13.	Breast cancer usually presents as a painful lump†	297 (49.5%)
Total score (mean ± SD)		5.53 ± 2.38
Level of knowledge		
•	Low (≤6 score)	393 (65.5%)
•	High (>6 score)	207 (34.5%)

† Indicates reversed answer.

Table 6 describes the assessment of knowledge regarding breast cancer. Based on the results, women showed good knowledge in the following test items, including: "The most frequently occurring cancer in women is breast cancer" (81%), followed by, "Annual Mammograms are recommended at age of 40 and above for early detection" (79.8%) and "Breastfeeding may decrease the risk of breast cancer development" (71.5%). However, women exhibited poor knowledge of the following statements: "Bearing one's first child under the age of 30 protects from breast cancer" (10.5), followed by, "Breast cancer is caused by bacterial infections" (13.3%) and "Women over the age of 70 rarely get breast cancer" (18.2%). The overall mean knowledge score was 5.53 (SD 2.38) out of 13. About two-third (65.5%) scored a low score (≤6 points) and the remaining (34.5%) scored a high score (>6 points). The histogram in Figure 5 shows a typical bell curve of knowledge suggesting a normal distribution in this sample.

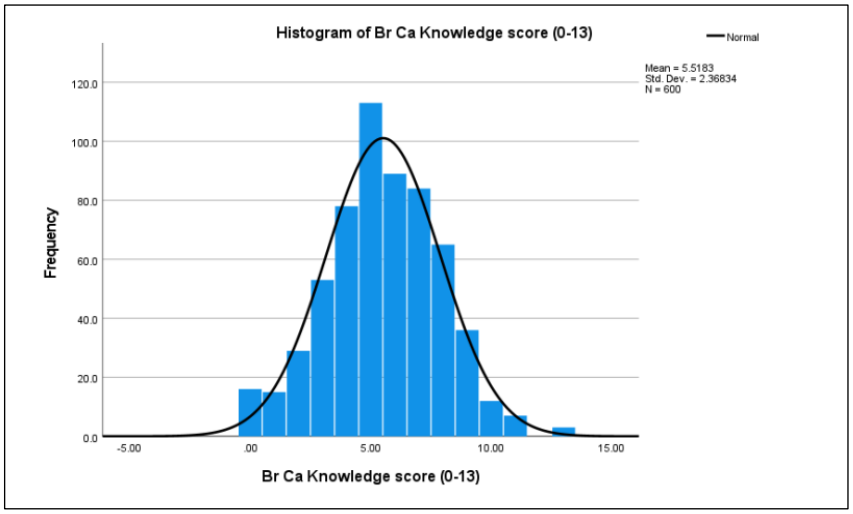

Figure 5:Histogram of Knowledge About Breast Cancer Score

Table 7:Assessment of Knowledge and Practice of Mammogram Screening

Statement	Overall N (%) (N=600)	<35 years N (%) (N=349)	≥35 years N (%) (N=251)	χ^2	*p*-value§
Heard about mammogram screening					
• Yes	430 (71.7%)	233 (66.8%)	197 (78.5%)	9.883	**.002****
• No	170 (28.3%)	116 (33.2%)	54 (21.5%)		
Received an explanation regarding how a mammogram is done					
• Yes	244 (40.7%)	131 (37.5%)	113 (45.0%)	3.389	.066
• No	356 (59.3%)	218 (62.5%)	138 (55.0%)		
Knowledge about age to start mammogram screenings					
• 20 – 30 years old	99 (16.5%)	58 (16.6%)	41 (16.3%)	1.753	.781
• 31 – 40 years old	192 (32.0%)	110 (31.5%)	82 (32.7%)		
• 41 – 50 years old	225 (37.5%)	129 (37.0%)	96 (38.2%)		
• >50 years old	07 (1.2%)	03 (0.90%)	04 (01.6%)		
• I don't know	77 (12.8%)	49 (14.0%)	28 (11.2%)		
Intend to get mammograms					
• Yes	376 (62.7%)	205 (58.7%)	171 (68.1%)	5.500	**.019****
• No	224 (37.3%)	144 (41.3%)	80 (31.9%)		
Preferred time to get mammograms (n=376)					
• Between 30 – 35 years	30 (8.0%)	27 (13.2%)	3 (01.8%)	69.486	**<.001****
• Between 36 – 40 years	17 (4.5%)	17 (8.3%)	0		
• At age >40 years	77 (20.5%)	58 (28.3%)	19 (11.1%)		
• As soon as possible	127 (33.8%)	47 (22.9%)	80 (46.8%)		
• If having symptoms	45 (12.0%)	22 (10.7%)	23 (13.5%)		
• Other reason	31 (8.2%)	26 (12.7%)	23 (13.5%)		

• I don't know	49 (13.0%)	8 (3.9%)	23 (13.5%)		
Reason for not wanting mammograms (n=224)					
• Already done	14 (06.3%)	01 (0.70%)	13 (16.2%)		
• Fear and painful	43 (19.2%)	24 (16.7%)	19 (23.8%)		
• No symptoms	76 (33.9%)	54 (37.5%)	22 (27.5%)		
• Still young	20 (8.9%)	19 (13.2%)	1 (1.2%)	33.894	**<.001****
• No time	6 (2.7%)	3 (2.1%)	3 (3.8%)		
• Not necessary	23 (10.3%)	18 (12.5%)	5 (6.2%)		
• Other reasons	42 (18.8%)	25 (17.4%)	17 (21.2%)		
Mammogram is free					
• Yes	226 (37.7%)	96 (27.5%)	130 (51.8%)	36.675	**<.001****
• No/I don't know	374 (62.3%)	253 (72.5%)	121 (48.2%)		
Mammogram is really necessary					
• Yes	477 (79.5%)	266 (76.2%)	211 (84.1%)	5.515	**.019****
• No/I don't know	123 (20.5%)	83 (23.8%)	40 (15.9%)		
Mammography helps with the early detection of any type of BC					
• Yes	540 (90.0%)	314 (90.0%)	226 (90.0%)	.001	.978
• No/I don't know	60 (10.0%)	35 (10.0%)	25 (10.0%)		

§P-value has been calculated using chi-square test.
**Significant at p<0.05 level.

Table 8:Assessment of Knowledge and Practice of Mammogram Screening (Cont'd.)

Statement	**Overall N (%) (N=600)**	**<35 years N (%) (N=349)**	**≥35 years N (%) (N=251)**	χ^2	***p*-value§**
Mammography reduces the chance of dying from breast cancer					
• Yes	336 (56.0%)	185 (53.0%)	151 (60.2%)	3.030	.082
• No/I don't know	264 (44.0%)	164 (47.0%)	100 (39.8%)		
Mammogram takes a very long time					
• Yes	32 (5.3%)	16 (4.6%)	16 (6.4%)	0.927	.336
• No/I don't know	568 (94.7%)	333 (95.4%)	235 (93.6%)		
Radiation from mammogram can cause cancer					
• Yes	41 (6.8%)	19 (05.4%)	22 (8.8%)	2.529	.112
• No/I don't know	559 (93.2%)	330 (94.6%)	229 (91.2%)		
Mammogram screening important					
• Yes	500 (83.3%)	281 (80.5%)	219 (87.3%)	4.769	**.029****
• No/I don't know	100 (16.7%)	68 (19.5%)	32 (12.7%)		
Mammogram screening is painful					
• Yes	139 (23.2%)	66 (18.9%)	73 (29.1%)	8.488	**.004****
• No/I don't know	461 (76.8%)	283 (81.1%)	178 (70.9%)		
It is embarrassing to go for mammogram					
• Yes	139 (23.2%)	67 (19.2%)	72 (28.7%)	7.383	**.007****
• No/I don't know	461 (76.8%)	282 (80.8%)	179 (71.3%)		

Mammogram can change the appearance of the breast					
• Yes	15 (2.5%)	05 (01.4%)	10 (4.0%)	3.899	**.048****
• No/I don't know	585 (97.5%)	344 (98.6%)	241 (96.0%)		

§P-value has been calculated using Chi square test.
**Significant at p<0.05 level.

Table 7 summarizes participants' knowledge of mammogram screening results suggesting that 71.7% of women had heard about mammogram screening, while the proportion of women who received an explanation regarding this procedure was much lower at 40.7%. Almost 40% (37.5%) of women believe mammogram screening programs should start between the ages of 41 and 50. The proportion of women who intend to get a mammogram is 62.7%. Of those, 33.8% indicated they want it as soon as possible. For women who did not want a mammogram, the most common reason was that they showed no symptoms (33.9%), followed by fear or the thought it would be painful (19.2%). The proportions of women who knew that mammograms are free and that they are really necessary was 37.7% and 79.5%, respectively. Similarly, the proportion of women who believed that mammography helps with the early detection of any type of breast cancer was 90%, while the proportion of women who believed that mammography reduces the chance of dying from breast cancer was 56%. The proportion of women who thought that the procedure would take a very long time was very low at 5.3%. Likewise, the proportion of women who thought that radiation from a mammogram can cause cancer was 6.8%. Additionally, the proportion of women who knew that mammogram screening is important, that it is painful, that it is embarrassing, and that it can change the appearance of the breast were 83.3%, 23.2%, 23.2%, and 2.5%, respectively. The age of participants (<35 and 35+) significantly influence the responses for a number of variables: older women were more

likely than younger women to have heard about mammogram screening ($\chi 2$=9.883; *p*=.002), intend to get mammogram ($\chi 2$=5.500; *p*=.019), prefer getting a mammogram at the earliest convenient time ($\chi 2$=69.486; *p*<.001), mammograms are free ($\chi 2$=35.375; p<.001) and are really necessary ($\chi 2$=5.515; p<.015), mammogram screening is important ($\chi 2$=4.769; *p*=.029), mammogram screening is painful ($\chi 2$=8.488; *p*=0.004), and it is embarrassing to go for mammogram ($\chi 2$=7.383; *p*=.007).

Among young women, most prevalent reason for not wanting a mammogram was that they had no symptoms (37.5%) but older womens' reasons were split between their fear/painful (23.8%) and they had no symptoms (27.5%). ($\chi 2$=33.894; *p*<.001), A small proportion of all ages of women falsely believed that a mammogram would change the shape of the breast, but younger women were also more likely to report no, or they didn't know (98.6% compared to 96.0%)

Table 9:Assessment of Knowledge Regarding Mammogram Screening for Women 35 Years and Older (N=251)

Statement	**N (%)**
Knowledge of place to get mammogram screening	
• Yes	136 (54.2%)
• No/I don't know	115 (45.8%)
If the first mammogram is normal, there's a need for subsequent mammograms	
• Yes	152 (60.6%)
• No/I don't know	99 (39.4%)
When was the last mammogram?	
• Never	158 (62.9%)
• Within the last year	34 (13.5%)
• 1 – 2 year	21 (8.4%)
• >2 years	32 (12.7%)
• I don't know	6 (2.4%)
Who advised you to get a mammogram (n=136)	
• Doctor	69 (50.7%)
• Self-referred	25 (18.4%)
• Family member	18 (13.2%)
• Friend	8 (5.9%)
• Health educator	8 (5.9%)
• Other	8 (5.9%)

Reason for having a mammogram (n=129)	
• Being over 40 years old	62 (48.1%)
• Having risk factors for breast cancer	54 (41.9%)
• Having breast changes/symptoms	13 (10.1%)
How frequently should a woman have a mammogram?	
• Never	10 (4.0%)
• If she feels a lump in her breast	53 (21.1%)
• Every 6 months	53 (21.1%)
• Every year to two years	82 (32.7%)
• Every five years	8 (3.2%)
• I don't know	45 (17.9%)

In the assessment of knowledge regarding mammogram screening for women 35 years and older (Table 8), it was found that 54.2% knew the proper place to go for mammogram screening. Furthermore, 60.6% indicated that even if the first mammogram is normal, a subsequent mammogram is needed. Only 13.5% of these women report that they underwent a mammogram screening within the last year. The person who most commonly advised women to get a mammogram was a doctor (50.7%), while the most common reason for having a mammogram was being over 40 years old (48.1%). In addition, 32.7% of participants believe that mammogram screening should be taken every year or every two years.

Aim 2: Assess cultural values related to mammography screening

Table 10:Assessment of Religious Health Fatalism (N=600)

Statement		Disagree N (%)	Unsure N (%)	Agree N (%)
1.	I don't worry about my health because it's in Allah's hands	119 (19.8%)	39 (6.5%)	442 (73.7%)
2.	If I am sick, I have to wait until it is Allah's time for me to be healed	356 (59.3%)	50 (8.3%)	194 (32.3%)
3.	When I have a health problem, I pray for Allah's will to be done	85 (14.2%)	25 (4.2%)	490 (81.7%)
4.	As long as I stay focused in prayer, I will be healed of any sickness	201 (33.5%)	85 (14.2%)	314 (52.3%)
5.	I trust Allah, not doctors, to heal me	142 (23.7%)	80 (13.3%)	378 (63.0%)
6.	If a person has enough faith, healing will occur without doctors having to do anything	315 (52.5%)	93 (15.5%)	192 (32.0%)
7.	Sometimes Allah allows people to be sick for a reason	72 (12.0%)	115 (19.2%)	413 (68.8%)
8.	If I become ill, Allah intended that to happen	31 (5.2%)	30 (5.0%)	539 (89.8%)
9.	Whatever illness I have, Allah has already planned it	23 (3.8%)	21 (3.5%)	556 (92.7%)
Total Score (mean ± SD)		21.6 ± 4.19	—	—

Level of religious health fatalism			
• Low (≤21 score)	278 (46.3%)	—	—
• High (>21 score)	322 (53.7%)	—	—

This aim uses a religious health fatalism score as an indicator of cultural values. Table 9 shows the assessment of religious health fatalism, consisting of 9 statements. The overall mean religious health fatalism score was 21.6 (SD 4.19) out of 27 points, with 46.3% indicating a low score and 53.7% reporting a high score. Findings show that most women agree with the following statements, including "Whatever illness I have, Allah has already planned it" (92.7%); "If I become ill, Allah intended that to happen" (89.8%); and "When I have a health problem, I pray for Allah's will to be done" (81.7%). Women show less agreement with statements such as, "If a person has enough faith, healing will occur without doctor's having to do anything" (32%) and "If I am sick, I have to wait until it is Allah's time for me to be healed" (32.3%). The histogram in Figure 6 shows a typical bell curve suggesting a normal distribution, with a few outliers, of religious health fatalism scores in the sample.

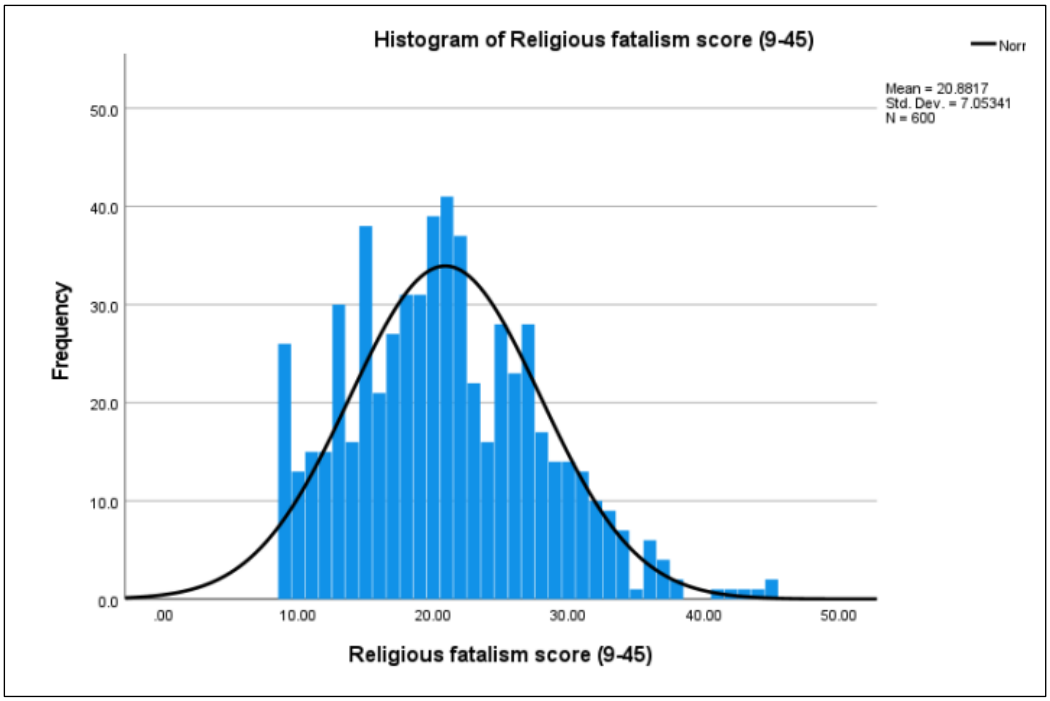

Figure 6:Histogram of Religious Health Fatalism Score

Table 11:Assessment of Beliefs About Breast Cancer (N=600)

Statement	Disagree N (%)	Unsure N (%)	Agree N (%)
1. I think it is God's will if I have breast cancer	29 (04.8%)	51 (08.5%)	520 (86.7%)
2. People usually blame those with breast cancer for their condition†	357 (59.5%)	129 (21.5%)	114 (19.0%)
3. Having breast cancer would gain me favor with Allah	84 (14.0%)	78 (13.0%)	438 (73.0%)
4. Suffering from breast cancer goes beyond just the affected woman and impacts the whole family	77 (12.8%)	86 (14.3%)	437 (72.8%)
5. There are social consequences of having breast cancer	115 (19.2%)	193 (32.2%)	292 (48.7%)
6. Knowing about breast cancer is my duty to my family	10 (01.7%)	47 (07.8%)	543 (90.5%)
7. Knowing about mammography is my duty to myself	05 (0.80%)	43 (07.2%)	552 (92.0%)
Total Score (mean ± SD)	10.3 ± 1.98	—	—
Level of belief about BC			
• Low (≤10 score)	356 (59.3%)	—	—
• High (>10 score)	244 (40.7%)	—	—

† Indicates reversed answer

In addition to religious health fatalism as an indicator of cultural values, beliefs about breast cancer and mammography are measured. The assessment of beliefs about breast cancer Table 10 demonstrates that the top 3 statements with which women agreed are: "Knowing about mammography is my duty to myself" (92%), "Knowing about breast

cancer is my duty to family" (90.5%), and "I think it is God's will if I have breast cancer" (86.7%). Women agreed the least with the following statements: "People usually blame those with breast cancer for their condition" (19%) and "There are social consequences of having breast cancer" (48.7%). The overall mean score of beliefs about breast cancer was 10.3 (SD 1.98) out of 21 points, as 59.3% were considered low score and 40.7% were considered high score. The histogram in Figure 7 shows a typical bell curve suggesting a normal distribution in the sample.

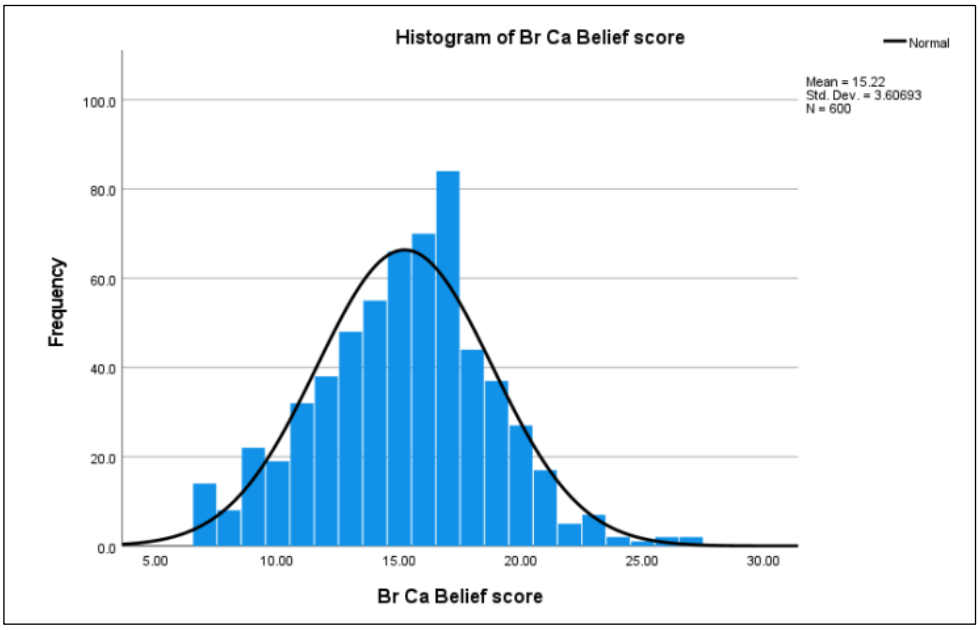

Figure 7:Histogram of Beliefs About Breast Cancer Score

Aim 3: Explore how knowledge and cultural values may act as barriers to mammogram screening.

Table 12:Assessment of Barriers to Participate in Mammogram Screening Program for Women (N=600)

Statement		Disagree N (%)	Unsure N (%)	Agree N (%)
1.	I feel God will protect me	120 (20.0%)	51 (08.5%)	429 (71.5%)
2.	I do not have anything wrong with my breasts	78 (13.0%)	112 (18.7%)	410 (68.3%)
3.	I am afraid of finding out I have breast cancer	166 (27.7%)	136 (22.7%)	298 (49.7%)
4.	I am afraid the screening results may affect my family	220 (36.7%)	91 (15.2%)	289 (48.2%)

5.	I am afraid of finding out if I have breast cancer because I may lose my breasts	246 (41.0%)	94 (15.7%)	260 (43.3%)
6.	I am afraid of finding out I have a breast cancer since my whole life will change	249 (41.5%)	117 (19.5%)	234 (39.0%)
7.	I do not want anyone to see/touch my private areas	309 (51.5%)	128 (21.3%)	163 (27.2%)
8.	I am worried there may be male staff at the clinic	312 (52.0%)	126 (21.0%)	162 (27.0%)
9.	Awareness programs are deficient	300 (50.0%)	144 (24.0%)	156 (26.0%)
10.	Mammogram facilities are not easily available	234 (39.0%)	211 (35.2%)	155 (25.8%)
11.	I am concerned the results of a mammogram will affect my marriage	312 (52.0%)	136 (22.7%)	152 (25.3%)
12.	I do not know where to go	324 (54.0%)	129 (21.5%)	147 (24.5%)
13.	I am concerned the results will jeopardize my chances of getting married	330 (55.0%)	127 (21.2%)	143 (23.8%)
14.	The exam is painful	198 (33.0%)	277 (46.2%)	125 (20.8%)
15.	I fear hospitals and health facilities	415 (69.2%)	71 (11.8%)	114 (19.0%)
16.	I do not want the exposure to radiation	336 (56.0%)	154 (25.7%)	110 (18.3%)
17.	I fear physicians and examiners	412 (68.7%)	79 (13.2%)	109 (18.2%)
18.	I have not heard of breast screening before this survey	457 (76.2%)	61 (10.2%)	82 (13.7%)
19.	I do not have approval from my husband or family	412 (68.7%)	107 (17.8%)	81 (13.5%)
20.	I do not have adequate transportation	411 (68.5%)	109 (18.2%)	80 (13.3%)
21.	I am concerned the results will jeopardize my daughter's chances of getting married	407 (67.8%)	120 (20.0%)	73 (12.2%)
22.	I am skeptical of mammogram screening results	340 (56.7%)	190 (31.7%)	70 (11.7%)
23.	I do not think it's important	440 (73.3%)	94 (15.7%)	66 (11.0%)
Total Score (mean ± SD)		40.8 ± 9.73	—	—
Level of barriers				
•	Low (≤40 score)	309 (51.5%)	—	—
•	High (>40 score)	291 (48.5%)	—	—

Table 11 describes the assessment of barriers to participate in a mammogram screening program. Participants answered "agree" more than 50% for just 2 of 23 statements: "I feel God will protect me" (71.5%) and "I do not have anything wrong with my breasts" (68.3%). However, a majority of participants rated "disagree" in statements such as, "I have not heard of breast screening before this survey" (76.2%) and "I do not think it is important" (73.3%). The total mean score of barriers to participate in a mammogram screening is 40.8 (SD 9.73) out of 69 points, with 51.5% considered as low score (≤40) and 48.5% considered as high score (>40). The histogram in Figure 8 shows a typical bell curve suggesting a normal distribution in the sample.

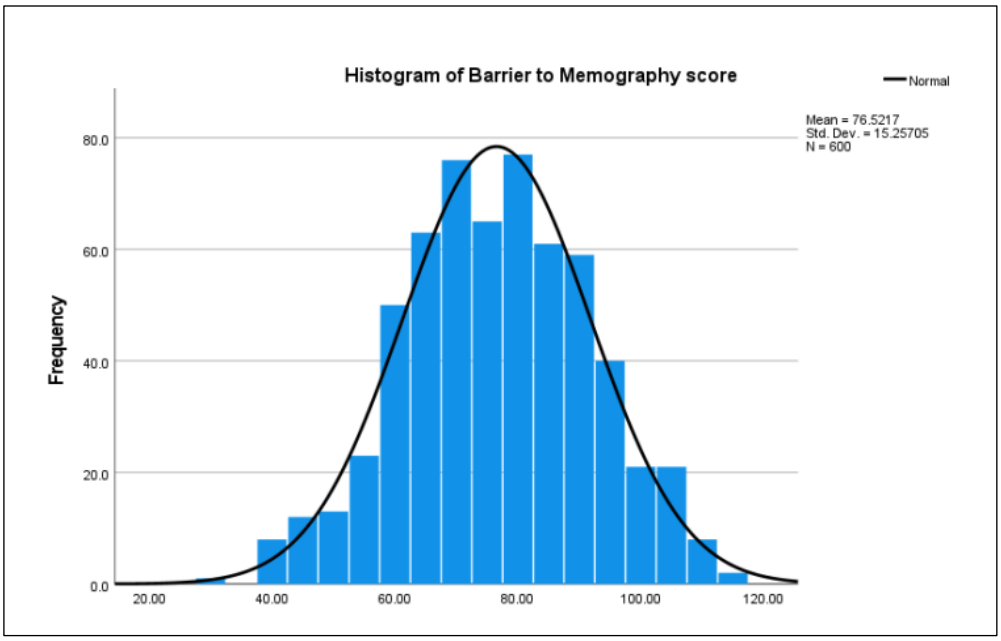

Figure 8:Histogram of Barriers to Participate Score

Recommendations to Encourage Mammogram Screening

Table 13:Assessment of Saudi Women's Recommendations to Encourage Participation in Mammogram Screening (N=600)

Statement	Disagree N (%)	Unsure N (%)	Agree N (%)
1. Women would be encouraged to participate if mammogram screenings were required to obtain services, such as driver's licenses	79 (13.2%)	81 (13.5%)	440 (73.3%)
2. Women would be encouraged to participate if a screening could be done during a gynecologist visit	13 (02.2%)	22 (03.7%)	565 (94.2%)
3. Women would be encouraged to participate if there were incentives for those who participated in the screening (e.g., loans, coupons)	73 (12.2%)	151 (25.2%)	376 (62.7%)
4. Women would be encouraged to participate if they had support from their partner or family	14 (02.3%)	34 (05.7%)	552 (92.0%)
5. Women would be encouraged to participate if they heard stories or information from the media	17 (02.8%)	40 (06.7%)	543 (90.5%)
6. Women would be encouraged to participate if they received regular messages from health care professionals	17 (02.8%)	70 (11.7%)	513 (85.5%)
7. Do you get any reminders for mammogram screening dates?	**N (%)**		
• Yes	92 (15.3%)	--	--
• No	508 (84.7%)	--	--
7a. If yes, how would like to be reminded for mammogram screening dates? (n=92)*			
• Smart messaging service (SMS)	75 (81.5%)	--	--
• Phone calls	08 (08.7%)	--	--
• Email	09 (09.8%)	--	--
Total score (mean ± SD)	10.76 ± 3.77	--	--

Level of encouraging participation			
• Low (≤7 score)	160 (26.7%)	--	--
• High (>7 score)	440 (73.3%)	--	--

* Excluded from the calculation of total score

The assessment of encouraging participation in mammogram screenings consists of 7 statements, with 6 items consisting of 3-Likert scale categories (Table 12). Agreement is high in the following statements: "Women would be encouraged to participate if screening could be done during a gynecologist visit" (94.2%), followed by, "Women would be encouraged to participate if they had support from their partner or family" (92%) and "Women would be encouraged to participate if they heard stories or information from the media" (90.5%).In addition, the proportion of women who received a reminder for mammogram screening dates was 15.3%, and they mostly preferred SMS .The overall mean score of encouraging participation in mammogram screening was 10.67 (SD 3.77) out of 19 points, with 73.3% considered low score ((≤7) and 26.7% were considered high score (>7).

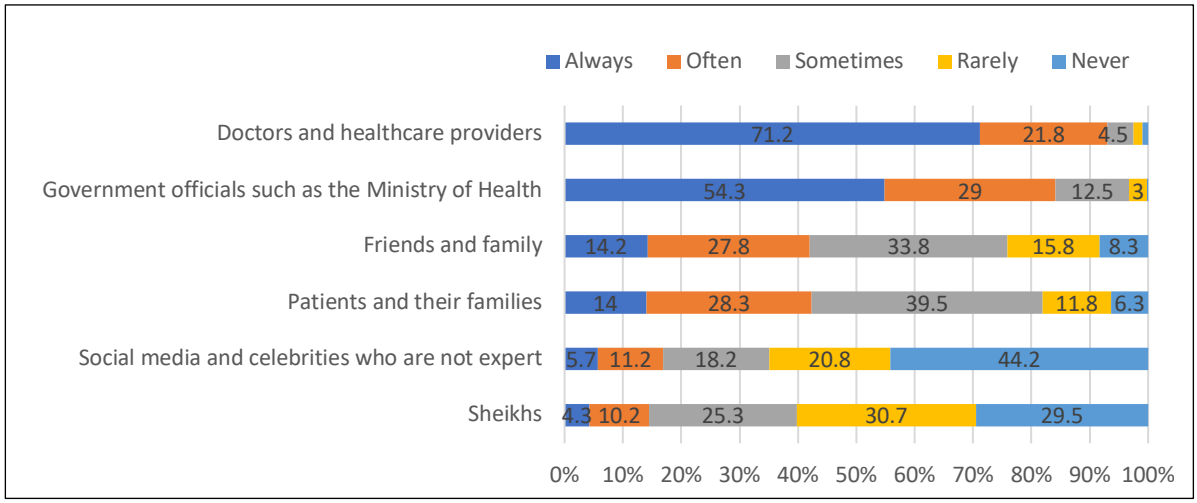

Figure 9:Level of Trust Toward the Source of Information

grams. Results as follow, most women trust the doctors and healthcare providers (71.2%),

followed by government officials such as the Ministry of Health (54.3%). Participants indicate the least trust toward Sheikhs (4.3%). The overall mean score for trust toward the source of information is 16.09 (SD 3.57) out of 30 points, with 85.2% considered low score (≤19) and 14.8% considered high score (>19).

Statistical Associations and Multivariable Logistic Regression to Test Aim 3

Characteristics of Participants (N=600)

Table 14:Statistical Differences of Scores Between Knowledge Toward BC and Demographic Characteristics of Participants (N=600)

Factor	Knowledge Median (min-max)	*H/U* test	P-value
Type of hospital [a]			
• Government	5.0 (0 – 11)		
• Private	5.0 (0 – 13)	*H*=1.063	0.588
• Military	5.0 (0 – 12)		
Age group [b]			
• ≤35 years	5.0 (0 – 13)	*U*=41448.5	0.258
• >35 years	5.0 (0 – 11)		
Educational level [b]			
• Diploma or below	5.0 (0 – 10)	*U*=52642.5	**0.001****
• University or higher	6.0 (0 – 13)		
Occupational status [a]			
• Employed	6.0 (0 – 13)		
• Unemployed	5.0 (0 – 12)	*H*=18.26	**0.001****
• Student	6.0 (2 – 13)		
Marital status [b]			
• Unmarried	5.0 (0 – 13)	*U*=37204	0.439
• Married	5.0 (0 – 13)		
Monthly income ($) [a]			
• <2,000	5.0 (0 – 13)		
• 2,000 – 8,000	5.0 (0 – 11)	*H*=28.59	**0.001****
• >8,000	6.0 (0 – 13)		
Family monthly income ($) [a]			
• <8,000	5.0 (0 – 13)		
• 8,000 – 15,000	5.0 (0 – 13)	*H*=9.628;	**0.022 ****
• >15,000	6.0 (0 – 12)		
• I don't know	5.0 (0 – 10)		
Family History of BC [b]			
• Yes	5.0 (0 – 11)	*U*=26908	0.220
• No	5.0 (0 – 13)		

Degree of relationship with BC [a] (n=121)			
• First degree	5.0 (1 – 10)		
• Second degree	6.0 (1 – 11)	*H*=1.575	0.455
• Third degree	6.0 (0 – 11)		

[a] P-value has been calculated using Kruskal Wallis test.
[b] P-value has been calculated using Mann Whitney U test.
** Significant at p<0.05 level.

Table 13 shows the statistical differences in scores between knowledge about BC in relation to the socio demographic characteristics of the participants. The results indicate that the knowledge median score of those with a university or higher degree (*U*=52642.5; *p*=0.001), those with more than $8,000 monthly income (*H*=28.59; p=0.001), and those with more than $15,000 family monthly income (*H*=9.628; *p*=0.022) are statistically significantly higher than the knowledge median score of unemployed women (*H*=18.26; *p*=0.001).

Table 15:Multivariable Logistic Regression Analysis to Predict Knowledge About the Practice of Mammogram Screening by-Demographic Characteristics (N=600)

Factor	**AOR**	**95% CI**	***p*-value**
Age group			
• ≤35 years	Ref		
• >35 years	1.97	1.29, 3.02	**.002**
Educational level			
• Diploma or below	Ref		
• University or higher	1.41	0.93, 2.13	.103
Occupational status			
• Student	Ref		
• Employed	0.85	0.36, 1.98	.706
• Unemployed	0.72	0.35, 1.48	.377
Monthly income ($)			
• <2,000	Ref		
• 2,000 – 8,000	0.98	0.59, 1.62	.941
• >8,000	2.54	1.26, 5.12	**.009**

AOR – Adjusted Odds Ratio; CI – Confidence Interval
Bold text: Significant at p<0.05 level

A multivariable logistic regression analysis presented in Table 14 is to determine the independent significant predictors associated with having heard about mammogram screening. The only significant associations are age and income to predict knowledge of mammography. The findings indicate that the odds of having heard about a mammogram screening program for those older than 35 are 1.97 times as much as those in the younger age group (AOR=1.97; 95% CI =1.29, 3.02; *p*=**.002**). It also reveals that women who earned more than $8,000 per month were 2.58 times more likely to have heard about a mammogram screening program (AOR=2.584; 95% CI=1.26, 5.12; *p*=.009).

Table 16:Relationship Between Knowledge About the Practice of Mammogram Screening and the Socio Demographic Characteristics of Women (N=600)

Factor	**Heard about Mammogram**		**χ2**	***p*-value[§]**
	Yes N (%) (N=430)	**No N (%) (N=170)**		
Type of hospital				
• Government	141 (70.5%)	59 (29.5%)		
• Private	141 (70.5%)	59 (29.5%)	0.804	.669
• Military	148 (74.0%)	52 (26.0%)		
Age group				
• ≤35 years	233 (54.2%)	116 (68.2%)	9.883	**.002****
• >35 years	197 (45.8%)	54 (31.8%)		
Educational level				
• Diploma or below	165 (38.4%)	84 (49.4%)	6.116	**.013****
• University or higher	265 (61.6%)	86 (50.6%)		
Occupational status				
• Employed	166 (38.6%)	43 (25.3%)		
• Unemployed	233 (54.2%)	114 (67.1%)	9.719	**.008****
• Student	31 (07.2%)	13 (07.6%)		
Marital status				
• Unmarried	116 (27.0%)	48 (28.2%)	.097	.755
• Married	314 (73.0%)	122 (71.8%)		
Monthly income ($)				
• <2,000	200 (46.5%)	106 (62.4%)		
• 2,000 – 8,000	90 (20.9%)	45 (26.5%)	28.676	**<.001****
• >8,000	140 (32.6%)	19 (11.2%)		

Family monthly income ($)				
• <8,000	100 (23.3%)	51 (30.0%)	13.902	**.003****
• 8,000 – 15,000	135 (31.4%)	63 (37.1%)		
• >15,000	135 (31.4%)	28 (16.5%)		
• I don't know	60 (14.0%)	28 (16.5%)		
Family History of BC				
• Yes	98 (22.8%)	23 (13.5%)	6.491	**.011****
• No	332 (77.2%)	147 (86.5%)		
Degree of relationship with BC (n=121)				
• First degree	28 (28.6%)	07 (30.4%)	.399	.819
• Second degree	47 (48.0%)	12 (52.2%)		
• Third degree	23 (23.5%)	04 (17.4%)		

§ P-value has been calculated using Chi-square test
** Significant at p<0.05 level

Chi-square tests were used to determine the relationship between having heard about mammogram screening and the socio demographic characteristics of women reported in Tables 15. Based on the results, the prevalence of women who had heard about mammogram screening was statistically significantly higher among those who were 35 or younger ($\chi2$=9.883; p=.002), held university or higher education ($\chi2$=6.116; p=.013), were employed ($\chi2$=9.719; p=.008), or made more than $2,000 - $8,000 per month ($\chi2$=28.676; p<.001). However, the prevalence of those who had heard about mammogram screening was statistically significantly lower among those who their family monthly income less than $8,000 ($\chi2$=13.902; p= .003) and those without a family history of breast cancer ($\chi2$=6.491; p=.011).

Table 17:Relationship Between Intention to Get Mammogram Screening and the Socio Demographic Characteristics of Women (N=600)

Factor	**Intention to Get Mammogram**		**$\chi2$**	***p*-value[§]**
	Yes N (%)	**No N (%)**		

	(N=376)	(N=224)		
Type of hospital				
• Government	132 (66.0%)	68 (34.0%)		
• Private	127 (63.5%)	73 (36.5%)	2.493	.287
• Military	117 (58.5%)	83 (41.5%)		
Age group				
• ≤35 years	205 (54.5%)	144 (64.3%)	5.500	**.019****
• >35 years	171 (45.5%)	80 (35.7%)		

§ P-value has been calculated using Chi-square test
** Significant at p<0.05 level

In Table 16 the prevalence of women intending to get a mammogram was statistically significantly higher among those in the younger age group (≤35 years) ($\chi 2$=5.500; *p*=.019). No other socio demographic characteristic was shown to significantly influence the intention to get a mammogram *(p*>.05).

Table 18:Relationship Between Having Mammogram Screening and Socio Demographic Characteristics of Women (N=251)

Factor	**Obtained Mammogram**		**$\chi 2$**	***p*-value§**
	Yes N (%) (N=93)	**No N (%) (N=158)**		
Type of hospital				
• Government	39 (36.8%)	67 (63.2%)		
• Private	28 (41.8%)	39 (58.2%)	1.111	.574
• Military	26 (33.3%)	52 (66.7%)		
Educational level				
• Diploma or below	48 (51.6%)	94 (59.5%)	1.480	.224
• University or higher	45 (48.4%)	64 (40.5%)		
Occupational status				
• Employed	30 (32.3%)	54 (34.2%)		
• Unemployed	61 (65.6%)	103 (65.2%)	1.194	.550
• Student	02 (02.2%)	01 (0.60%)		
Marital status				
• Unmarried	19 (20.4%)	28 (17.7%)	.282	.595
• Married	74 (79.6%)	130 (82.3%)		
Monthly income ($)				
• <2,000	39 (41.9%)	81 (51.3%)		
• 2,000 – 8,000	13 (14.0%)	35 (22.2%)	8.535	**.014****
• >8,000	41 (44.1%)	42 (26.6%)		
Family monthly income ($)				

• <8,000	23 (24.7%)	57 (36.1%)	9.154	**.027****
• 8,000 – 15,000	31 (33.3%)	52 (32.9%)		
• >15,000	30 (32.3%)	27 (17.1%)		
• I don't know	09 (09.7%)	22 (13.9%)		
Family History of BC				
• Yes	29 (31.2%)	30 (19.0%)	4.842	**.028****
• No	64 (68.8%)	128 (81.0%)		
Degree of relationship with BC (n=60)				
• First degree	13 (44.8%)	11 (35.5%)	.568	.753
• Second degree	10 (34.5%)	12 (38.7%)		
• Third degree	06 (20.7%)	08 (25.8%)		

§ P-value has been calculated using Chi-square test
** Significant at p<0.05 level

In Table 17, the prevalence of women who underwent mammogram screening was statistically significantly higher for those who earned more than $8,000 per month ($\chi2=8.535$; $p=.014$), while it was statistically significantly lower among those who don't know their family monthly income ($\chi2=9.154$; $p=.027$) and those with a family history of breast cancer ($\chi2=4.842$; $p=.028$).

Table 19:Multivariable Logistic Regression Analysis to Predict the Effect of Having Mammogram Screening and the Socio Demographic Characteristics of Women

Factor	**AOR**	**95% CI**	***p*-value**
Educational level			
• Diploma or below	Ref		
• University or higher	0.93	0.48, 1.81	0.835
Occupational status			
• Student	Ref		
• Employed	0.29	0.02, 4.10	0.360
• Unemployed	0.51	0.04, 6.91	0.612
Monthly income ($)			
• <2,000	Ref		
• 2,000 – 8,000	0.92	0.42, 2.04	0.844
• >8,000	2.31	1.03, 5.17	**0.043**
Family History of BC			
• No	Ref		
• Yes	1.76	0.94, 3.30	0.078

AOR – Adjusted Odds Ratio; CI – Confidence Interval
Bold text: Significant at p<0.05 level

The multivariable regression model in Table 18 shows that those with monthly income of more than $8,000 were significantly more likely to be associated with having received a mammogram screening (AOR=2.31; 95% CI=1.03, 5.17; *p*=.043).

Table 20:Statistical Differences of Scores Between the Religious Health Fatalism in Regard to the Socio Demographic Characteristics of Women

Factor	**Religious Health Median (min-max)**	***H/U* test**	***p*-value**
Type of hospital[a]			
• Government	23 (9 – 27)		
• Private	22 (9 – 27)	*H*=9.493	**.009****
• Military	21 (9 – 27)		
Age group[b]			
• ≤35 years	22 (9 – 27)	*U*=48643	**.020****
• >35 years	23 (9 – 27)		
Educational level[b]			
• Diploma or below	23 (9 – 27)	*U*=-34866	**.001****
• University or higher	21 (9 – 27)		
Occupational status[a]			
• Employed	22 (11 – 27)		
• Unemployed	23 (09 – 27)	*H*=11.57	**.003****
• Student	20 (09 – 27)		
Marital status[b]			
• Unmarried	21 (9 – 27)	*U*=38230	0.188
• Married	22 (9 – 27)		
Monthly income ($)[a]			
• <2,000	22.5 (09 – 27)		
• 2,000 – 8,000	22.0 (10 – 27)	*H*=7.540	**.023****
• >8,000	21.0 (09 – 27)		
Family monthly income ($)[a]			
• <8,000	24 (09 – 27)		
• 8,000 – 15,000	22 (09 – 27)	*H*=23.727	**.001 ****
• >15,000	21 (09 – 27)		
• I don't know	23 (12 – 27)		
Family History of BC[b]			
• Yes	22 (9 – 27)	*U*=30576	.347
• No	22 (9 – 27)		
Degree of relationship with BC [(n=121)] [a]			
• First degree	22 (11 – 27)		
• Second degree	22 (09 – 27)	*H*=0.453	.797
• Third degree	21 (09 – 27)		

[a] P-value has been calculated using Kruskal Wallis test
[b] P-value has been calculated using Mann Whitney U test
** Significant at p<0.05 level

In Table 19, the Kruskal Wallis and Mann-Whitney U tests were used to measure the relationship between the religious health fatalism median score and socio demographic characters. Religious health fatalism was statistically significantly higher for participants in government hospitals (*H*=9.493; p=.009), those in the older age group (>35 years) (*U*=48643; p=.020), those with diplomas or below (*U*=34866; *p*=.001), unemployed women (*H*=11.57; *p*=.003), those with less than $2,000 monthly income (*H*=7.540; *p*=.023), and those with less than $8,000 family monthly income (*H*=23.727; *p*=.001).[5]

Table 21:Statistical Differences of Scores Between Barriers to Participate in a Mammogram Screening and Socio Demographic Characteristics of Women

Factor	**Barriers Mean ± SD**	***F/t* test**	***p*-value**
Type of hospital[a]			
• Government	42.6 ± 10.3		
• Private	40.1 ± 9.27	F=5.399	**.005** **
• Military	36.7 ± 9.37		
Age group[b]			
• ≤35 years	39.9 ± 9.03	t=-1.600	.110
• >35 years	41.3 ± 9.31		
Educational level[b]			
• Diploma or below	43.6 ± 9.96	t=-6.116	**<.001** **
• University or higher	38.8 ± 9.08		
Occupational status[a]			
• Employed	39.2 ± 9.52		
• Unemployed	41.9 ± 9.49	F=5.204	**.006** **
• Student	39.7 ± 7.97		
Marital status[b]			
• Unmarried	40.5 ± 9.52	t=-.397	.692
• Married	40.9 ± 9.83		
Monthly income ($)[a]			
• <2,000	42.4 ± 9.67		
• 2,000 – 8,000	41.6 ± 9.69	F=17.046	**<.001** **
• >8,000	37.1 ± 8.93		

[5] They may have limited access to private medical care, and they have poor health literacy level and knowledge about breast cancer. Hence, such an association between employment status and health screening performance could be partially explained.

Family monthly income ($)[a]			
• <8,000	44.5 ± 10.3	F=18.578	**<.001 ****
• 8,000 – 15,000	41.5 ± 9.15		
• >15,000	36.7 ± 8.50		
• I don't know	40.5 ± 9.53		
Family History of BC[b]			
• Yes	40.5 ± 9.74	t=-.395	.693
• No	40.9 ± 9.74		
Degree of relationship with BC (n=121)[a]			
• First degree	41.3 ± 10.8	F=.310	.734
• Second degree	39.7 ± 8.59		
• Third degree	40.8 ± 11.1		

[a] P-value has been calculated using one-way ANOVA test
[b] P-value has been calculated using independent sample t-test
** Significant at p<0.05 level

In Table 20, a one-way ANOVA test was used to determine the association between barriers to participate in mammogram screening mean scores with socio demographic characteristics. Barriers to participate in screening were statistically significantly lower among those with a university or higher degree (t=-6.116; p<.001), those who earned more than $8,000 per month ($F$=17.046; p<.001), and those who had a family monthly income of more than $15,000 ($F$=18.578; p<.001). In contrast, the mean barriers scores of those who were participants in the government hospital (F=5.399; p=.005) and unemployed women (F=5.204; p=.006) were statistically significantly higher.

Table 22:Statistical Differences of Scores Between the Levels of Trust for the Sources of Information in Regard to the Socio Demographic Characteristics of Women

Factor	**Level of trust‡ Median (min-max)**	***H/U* test**	***p*-value**
Type of hospital[a]			
• Government	20 (12 – 30)	*H*=3.265	.195
• Private	20 (06 – 30)		
• Military	20 (07 – 30)		
Age group[b]			
• ≤35 years	20 (06 – 30)	*U*=48702.5	**.019****
• >35 years	20 (12 – 30)		

Educational level[b]			
• Diploma or below • University or higher	20 (6 – 30) 20 (6 – 30)	*U*=-40736	.155
Occupational status[a]			
• Employed • Unemployed • Student	20 (07 – 30) 20 (06 – 30) 19 (12 – 25)	*H*=5.436	.066
Marital status[b]			
• Unmarried • Married	19 (6 – 30) 20 (6 – 30)	*U*=41013	**.005****

[a] P-value has been calculated using Kruskal Wallis test
[b] P-value has been calculated using Mann Whitney U test
** Significant at p<0.05 level

In Table 21, the difference in the level of trust for the sources of information score was statistically significant for age group (*U*=48702.5; *p*=0.019) and marital status (*U*=41013; *p*=.005).

Table 23:Confounding Testing Analysis of Scores Between Religious Health Fatalism and Socio Demographic Characteristics of Women

Factor	***b* (95% CI)**	***SE B***	***T***	***p*-value**
Model 1				
Knowledge about BC [mediator]	-.425 (-.717 – -.132)	-.249	-2.850	**.005** **
Age group	.205 (-.621 – 1.031)	.047	.488	.625
Knowledge about BC x Age group [Interaction]	.031 (-.109 – .171)	.056	.438	.661
Model 2				
Knowledge about BC [mediator]	-.613 (-.952 – -.274)	-.359	-3.549	**<.001** **
Family Monthly Income	-.927 (-1.684 – -.169)	-.223	-2.403	**.017** **
Knowledge about BC x Family Monthly Income [Interaction]	.115 (-.021 – .250)	.225	1.664	.097

** Significant at p<0.05 level.

In Table 22, Model 1 shows there was a significant negative effect when adding knowledge about BC for the relationship between age group and religious fatalism (*b*=-0.425; 95% CI=-0.717 – -0.132; *p*=.005). In model 2, there was an inverse significant effect

of knowledge about BC and the relationship between family monthly income and religious fatalism (*b*=-0.613; 95% CI=-0.952 – -0.274; p<.001) while the increase in the score of religious fatalism has an inverse effect on the family monthly income variable (*b*=-0.924; 95% CI=-1.684 – -0.169; *p*=.017).

Table 24:Confounding Testing Analysis of Barriers to Participate in Mammogram Screening Scores and Socio Demographic Characteristics of Women and Knowledge about BC

Factor	***b* (95% CI)**	***SE B***	***T***	***P*-value**
Model 1				
Knowledge about BC [mediator]	1.372 (.010 – 2.734)	.221	1.979	**.048** **
Type of hospital	2.034 (-1.567 – 5.636)	.109	1.109	.268
Knowledge about BC x Type of hospital [Inter-action]	-.010 (-.649 – .629)	-.004	-.031	.975
Model 2				
Knowledge about BC [mediator]	2.843 (1.107 – 4.578)	.457	3.216	**.001** **
Educational level	11.915 (6.262 – 17.569)	.385	4.139	**<.001** **
Knowledge about BC x Educational level [Inter-action]	-1.061 (-2.074 - -0.049)	-.366	-2.059	**.040** **
Model 3				
Knowledge about BC [mediator]	1.307 (.212 – 2.401)	.210	2.345	**.019** **
Monthly income	4.227 (.700 – 7.754)	.234	2.354	**.019** **
Knowledge about BC x Monthly income [Inter-action]	-.122 (-.692 – .449_	.234	-0419	.675
Model 4				
Knowledge about BC [mediator]	1.413 (.198 – 2.627)	.227	2.284	**.023** **
Family monthly income	3.368 (.655 – 6.081)	.222	2.438	**.015** **
Knowledge about BC x Family monthly income [Interaction]	-.063 (-.548 – .422)	-.034	-.257	.798

** Significant at p<0.05 level

In Table 23, Model 1 shows there is a positive significant effect when adding knowledge about BC and the relationship between the type of hospital and barriers to participate in mammogram screening programs (*b*=1.372; 95% CI=0.010 – 2.734; *p*=.048). In Model 2, there was a positive significant effect of the knowledge about BC for the relationship between educational level and the barriers to participate in a mammogram screening program (*b*=2.843; 95% CI=1.107 – 4.578; *p*=.001). In Model 3, there is a positive significant effect of knowledge about BC and participants' monthly income and the barriers to participate in mammogram screening (*b*=1.307; 95% CI=0.212 – 2.401; *p*=.019) where the increase in the score of barriers to participate in mammogram screening is associated with the decrease in monthly income (*b*=4.227; 95% CI=0.700 – 7.754; *p*=.019). In Model 4, there is a positive significant effect when adding knowledge about BC and the relationship between family monthly income and the barriers to participate in mammogram screening (*b*=1.413; 95% CI=0.198 – 2.627; *p*=.023) whereas the increase in the score of barriers to participate toward mammogram screening is associated with the decrease of the family monthly income (b=3.368; 95% CI=0.655 – 6.081; *p*=.015). In other words, women with low income were associated with higher barriers to receive mammogram screening.

Table 25:Confounding Testing Analysis of Encouraging to get Mammogram Screening Score in regard to the Socio Demographic Characteristics of Women and Knowledge about BC

Factor	***b* (95% CI)**	***SE B***	***T***	***p*-value**
Model 1				
Knowledge about BC [mediator]	-.207 (-.388 – -.027)	-.257	-2.259	**.024 ****
Type of hospital	-.034 (-.781 – .175)	-.126	-1.254	.210

** Significant at p<0.05 level.

In Table 24, in Model 1, there is an inverse significant effect when adding the knowledge about BC for the relationship between the type of hospital and the encouragement to get mammogram screening *(b*=-.207; 95% CI=-.0388 – -.027; *p*=.024).

Multiple Linear Regression Tests for Aim 3

Table 26:Multiple Linear Regression for the Effect of Knowledge About BC in Relation to Other Predictors of Mammogram Screening

Factor	*b* (95% CI)	*SE B*	*T*	*p*-value
Religious fatalism score	.030 (-.016 - .075)	.086	1.278	.202
BC belief score	-.110 (-.191 – -.029)	-.176	-2.667	**0.008** **
Barriers about mammography	.021 (.001 – .041)	.147	2.092	**.037** **
Encouragement to mammography	-.068 (-.148 – .012)	-.109	-1.685	.093
Health information	-.075 (-.164 – .015)	-.108	-1.640	0.102

Adjusted with type of hospital, age, education, income, family status and marital status
** Significant at p<0.05 level.

In Table 25, breast cancer belief score has an inverse effect with knowledge about BC (*b*=.030; 95% CI=-.016 – .075; *p*=.008) while barriers about mammography screening were likely to decrease knowledge about breast cancer (*b*=.021; 95% CI=.001 - .041; *p*=.037). On the other hand, religious fatalism, encouragement to mammography screening and health information did not show significant effect toward knowledge about BC after adjustment to regression model (p>0.05)**.**

Table 27:Multiple Linear Regression for the Effect of the knowledge about BC in Relation to other Predictors of Mammogram Screening with Interaction of Receiving a Mammogram

Factor	*b* (95% CI)	*SE B*	*T*	*p*-value
Religious fatalism score	.025 (-.020 – 0.070)	.073	1.098	.273
BC belief score	-.115 (-.195 – -.035)	-.184	-2.824	**0.005** **
Barriers about mammography	.018 (-.002 – .030)	.125	1.785	0.075

Encouragement to mammography	-.056 (-.135 – .024)	-.089	-1.385	.167
Health information	-.076 (-.164 – .013)	-.109	-1.687	0.096

Adjusted with type of hospital, age, education, income, family status and marital status
** Significant at p<0.05 level.

In Table 26, the BC belief score has a negative effect toward knowledge about BC (*b*=.115; 95% CI=-.195 – -.035; *p*=0.005). Other variables included in the model were observed to have no significant effect on the knowledge about BC after adjustment to regression model (*p*>0.05).

Discussion

The current study divided women in two age groups: the younger group from 20 to 34 years, and the older group from 35 to 60 years of age. A higher proportion of the younger group had a family history of breast cancer, compared to a smaller proportion of the women in the older group, but the difference was not significant.

In assessing knowledge about breast cancer, more than one-half of participants reported low knowledge (65.5%), whereas a smaller percentage (34.5%) reported high knowledge. The mean score for the knowledge BC item was 5.53 out of 13. However, the assessment of factors affecting the level of knowledge of women showed that educational level, occupation status, monthly income, and family monthly income were significant factors affecting the level of knowledge. Similar studies, such as Latif (2014), assessed of Saudi female student's knowledge possible scored about breast cancer. It was found that the mean score of knowledge was 16.6 out of 29; in general, there was low knowledge among female students.

Students' score of knowledge is significantly influenced by marital status, a family member suffering from breast cancer, and practice of breast self-examination. Poor knowledge among women was reported from Al-Ahsa, city in the east of the kingdom of Saudi Arabia where only 39.7% had good knowledge about breast cancer (Ali et al 2018). Also, poor knowledge was found among women from Najran city, located to the south of (Saudi Arabia) (Alshahrani et al 2019). In comparison, our study reported greater knowledge compared to the previous studies (Ali et al 2018; Alshahrani et al 2019).

Findings from a study conducted with women from primary health care centers in Al-Khobar city support (Alrasheed & Soweilum 2013) our study 'results regarding education and occupation as predictors for the level of BC knowledge among women. Their study found that a high proportion of women had knowledge deficits regarding breast cancer. Multiple regression analysis showed that age, education, and occupation were positive predictors for women's knowledge (Alrasheed & Soweilum 2013). Results from other middle east countries did not vary from those represented in Saudi Arabia. One study from Egypt reported that over one-half of women who participated in the study showed a low score of knowledge about breast cancer and screening methods (Eltwansy, 2018).

Practice and knowledge of women in this study showed variation between the two groups of women: the younger and older groups. Over half of participants intended to get mammograms; the largest proportion, however, was found among younger age women. There was variation regarding reasons for not wanting mammograms; however, the major barrier reported was being asymptomatic in both groups. Also, there was significant variation regarding knowledge about the importance of mammograms between the two groups,

but a significant proportion of the younger group reported knowledge about its importance. However, the practice of clinical breast examination and mammography was rare among female Saudi students, as found in a previous study Latif (2014). Similar findings were reported by a previous Saudi study conducted on a total of 3245 women that found low knowledge about mammography and performing mammography, with40%of participants reporting ever having a mammogram (Al-Wassia et al., 2017). Above findings are comparable to ours and a study from Abha city in the south of the kingdom that demonstrated insufficient knowledge and low practice regarding mammography (Mahfouz et al 2013). Insufficient knowledge and practice were also reported for Al-Qunfudah, a city in Saudi Arabia where 65.5% of study participants showed low awareness about mammography. Women's knowledge in this study was remarkably influenced by age, marital status, and occupation (Yaghmour et al 2020). Women from Najran city in the south of the Saudi Arabia also demonstrated poor knowledge regarding breast cancer screening methods. Moreover, the major screening barrier was lack of awareness of screening methods (Alshahrani et al 2019). The previous results were different from that found in our study, which could be attributed to changed knowledge level among women between the two studies. Abdel-Salam et al. in their Saudi study, reported several barriers affecting mammography screening, including lack of information about mammography (69.5%), fear of exposure to radiation (67.4%), fear of discovering breast cancer (62.9%), and being busy (67.2%) (Abdel-Salam et al 2020).

Major barriers reported in an Egyptian study included pain, embarrassment, and extensive cost (Eltwansy, 2018); whereas, in our study, fear of pain was the second most

common barrier. In another Egyptian study (Manzour &Eldin, 2019) the authors reported very low rates (8. %) for mammography screening practice. Major barriers identified from a study on Lebanese women were similar to our study and other previous studies in middle east, where fear of learning bad news, pain, and costs acted as major barriers for screening and receiving a mammography (El Asmar et al 2018). Result yielded a religious health fatalism by the scale obtained a mean score of 21.6, where 53.7% had a high score. Regarding beliefs about breast cancer, the mean score on beliefs was 10.3; with 59.3% receiving low scores on beliefs. The mean score for barriers was 40.8%, where 48.5% had high barriers. However, almost three-quarters strongly recommend the encouraging women to participate in mammogram screening.

The religious health fatalism of our participants was significantly affected by participants' demographics, except for marital status, family history of breast cancer, and degree of relationship with breast cancer which had no significant impact on the religious health fatalism of our participants. Barriers among our participants were significantly influenced by fewer factors, such as type of hospital, educational level, occupational status, monthly income, and family monthly income. There was no previous study or data reported about religious health fatalism, hence this study is the first to report information about such a topic.

In a previous study from Egypt, participants had a positive attitude toward breast cancer screening and mammography (Manzour &Eldin 2019); findings of that study offer a better comparison with ours as the mean score of beliefs was 10.3, and only 40.7% had positive beliefs. Moreover, the level of knowledge was significantly and positively

associated with the attitude of women toward breast cancer screening (Manzour &Eldin 2019). In a study from Lebanon, it was found that knowledge, attitude, and practice of women correlated significantly with each other (El Asmar et al 2018).

knowledge about breast cancer is significantly affected women's breast cancer beliefs and barriers about mammography, especially mammogram screening. Regarding the interaction of receiving a mammogram, knowledge about breast cancer affected breast cancer beliefs and receiving a mammogram. however, lack of information is a significant perceived barrier in the HBM, which could prevent women from obtaining screening and treatment for breast cancer. Awareness is a significant cue to action as explained in the HBM, which could increase breast cancer screening and treatment among women.

Summary

This chapter reports findings yielded by the survey for Aims 1, 2, and 3.
Aim 1 assessed knowledge of breast cancer and mammography. The women in this study had a low level of knowledge regarding breast cancer which is influenced by participants' age and their monthly income. Very few of these women have obtained mammogram screening, although most women knew about the importance of mammograms, which could be attributed to the fact that they had no symptoms.

Aims 2 and 3 addressed cultural values, which were tested with a scale on religious health fatalism, beliefs about mammogram screening, and their influence on barriers to mammogram screening. women in the study showed high religious health fatalism about breast cancer. There were several barriers to participating in mammogram screening, and the most common one was of experiencing no symptoms,

followed by fear and pain. The barriers reported in our study found both agreement and contrast to the barriers reported in other studies. However, most of the participants in this study indicated many recommendations to encourage participation in mammogram screening. Regarding mammogram screening and receiving a mammogram, knowledge about breast cancer was a significant factor that is associated with breast cancer beliefs, barriers about mammography, and receiving a mammogram.

Chapter IV

Qualitative Data Analysis

This chapter addresses Aim 3 of the research study as it explores how knowledge and cultural values of Saudi women may act as barriers to mammogram screening. It examines qualitative data from focus groups to expand understanding of the quantitative findings discussed in the previous chapter. Narrative data gathered from focus groups with Saudi women was analyzed, using the method of thematic analysis, as outlined by Creswell (2005).

Participants' responses were summarized into five themes, as follows:

1) knowledge about breast cancer,
2) statements about religious health fatalism,
3) knowledge about the practice of mammogram screening,
4) barriers that prevent participation in mammogram screening programs, and
5) facilitators to encourage participation in mammogram screening programs.

To illustrate the themes above, sample quotes are provided below for each theme.

Location and Participants' Demographics

Seven focus groups were conducted between August and November 2020. Each group consisted of five to six participants and lasted between 60 and 120 minutes, allowing

sufficient time for participants to share their opinions. Each focus group was facilitated by one researcher/moderator.

To recruit participants for the survey sample, recruitment signs were posted seeking volunteers in all open areas of the randomly selected six hospitals. Additionally, all recruitment information was messaged via WhatsApp, an application for smart phones, available throughout Saudi Arabia. Snowball sampling procedures were employed as needed in obtaining the established sample size. After full consent was obtained, seven one-to-two-hour focus groups were conducted. All were audio-recorded and kept in safely locked storage.

Data Analysis:

Data analysis was guided by Krueger's Critical Ingredients and Principles of Qualitative Analysis (1998), which emphasizes the following:

- Analysis must be systematic. The analysis should follow a prescribed, sequential process. The analytical steps are not arbitrary or spontaneous but deliberate and planned. In this study, the author and her assistant followed Krueger's systematic protocol, where:
- The questions' sequence in the moderator's guide allowed participants to first become familiar with the topic before exploring key questions. Final summary questions concluded each session (Krueger ,1998).
- Data were electronically recorded with additional memos and notes (Krueger ,1998).

- The qualitative data were broken down into smaller components. These components were labeled and given codes to allow for comparison between the groups. Common themes found across focus groups were assigned the same code, and new themes were given a new code until the data was exhausted (Krueger & Casey, 2014).

The codebook was developed in collaboration with an expert qualitative researcher. Since this is an exploratory study, some deductive codes were added to the codebook that were anticipated from the research questions. However, most codes were inductively discovered in line with the recommended process (Bernard & Ryan, 1998). The codes were revised in an iterative process to reach a finalized unified codebook for women with example statements for each code.

Five major themes emerged from systematically categorizing excerpts from the narrative data obtained from the seven focus groups. Data transcripts were examined in detail, looking for themes and patterns from participants' narratives that would help build strong support for the themes that were gradually identified from the transcripts. At first, the author considered employing open coding, followed by axial ; however, because participants natural language and words were very explicit when alluding or describing their preferences and dislikes, it was determined that an identification of the themes, as each naturally emerged using participants own language descriptors (however, translated for the purpose of this dissertation) would better enable the reader to understand and interpret participants own wording and explanations Hence, this chapter provides direct quotes from participants to support our more abstract naming of the themes; however, note that the naming of the themes comes from participants' own words when responding to

questions raised during the focus groups and their respective answers. It was decided that given the richness of the data, the naming of the themes and supporting narratives, that these clearly illustrate each of the themes presented here. It is also noticed that the themes presented here naturally emerged in each of the focus groups, and for the purpose of analysis, they were grouped to illustrate data from all seven groups.

Focus Group Participants' Characteristics

An overview of participants' demographic characteristics, including socio-economic status, age, and education are shown in **Table 27.** Forty participants between 20 and 60 years old took part in these sessions.

Table 28:Demographics of the Focus Group Participants (N=40)

Study Data	**N (%)**
Group	
• Focus 1	6 (15.0%)
• Focus 2	6 (15.0%)
• Focus 3	6 (15.0%)
• Focus 4	5 (12.5%)
• Focus 5	6 (15.0%)
• Focus 6	6 (15.0%)
• Focus 7	5 (12.5%)
Education level	
• No formal education	1 (2.5%)
• Less than high school	4 (10.0%)
• High school or equivalent	8 (20.0%)
• Diploma	9 (22.5%)
• Bachelor's degree	15 (37.5%)
• Postgraduate	3 (7.5%)
Occupational status	
• Employed	16 (40.0%)
• Unemployed	24 (60. %)
Marital status	
• Single	7 (17.5%)
• Married	30 (75.0%)
• Separated	01 (2.5%)
• Divorced	02 (5.0%)
Monthly income ($)	

• <2,000	13 (32.5%)
• 2,000–8,000	11 (27.5%)
• 6,500–10,000	11 (27.5%)
• 10,500–14,000	02 (5.0%)
• ≥20,000	03 (7.5%)
Family monthly income ($)	
• <8,000	07 (17.5%)
• 9,000–15,000	03 (7.5%)
• 16,000–25,000	16 (40.0%)
• 26,000–40,000	02 (5.0%)
• >40,000	05 (12.5%)
• I don't know	07 (17.5%)
	Mean ± SD
Age in years	40.4 ± 9.03
Age at marriage	20.4 ± 4.52
Number of children	4.7 ± 1.83

Table 27 shows the demographics of focus group participants. Each group-included six participants (15% of the total sample), except for groups 4 and 7, which only included five (12.5%). In terms of education, the highest percentage (37.5%) had a bachelor's degree, followed by a diploma (22.5%). and high school or equivalent (20%). Few had less than a high school education (10%), completed postgraduate studies (7.5%), or no formal education at all (2.5%). Regarding occupational status, 40% were employed and 60%were unemployed. Most participants were married (n=30, 75%), 17.5% were single (n=7), 5% were divorced (n=2), and 2.5% were separated (n=1). Concerning monthly income, 32.5% earned less than $2,000, 27.5% earned between $2,000 and $8,000, 27% earned between $6,500 and $10,000, 7.5% earned $≥20,000, and 5% earned $10,500 to $14,000. Monthly family income, ranged from $16,000 to $25,000 (40%), 17.5% reported less than $8,000, 12.5% was greater than $40,000, 7.5% was from $9,000 to $15,000, and 5% earned from $26, 000 to $40, 000, while 17% did not know. The

participants had a mean age of Mean ± SD, 40.4 ± 9.03 years, mean age at marriage 20.4 ± 4.52, and the mean number of children was 4.7 ± 1.83.

Thematic Analysis of Focus Group Discussions (FGDs)

Five themes were identified through analysis: Knowledge about the cause of breast cancer, knowledge about mammogram screening, religious health fatalism, barriers preventing screening, and suggested facilitators, i.e., recommendations for increasing mammogram screening. Two of the themes, barriers and facilitators, highlight factors in the HBM. Further, knowledge affects beliefs, such as health fatalism, and perceptions, such as susceptibility to breast cancer, and ultimately lead to health behaviors, for example the decision to receive a mammogram.

1. Knowledge About the Cause of Breast Cancer

The first two themes were related to knowledge: knowledge about the cause of breast cancer and knowledge about mammogram screening. Participants mentioned several perceived causes of breast cancers. They included genetic and hereditary reasons, bad luck, fate, destiny, evil eye, mental stress, hormonal changes, poor health habits, environment, and nutrition. Most of participants included in their descriptions, factors not based on scientific fact. However, the level of one's knowledge is an important structural variable that may modify one's beliefs and perceptions toward a health problem, as suggested by the Health Belief Model.

For example, when exploring participants' knowledge about the causes of `breast cancer, a 38-year-old, divorced and full-time employee participant observed: ***"The***

causes—I think there are different causes, such as inherited, when a person is susceptible to have the disease, and I do not know but they always say some deodorants and psychological factors."

In general, participants' responses on perceived causes of breast cancer were most likely to focus on social and theological perspectives than scientific ones. Most talked about social factors, and only a few talked about genetics, environment, and nutrition, which are closer to the actual causes of breast cancer. The following quotes provide examples of the type of statements shared by participants.

In the words of a 36 years old, single, employee: ***"inherited genes and could be the effect of environment and nutrition."***

Participants also associated breast cancer with stress. A 54-year-old unemployed observed stated that stress develops into a physical condition if not alleviated quickly. ***"I think there are many causes, some are inherited or from the gene itself. But I think the main cause is stress because diseases are mental situations turns to physical impact."***

Below, the most frequently indicated perceived causes of breast cancer are listed.

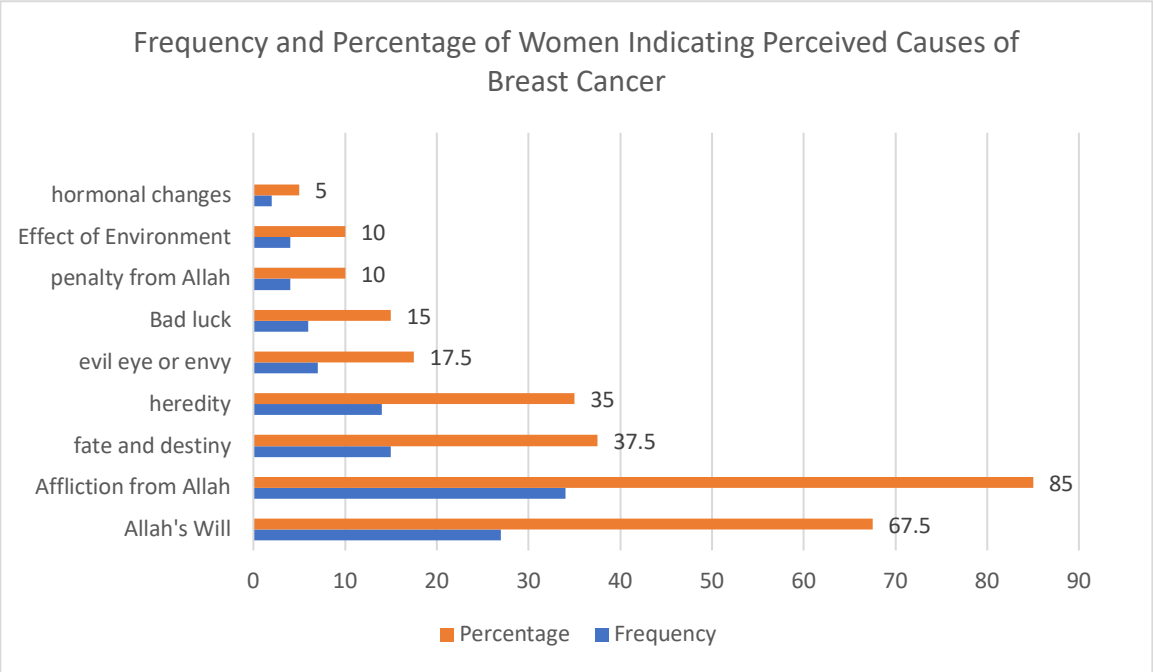

Figure 10:frequency of Perceived stated Causes of Breast Cancer

Table 29:Perceived Causes of Breast Cancer

Perceived Causes	**Count**
Allah's Will	27
Affliction from Allah	34
Fate and Destiny	15
Heredity	14
Evil Eye or Envy	7
Bad Luck	6
Penalty from Allah	4
Effect of Environment	4
Hormonal Changes	2

As reflected in Figure 10 and Table 28, participants most frequently cited Allah's will, followed by affliction from Allah, fate, and destiny, and hereditary causes. The first two causes are underlined by religious beliefs since both ascribe illness to Allah suggesting that religious views dominated participants' perceptions. However, others mentioned environmental and biological factors, such as life routine, and bad luck.

The following quote suggests bad luck may cause disease. Participant, 42-year-old unemployed: ***"Bad luck, for example, could be a cause of disease, like when a child was born with blood cancer, so he was not affected by the environment or stress. Although I believe it's inherited, but a person could have a disease out of nowhere."***

participants' knowledge is based on belief and tend to be experience-oriented, As evidenced by the examples they shared. At some point, participants associated fate with bad luck Jointly producing some causes of breast cancer. Participant, 58-year-old unemployed: ***"Yes, it's fate and destiny when it happens suddenly without any causes. For example, when a non-smoker has lung cancer even though her physical health is stable, this is fate and destiny."***

Participants also explained illness as resulting from particular lifestyles that involve chemical use, along with exposure to environmental pollutants, containing toxic materials. They stated that contraceptives, pills, and preserved foods could also cause hormonal changes leading to breast cancer, as well as a tight brassiere. Further, a few participants ascribed breast cancer to alcohol, cigarettes, Avoidance breastfeeding, unhealthy food, emotional distress, environmental pollution, staying up late, and immunodeficiency. Lack of knowledge on the causes of breast cancer is a significant perceived barrier anticipated

by the HBM that could impede women in the study from taking health measures to prevent breast cancer, such as getting regular breast exams and mammograms.

Knowledge about Diagnosis and Treatment

While screening for breast cancer is considered prevention, equally important is finding the correct location of services for diagnosis and treatment. Participants did not demonstrate clear knowledge of this. Their responses revealed that most tended to contact doctors and receive treatment based on a doctor's advice. Some of them also mentioned they would seek religious therapies, such as Quran therapy. Others said they would gather more information on the disease before finding the relevant hospital for treatment.

Participant, 45 years old, married: ***"I will search for the information first, but if I am sure about the symptoms I will go to the hospital. After the diagnosis, I will just follow the medical instructions."***

Participants reported that they believe in clinical diagnosis and treatment of the disease; however, they confirmed the vital role of religion in coping. Participant, 52 years old, married unemployed: ***"Of course, praying to Allah will save me from depression."***

Some participants said they refused to go to a doctor and ignore the condition.

Participant, 26 years old, single, unemployed: ***"No, I will ignore it, it's all about fear of facing the reality so, I won't go."***

Overall, more than 90% of participants agreed that the hospital is the appropriate place for diagnosis and treatment. However, differences of opinion existed among the

groups for example, choosing to go to hospital for treatment, ignoring the disease or not going to the hospital at all. Religious beliefs on treatment become significant perceived barriers to health promoting behaviors as Health Belief Model, which could impede a person's intent to adhere to healthy Lifestyles and behaviors.

Knowledge of Cancer Treatment Options

A relevant component regarding knowledge of breast cancer is participants' knowledge of treatment options. In the initial stages of illness, many patients received an examination by visiting gynecologists. Others also look for open-source information to understand the disease. Other practices related to treatment include the following:

- Visiting doctors and taking medication as advised: Participant, 39 years old, unemployed: ***"Usually, I take an examination with the obstetrician and gynecologist. And sometimes I search for it on Google."***
- Consulting close friends and family, then using a hospital facility for treatment: Participant, 41 years old, married: ***"I will ask close friends if this is normal or because of hormones, and then I will go to the hospital."***
- Consulting information sources, like the Pink Ribbon Campaign. Participant, 50 years old, unemployed: ***"Yes, because if there are not, how could we know this information? We see the pink ribbons everywhere. Also, some schools do campaigns for the student where nurses give them lectures about breast cancer."***

Some women did not have much information on treatment and mentioned that there are no medical facilities available in their neighborhoods. Participant, 35 years old,

unemployed: ***"I have not seen anything in the neighborhood but the malls and schools."*** Despite a strong belief in religion, patients showed trust in doctors because they have a better understanding of the disease and can explain it to patients.

Knowledge about Healing and Using Alternative Medicine

Alternative medicine can be applied only when doctors make the diagnosis. Reading the Quran is also suggested as an alternative treatment. Some people use herbs, oil and water, which is known from the Quran. Honey is also mentioned in the Quran and used by women. Participant 52 years old, unemployed: ***"I always use herbs like oil and water, which we read Qur'an for healing."***

In few cases, participants planned to take herbal medicine but changed their minds after diagnosis and a doctor's advice. There are cases in which women know that the Quran describes herbal medicine, but they disagree on Quranic Therapies. For these participants, alternative medicine or therapies are only valuable in offering mental relief.

Additionally, changes in lifestyle including nutrition and meditation, are some options women prefer to take before using hospital facilities and medication. Neglect of treatment options due to religious beliefs is a significant perceived barrier, as suggested by the HBM, which may prevent individuals from obtaining diagnosis and treatment of breast cancer.

2. Knowledge of Breast Cancer and Religious Fatalism

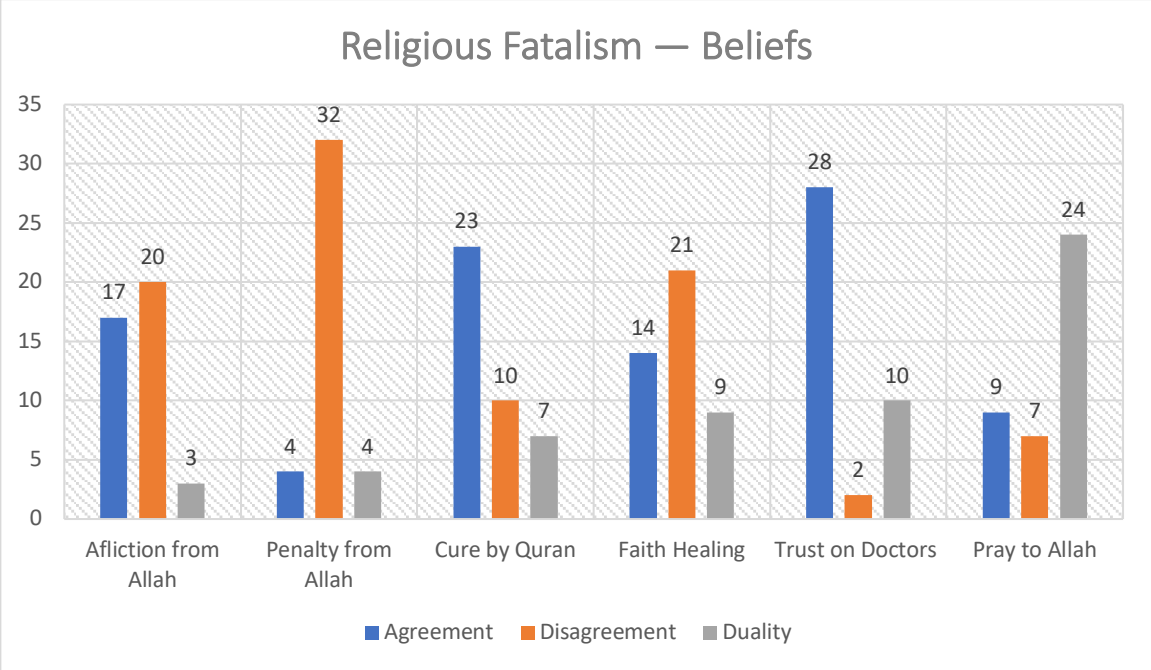

Figure 11:Religious Fatalism-Beliefs

Religious fatalism was the third theme in the FGD, which included the Above beliefs in Figure 11. Participants reported praying to Allah gave them the strength to face a critical situation. However, exact treatment and medication are required to heal the disease. Visiting a doctor is beneficial for an exact diagnosis. The religious affiliation is spiritual, whereas the disease is physical. Participants also stated that if praying is healing, Muslims only practice it. But what about the patients who do not believe in Allah. The treatment and medication are similar for everyone.

The difference between a believer and non-believer in the perception of healing is that the believer gets treatment and prays to Allah for help and strength while the non-believer only relies on medication and treatment. Participants believe that the disease

comes from Allah, however, it will not be cured by praying only. Instead, the solution must be sought and applied by patients. Participants indicated that healing comes from Allah, but Allah has created doctors who can support other human beings. Therefore, they reported it is appropriate to take the medication and treatment and then pray, despite relying on prayer only. Participant, 46 years old, married: ***"No, I believe in Allah, then the doctors. Because Allah causes these diseases, and the doctor will give me the treatment plan by Allah's will. So, I trust the doctor and follow the instructions, whatever they are. Because I trust him in choosing a suitable treatment plan."***

Participants expressed a strong connection between healing and praying to Allah. As stated in the quote below, praying to Allah supports treatment and medication. Participant, 42 years old, married, employee: ***"You should not ask this question because we are all Muslim, so we will pray of course. You should paraphrase it as 'is praying for healing enough?' then the answer is no. Praying is essential for sure; after that is the doctor's advice. I believe that healing is by Allah's will."***

Praying to Allah and offering charity is a view shared by participants who did not believe in an immediate medical treatment. They stated that if prayer and offering charity will not heal, they might consult a doctor. A 51-year-old married unemployed observed: ***"I think it's enough to pray to Allah and give a charity for healing because Allah will heal us no matter what. If I did not feel well, I will go to the hospital. but I will not go immediately."***

A 45-year-old, married woman, employee agrees with the above and further noted: ***"I agree. I will pray to Allah for healing which is considered a type of psychological***

treatment that will help me during the medical treatment, and I will go to the doctor after that." However, participants also noted that treatment requires support from the family. A36 years old married, also agrees: ***"Yes, also family support and speaking to someone you love, like husband, family, brothers and sisters, who will support you in accepting the disease and treatment plan."***

participants' dominant view revealed that while medication and a doctor's advice are essential, praying to Allah and family support also help fight the disease by strengthening mental health. A few participants had other views: for example, a person was healed from blood cancer by praying and using Zamzam water, as mentioned in the quote below.

A 43-year-old married and employed noted: ***"Yes, many people are cured by only praying. A patient had blood cancer and he traveled to Mecca to drink Zamzam water and then the disease disappeared. I had two sick children and I always pray for them, and they are getting better, praying is very useful."***

Although not shared by all, some believed that breast cancer may result from specific personal and social circumstances, as reflected in the following quote.

A married,57 years old, unemployed further suggested that: ***"Praying to Allah is something great and important. Sometimes doctors do not have a treatment for the disease, but at the end [it is] Allah Who cure[s] us. For example, my sister had bowel cancer, and the doctors said her situation is hopeless, but by praying to Allah her health is better."***

Women believe that the disease comes from Allah; however, it will not be solved by praying only. The belief in both Allah and medication for healing is a significant perceived

benefit, which could encourage religious people to take health measures, as expected from the HBM.

Healing Without Doctor or Treatment

Some respondents used hospital facilities and prescribed medications to treat breast cancer, but others viewed religion as a healing source, called faith healing. Overall, three types of perceptions and practices emerged from the data. Some women believed in medical treatment, others believed in faith healing without doctors, while still others believed that faith healing and doctors' treatment were both necessary.

Belief in medical treatment dominated responses because most participants were formally educated and aware of breast cancer, believing that both doctor's treatment and faith are necessary. For example, a married 38-year-old observed: ***"Medicine and medications are the reason for healing. On the other hand, strong faith makes the patient feel relieved and accept the disease, but healing come from the medicine."***

Some participants believed that certain medications advised by doctors consist of natural substances, like honey, dates, and Zamzam water, which are scientifically proven to cure several diseases. Participants claimed that if these were taken properly, they could heal up to 90% of the disease. A 44-year-old married and employed concurs: ***"I agree. All the medications that the doctor will give me consist of natural substances. For example, the honey, scientists*** agree ***that it contains a*** Healing ***substance which helps the body, also. Sometimes, patients refuse to take medication and use alternative medicine, but if***

they use both, the possibility of healing will be above 90%. Using one type of medication won't be as helpful as when you use both."

Most women agreed the faith healing is not applicable alone, but when recommended along with medication and medical consultations. However, there are references from Islamic history and society where faith healing was applied successfully. Regardless of the historical evidence on faith healing, it is important to note the difference in treatment between previous centuries and current scientific findings. Faith presents some facts that never change, whereas health conditions and treatment options have evolved. Faith healing cannot be denied as whole; however, it should also accept the success of medical science. Those who believe in both modern medicine and religious involvement still believe that a strong faith is the main reason for healing. Participant, 36 years old, single agree: ***"Strong faith and medication will help to increase healing. So, faith is the main reason for healing."*** Although the number of participants who subscribe to the benefit of medication is high, only a few mentioned healings without faith, or using medication only results in healing. Participant, 57 years old, married, unemployed: ***"But we have in Islam similar stories for our Prophets like Ayoub (job)—peace be upon him—he had a severe illness, but Allah healed him by asking, 'Run with your feet to a cold water for wash and drink,' where the water was his treatment. So, Allah advises us to seek treatment as well as praying."***

The dual belief in the health powers of Allah and medicine, is supported by the argument that some people visit doctors and use medicine but cannot heal unless they have faith.

24 years old, single agree: ***"Sometimes people visit doctors, but they do not heal."***

Participants also shared that faith healing is more related to the psychological conditions of the patients, as it has a positive impact on their mental health. Participant, 41 years old, married, unemployed: ***"Faith is something related to the psychological side, and many doctors said it's related to healing. If your mental health is stable, healing will be better and better. I think being close to Allah makes the person feel safe, and more believing in Allah […] make[s] him positive about healing and impacts his health."***

As noted below, there is no conflict between the faith in Allah and medication use; they go hand-in-hand toward healing. Participant, 45 years old, unemployed: ***"Strong faith does not conflict with going to the doctor. Believe in Allah and His ability does not conflict with going to the doctor. Both are parallel and useful together."***

Most of participants trusted both western medicine and faith healing. Participants did not find any contradiction between taking medicine and seeking the doctor's advice while also praying for healing, reading the Quran, and visiting the sheikh. The majority dismissed the possibility of a conflict between treatment and faith even when a doctor's advice contradicted their faith. Only a few mentioned that they would not use any medication or treatment that contradicted their religious beliefs. However, few participants mentioned that people could heal by using medication only, such as this participant, 40 years old, and married: ***"I should depend on the medicine and doctors for healing."***

Allah's Will

Among participants, some of the concepts regarding the causes of breast cancer, such as affliction from Allah, bad luck, fate and destiny, evil eye, and envy, are intertwined with

Allah's will, these are similar in context and varied in their forms as all related to the will of God. At the same time, their belief also reflects their tendencies towards treatment with various methods. Participant, 25 years old, single, employed: ***"Everything happens by Allah's will, and it's our fate and destiny. But we must find the treatment."***

Regarding beliefs that Allah's will stands out as the first cause of anything, a second cause relates to a person's actions. For participants, nothing happens without Allah's will, but people have the option to choose right and wrong for themselves. Participant, 36 years old, single, employed: ***"Things happen by Allah's will, but not everything. For example, if I touch something hot and I burned my hand, this is not by Allah's will."***

Although illness may come from Allah, treatment needs to be found by the individual, and recovery depends on the treatment. It is also referred to in the Quran, where Allah has advised followers to take good care of oneself because Allah has blessed people with a brain and wisdom to decide between good and evil. Humans make mistakes that lead to disease, but disease is the will of Allah and a person cannot control it. A different perspective contends that Allah is great and merciful, so he does not curse one with disease (other conditions must cause it). Participant, 41 years old, unemployed: ***"There must be a reason for disease, whether genetic or hormone disorder. But saying the disease is by Allah's will. no, I don't think so and I disagree. Allah is the most merciful, does not torment people with diseases."***

Another participant suggested that religion does not have a physical impact, but a belief in religion gives one hope and safety. Participant, 45 years old, married: ***"I don't think physical impact and religion are related; both are different. But thinking that it's***

by Allah's will, gives the patient sense of feeling safe or hope...but I don't see it as Allah's will." Participants reported that they believe that health issues stem from God; however, they also shared perceptions of social and physiological causes of diseases. Referring everything to Allah is part of Muslims' beliefs. As expected from the HBM, the belief that healing comes primarily from Allah is a significant modifying variable which could discourage one from obtaining breast cancer diagnosis and treatment.

Affliction from Allah

All FG participants were Muslims; therefore, many were concerned with the linkages between Allah and disease, believing that affliction is a trial from Allah. Some participants believe that affliction is a trial to test the faithful's patience. Others, however, disagreed, explaining that they attributed pain to lifestyle choices and stress. In some cases, participants mentioned that disease is a good thing, as it brings knowledge with it. When someone suffers, they find out more about their disease, which increases knowledge and helps them overcome their ailment.

Some participants indicated that Allah has a system to test one's faith. Therefore, breast cancer could be an affliction meant to test a believer's patience, gratefulness, and capability to stay strong and worship during illness. At the same time, Allah reminds people of his existence, sometimes when they do not regularly worship and commit sins. The disease reminds them that their faith is becoming weaker and that they must return to Allah. Although the belief in Allah's affliction is strong, participants simultaneously believe that a disease is only the sign of affliction and that its causes and prevention depend on a person's worldly life.

Further, participants supported their argument with references to how Allah afflicted the prophets. Any Muslim who has a strong faith will be afflicted, whether by disease or other means, just as the prophets were stricken. Participant, 50 years old, retired: ***"Sometimes Allah afflicts the person to test his patience: is he going to thank Allah anyway or not?"***

In contrast, some participants believed that Allah would not test them through the disease. Participant, 30 years old, single, employed: ***"No, I disagree with the sentence. I don't see the disease as a test for our faith or afflict[ion] from Allah. I see just a disease."***

They may have different religious views and practices. Participants reasoned that people from other religions could also have breast cancer, so they were not convinced of affliction came from Allah. Participant, 40 years old, unemployed: ***"There is [a] difference between scourge and afflict[ion]. Afflict[ion] is for those who Allah's love[s] and want[s] them to worship Him. But scourge is for the sinful people."***

Although participants reported that daily life routines could cause diseases, they insisted on attributing the causes to fate and destiny. They claimed that believers get sick to test their faith and get closer to God, while sinners get sick to remind them to repent.

Moreover, there is also a duality of perception between those who believe that the disease is caused by the daily life routine and lifestyle, but it is also an affliction from Allah

3. Knowledge About the Practice of Mammogram Screening:

The third theme revealed in the FGD was knowledge about the practice of mammogram screening.

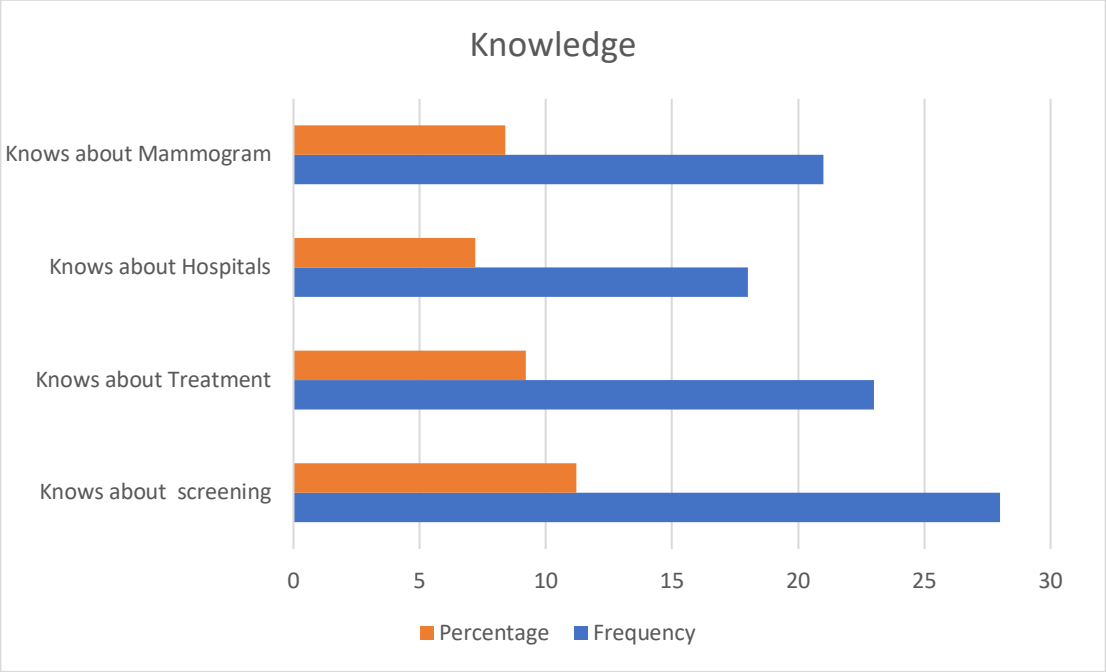

Figure 12:Knowledge About the Practice of Mammogram Screening

Women's knowledge of the breast examination process and early mammogram screening varied depending on education, awareness, and religious practices. They mentioned different sources of information where they learned about breast cancer. Among these, social media and awareness campaigns dominated the responses. Women also shared their experiences of undergoing or deciding not to undergo a mammogram. Participant, 39 years old, divorced, employed: ***"Yes, because two or three years ago, when I was 35 or 33, I attended an event where they had an early-stage examination and they ask[ed] me if I have a family history with the disease, so I said no. Then they said no need for the examination given my age. So, I forget about the examination since then and I said when I feel the symptoms I will go."***

Participants also knew about the importance of the examination, as breast cancer is one of the most common forms of cancer. They knew that the examination should be taken periodically, especially in one's thirties, and believed that examinations and early diagnoses are helpful in obtaining appropriate treatment and moving to an early-stage recovery. There are different perceptions among women about age and frequency to undertake the examination: some believed they should take it in their twenties while others suggested they needed to undergo mammograms in their mid-thirties, after their forties, or simply every six months.

Some women do not trust the screening process and mammograms because they feel discomfort and pain from the machines. They also said they believed the procedure could even cause cancer and referred to some cases as examples. These participants tended to read the Quran for healing and did not believe in the medical and surgical procedures for treatment. However, some women found information about early screening, especially during the October awareness campaign, through the internet, social media, TV, SMS, and advertisements. Physical distributions of informative materials, as well as lectures in hospital, also stood out as important sources of information for respondents. Participant, 45 years old, married: ***"We have heard a lot, on the TV, media, malls and during awareness campaign where we see many examination stations. Also, healthcare providers always wear pink ribbons, so honestly, we have full awareness of breast cancer."***

Women knew about the mammogram through an awareness campaign run in October and some received a mammogram. The majority of respondents who received a mammogram, said they felt stressed due to the unknown procedures and fear of being hurt. But

once they got it, they felt better because it only hurt a little and was beneficial in discovering cancerous cells and leading to an early-stage treatment. However, other women shared that they felt hurt and embarrassed while getting a mammogram. Embarrassment is important to this discussion, since it is associated with the participants' conservative social setting, as women view breasts as a private part of the body and having anyone touch or adjust them was irritating and embarrassing. Participant, 41 years old, unemployed: ***" I hate going to the hospital to have it because it hurts, and I am embarrassed"***

A small number of women had little or no information about mammograms. They perceived it as a painful procedure and did not explore it further. In some cases, women did not have much information but thought that, if it was required, they would ask a doctor about it and do it.

Additionally, the information women saw sometimes did not explain in detail all aspects of the procedure. For example, some women knew about early screening, but they were not aware that it was called a mammogram. If someone asked them about a mammogram, they were surprised. Participant, 43 years old, unemployed: ***"I have heard about the early screening, but I did not know it's mammogram."***

Also, some believed that a mammogram changes the shape of the breast, while others did not. However, among those who knew about mammograms but had not gotten it yet, most intending to have it done. Some participants shared that their appointments were affected by COVID-19 but that they would take an examination as soon as the lockdown ends.

4. Barriers to Screening and Treatment Services:

Despite having knowledge about breast cancer, women did not go for screening, treatment, or regular checkups due to certain barriers in the process (Figure 13).

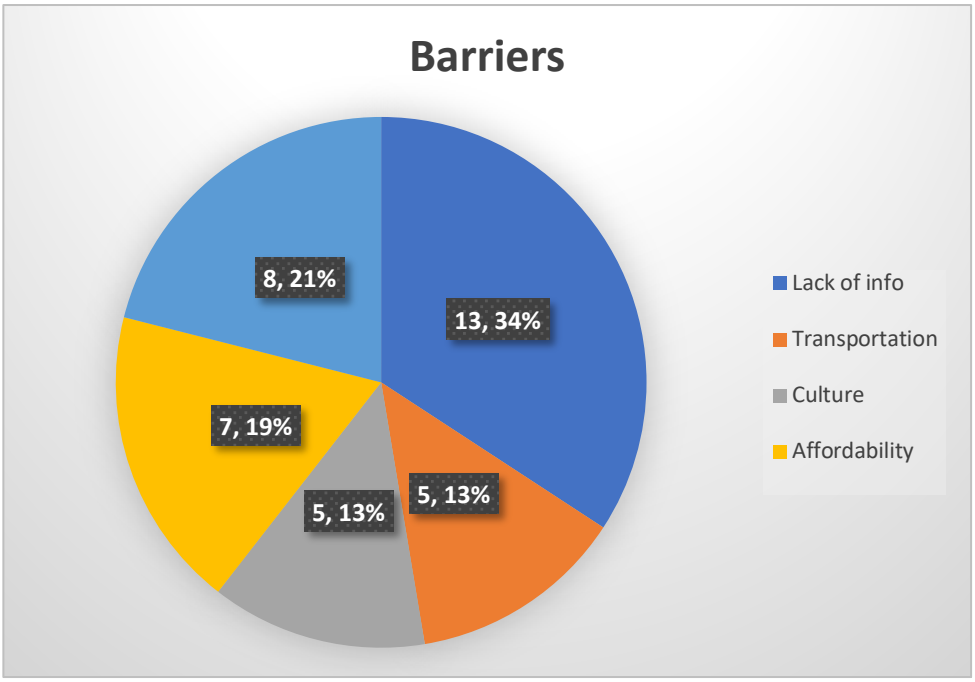

Figure 13:Barriers to Screening and Treatment Services

These barriers are either structural or individual hurdles to receiving treatment. Participants mentioned the following:

- The existence of limited centers providing a free examination. Otherwise, all women could not afford the expense. Participant, 50 years old, unemployed: ***"I think we have limited centers who provide free examinations because not all women have money for private centers."***

- Transportation. Participant, 44 years old, married: "***Transportation is very important because sometimes I did not find anyone to take me for the examination."***
- Lack of information about the location and other details of the centers. Participant, 48 years old, unemployed: ***"It could be. They don't know the place or the examination itself. So, ignorance is the obstacle."***
- Ignorance in the families who are not aware of the disease. Participant, 39 years old, married: ***"Ignorance, my family and culture are not aware of the disease, so I do not have enough information."***
- Lack of information about making an appointment and contacting the appropriate doctors. Participant, 45 years old, married unemployed: ***"Yes, possible, especially if I do not know where to go or how to book [an] appointment because maybe there are available appointments in the center, but i does not know."***
- Families of some women prevent them from going for an examination because they do not think it is essential.
- Being too shy to take the examination. Participant, 35 years old, single, employed: ***"Yes, of course, if the woman's culture refuses that someone see her, it will be a huge obstacle."***
- Fear of discovering the disease and its consequences. Some participants reported that they worry about the possibility of losing their breasts in the case of receiving a cancer diagnosis.
- Fear of pain and embarrassment. As a Participant, 48 years old, married, unemployed said: ***"Fear. I have pain in my breast, and I was very scared. I was worried that if I did the examination, I would discover the disease."***

- Some participants believed that there are no obstacles, except for a lack of willingness to be examined and treat the disease. Participant, 38 years old, married, employed: ***"I don't think there are obstacles, every woman knows where to go, we have it for free. There is no obstacle, it depends on the person herself and her lifestyle. The problem is with appointments in the governmental hospitals, while private hospitals are much easier."***

Although some participants had the knowledge of breast cancer treatment and screening, most of them lacked the information about hospital location and how to contact doctors. Lack of information is a significant perceived barrier in the HBM, which could prevent women from obtaining screening and treatment for breast cancer.

Lack of Access to Available Services

The majority of participants shared that there are no services and facilities available in their areas, suggesting another barrier. Although they know about the available treatment options in general, the areas close to them do not have such facilities. Participant, 43 years old, married, unemployed: ***"I don't know, it could be in the hospital that I have visited, but I did not receive messages or emails about it."***

Some of them pointed out the October campaign, as the information about available facilities is shared with the people to contact in case of disease. Participant, 38 years old, married, employed: ***"In October only, some workplaces send emails for awareness or do campaigns. But it's only in October."***

Participant, 43 years old ***"We rarely see it. I think I saw once on the street but not at the medical center. They have not ever done a lecture or sent reminders on SMS. I always see a saleswoman for milk and feeding products in the medical center, but nothing about breast cancer."***

However, some women referred to facilities they see around that provide information and treatment centers. Participant, 48 years old, married: ***"Yes, at the gym, medical center, and on awareness programs always available at the health care clinic. Also, I see*** Signs ***on the streets and hospitals."***

Participants claimed that there were limited services and facilities in their communities. They also complained of lack of communication and campaigns on awareness except in October. Lack of availability of services and facilities is a significant perceived barrier, which could influence one's beliefs and perceptions about getting breast cancer diagnosis and treatment.

5. Motivations and Facilitators to Get a Mammogram

Direct quotes from participants presented in this chapter suggest that women know about mammograms, but not all of them have received one. Some reasons for avoidance include embarrassment, pain, lack of appropriate information, and affordability. Despite these factors, most take the examination expecting a positive outcome. Some of their motivations include:

- Stories of other women who have received a mammogram, were diagnosed early, and had treatment and recovery. These stories encouraged women to get examined,

as breast cancer is the most common form of cancer that can be treated if diagnosed through early screening. Participant, 57 years old, married, unemployed: ***"Women, in general, like to share their experience and listen to others, especially in our society it's very encouraging to share your story. Most women try things when they hear others' stories. So, when others share their experience receiving early screening or negative stories where they delayed the examination, this kind of sharing could encourage women."***

- The early examination could save women from pain and danger.
- It is a personal health problem, and women who realize the importance of their health, take the examination for their own safety.
- The early screening is free, and most women know that there is no reason to wait or avoid the examination.
- If there is a family history of such a disease, the examination could help identify the disease transfer.
- Awareness campaigns explaining the impact of the mammogram convince people.
- In most hospitals, mammograms are free, while some private hospitals charge fees for it. People need to be informed about accessible facilities of the mammogram faculties because many patients cannot afford it in private hospitals. Participant, 44 years old, unemployed: ***"I mean, increase awareness about the disease, and provide the examination for free in all hospitals because it's more than 2000 SR. I remember when I was in a private hospital, a specialist talked about the examination and when the patients asked about the price, they left the hospital. So, this means it's expensive."***

Participants acknowledged that sharing information about breast cancer prevention If only among themselves had positive impacts on the decision to receive a mammogram. The influence of peers and group pressure is a psychosocial variable, which could increase a person's intent to obtain breast cancer screening and treatment.

Recommendations of Participants to Encourage Access to Prevention:

A major theme that emerged during FG discussion was the suggestions to improve access to prevention and treatment.

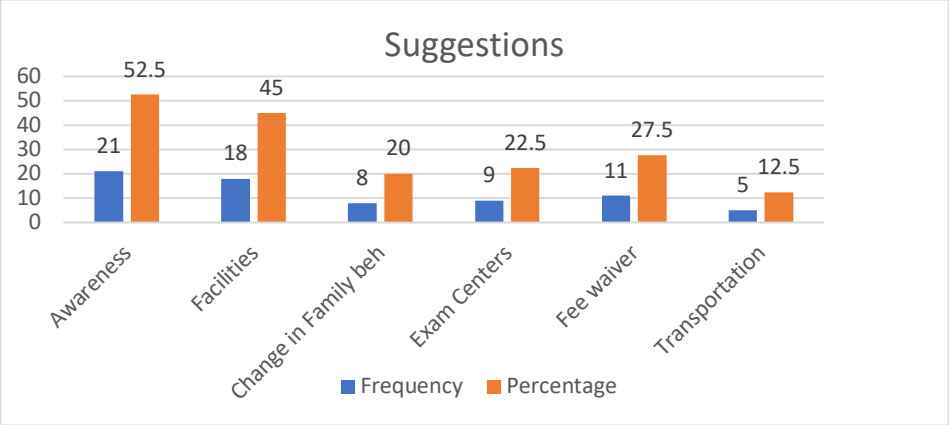

Figure 14:Suggestions to Improve Access to Prevention and Treatment

Study participants suggested a few steps that could improve breast cancer care and treatment (Figure 14). These are:

- Screening and treatment centers need to be established in all communities to improve access for women with transportation issues. Participant, 42 years old, married, unemployed: ***"The centers should be available and accessible. Also, it should be label[ed] with [the] Pink October logo, so women know that this center provides examination services."***

- Examination centers should be opened in proximity to communities, which will encourage women to get examinations. Participant, 36 years old, employed: ***"Awareness campaigns in October are very useful because they tell us the benefits of early examination, so if they do it all year rather than just in October. Also, the medical center needs to send awareness emails to their patients as well as reminders for periodical examination. I think this will help a lot especially if the message is clear with all necessary information on how to book an appointment. This will be very helpful."***
- The awareness campaign should target all women, as most women lack sufficient information to convince them to go for a screening. Participant, 26 years old, single: ***"Awareness, awareness in all different ways. we must start awareness at schools to become aware of the importance of early examination as it could save someone's life. It is very important to increase awareness from childhood."***
- Examinations and mammograms should be free from the government and charitable organizations so that low-income women may access examinations and testing services.
- Schools need to become leaders in the delivery of initial awareness campaign.
- Women who sign up for an examination should be sent reminders through SMS by the Ministry of Health.
- Existing hospitals must have specialized screening centers separate from general medical activities.
- Appointment systems need to be easily accessible and understandable by people unfamiliar with health system management terms and technology

- Since cultural problems were reported as hurdles to early screenings, it was suggested that the ministry of health collaborate with different sectors to address this problem. For example, the collaboration between the ministry of health and the ministry of social affairs can help involve families, especially male figures, to support women needing breast screening.
- Success stories and case studies should be publicized to people unwilling to get a mammogram, in order to increase acceptability
- Social media should be used more frequently for awareness campaigns.
- Surveillance. Mammogram's screening can be linked with national data and identity cards to ensure participation.

However, awareness is a significant cue to action as explained in the HBM, which could increase breast cancer screening and treatment among women.

Discussion

The qualitative component of the larger dissertation study addressed Aim 3 to assess how knowledge and cultural values affected barriers to breast cancer diagnosis and treatment. The FGDs revealed five themes; knowledge about breast cancer, religious health fatalism of women, women's knowledge about mammogram screening, barriers preventing participation in mammogram screening programs, and recommendations to facilitate and encourage their participation in the mammogram screening program.

Regarding knowledge about breast cancer, our participants reported several causes for breast cancer; the majority reported social and theological factors, whereas a few of

them reported genetic, environmental, and nutritional factors, which are closer to the actual causes of breast cancer. The two major causes reported were affliction from Allah, followed by Allah‘s will. These findings indicate that religious views dominated the perception and knowledge of participants. On the other hand, the participants who reported genetic, nutritional, and environmental factors reported that breast cancer could be caused by hormonal changes, preserved food, and contraceptive pills. In general, participants showed a lack of knowledge about the causes of breast cancer.

In a study of a low level of knowledge among female students from Taibah University, Saudi Arabia, he found regarding symptoms and management of breast cancer. Similar to our study, the women lacked knowledge about the causes and risk factors for breast cancer (Latif, 2014). In the Al-Ahsa region, the knowledge of Saudi women regarding breast cancer revealed that the majority of them attributed breast cancer to heredity, and more than one-half falsely attributed it to contraceptive pills (Ali et al., 2018).

Additionally, this study investigated religious health fatalism regarding the diagnosis and treatment of breast cancer. The women in this study reported various religious fatalism-beliefs as a possible barrier to diagnosis and treatment. The largest proportion trusted doctors and reported contacting doctors and receiving treatment, followed by those seeking religious therapy such as Quran therapy. However, most agreed that the hospital is the appropriate place for diagnosis and treatment. Participants also largely agreed that it is appropriate to take medication and treatment and then pray to Allah, asking for a cure. Medical treatment options varied among the participants; some women

lacked information on treatment and reported that there was no medical facility near them. The treatment options mentioned included visiting doctors, counseling from friends, then visiting hospitals for treatment, waiting for symptoms to disappear, and counseling information sources. Alternative medicine was also reported by women as a choice.

Overall, it was found that religious beliefs affected the treatment of women and led to their reluctance to get treatment. Few studies in the previous literature were qualitative studies attempting to explain how religious health fatalism acted as barriers to diagnosis and treatment of breast cancer. Quantitative studies reported findings similar to our study. An Iranian study found that fatalism was a barrier to breast screening among Iranian women (Lamyian et al., 2007), which was similar to our findings. A study from Eygpt reported a agreement between fatalism, fear, and breast cancer screening (Elsaba et al 2020).

On the other hand, Quantitative studies from Turkey Obtained contrasting findings to our study. One reported by Kretzler et al., (2018) found a correlation between the increased likelihood of participating in cancer screening and the higher frequency of attendance in religious services (Kretzler et al., 2018). Our study Found that participants were also religious, but few participated in cancer screening. Moreover, another study from Turkey reported no association between the screening behavior of women and their degree of fatalism (Kissal et al., 2018). Gullatte et al, (2017) also reported that women's religious and spiritual beliefs were not predictive for the decision of women to delay medical care. The large majority of women in this study knew about screening and

mammogram screening, and a few women had a low level of information about a mammogram.

The knowledge of women was influenced by their educational level and religious practice. Some women didn't trust the screening process and mammogram due to feeling uncomfortable and their suspicion that the screening process may cause cancer or change the shape of breast cancer. Those women were more affected by their religious beliefs, and they tended to read Quran for treatment, and few believed in medical treatment. There were several sources of information, including social media and the October awareness campaigns. knowledge about mammography in a previous Saudi study was found to be associated with education level, such as in our study. However, additional factors were reported to influence the level of knowledge, including age, marital status, family income, and history of breast cancer (Al-Wassia et al., 2017).

A study conducted on Saudi women health care workers demonstrated that it knowledge regarding the screening of breast cancer was poor among more than one-half of participants, whereas only a few had moderate knowledge, and very few showed good knowledge (Alshahrani et al 2020).In Najran city, women reported that it main source of information was social media, and the very few reported that their health care provider was the source of their information (Alshahrani et al 2019).

Comparing previous findings (Alshahrani et al 2019) with our findings reveals that social media has a significant role in the awareness level of women about breast cancer, and that physicians play a minor role compared to social media. Therefore, it is necessary to increase the role of physicians in increasing women awareness since social media provide

incorrect information since anyone in social media can publish information without medical sources and evidence. knowledge of barriers and facilitators to access mammogram screening is the first step in the improvement and development of a successful screening program (Momenimovahed et al, 2020).

Major barriers for practicing mammogram screening among women in the current study included lack of information about the location of centers where these are available, followed by lack of facilities, affordability, transportation, and culture. There are other barriers related to the women themselves, such as embarrassment and pain. In a cross-sectional survey that included five main regions of Saudi Arabia and included a total of 3245 women, it was found that there was a low practice of mammography.

The major barriers reported in above study included women are thinking about mammography; Mainly that it is not important, followed by worrying about results, not knowing where to go and not wanting anyone to see or touch their breasts and pain (Al-Wassia et al., 2017). It seems that pain, embarrassment, lack of information about facilities are existing barriers in Saudi Arabia, and these too were reported in our study.

In a previous Saudi study by Abdel-Salam et al., there were several barriers reported regarding mammography screening. The authors categorized the barriers into three categories; personal barriers that included lack of information about mammograms, fear of radiation exposure, fear of finding breast cancer, being busy, and fear of cancer treatment, whereas economic barriers included the cost of a mammogram. The third category of barriers were related to the health system, and they included fear of error in diagnosis, long time to take a medical appointment, and preferring not performing mammograms without

doctors‘ Advice (Abdel-Salam et al., 2020). There were similarities between the barriers reported in the previous study, and ours regarding personal and economic barriers. Another Saudi study reported several barriers for receiving a breast cancer examination, and these barriers included traditions as the major barrier followed by unavailability of facilities, lack of knowledge, and fear of results (Amin et al 2009). The previous findings confirmed that limitation in facilities is a major problem, as we found in our study.

There were several recommendations reported by women to improve their access to prevention and treatment. These recommendations included the establishment of screening and treatment centers in all communities to facilitate access to women and the targeting of all women by the awareness campaign to deliver information to all women.

However, there are several cultural problems acting as obstacles for early screening, such as non-supportive society, and fear of finding cancer, so it was suggested that the ministry of health needs to collaborate with different sectors to address this problem. This can help involve families, especially males, to support women who need breast screening. It was reported in a previous Saudi study that tradition was the major barrier to breast examination and screening. (Amin et al., 2009); this reflects the impact of cultural on the practice of breast screening.

Summary

The knowledge about the causes of breast cancer tended to be affected by religion rather than scientific causes. Lack of knowledge on the causes of breast cancer was a significant perceived barrier anticipated by the HBM that could impede women from taking

health measures to prevent breast cancer, such as getting regular breast exams and mammograms. Religious fatalism also influenced the perspective and beliefs of women regarding the diagnosis and treatment of breast cancer. Religious beliefs about treatment were significantly perceived barriers to health-promoting behavior as expected from the Health Belief Model, which could impede a person's intent to adhere to healthy behaviors. Women believed that the disease comes from Allah; however, it will not be solved by praying only.

The belief in both Allah and medication for healing is a significant perceived benefit, which could encourage religious people to take health measures, as expected from the HBM. Despite a strong belief in religion, patients showed trust in doctors because they had a better understanding of the disease and could explain it to patients. They reported that they did not have much trust in religious leaders on health matters, but their belief in Allah supported them through the disease and treatment process. Neglect of treatment options due to religious beliefs was a significant perceived barrier as expected from the HBM, which may have prevented individuals from obtaining diagnosis and treatment of breast cancer. Participants were very knowledgeable about mammogram screening and early screening; however, religious beliefs influenced their behavior and attitudes toward the practice of mammograms.

The barriers to screening and treatment were classified as individual or structural. Structural barriers were related to the facilities and transportation. Most of them lacked information about hospital locations and how to contact doctors. Individual barriers included embarrassment and fear of pain in getting a mammogram. Although some participants had knowledge of breast cancer treatment and screening, their lack of information

about the location of facilities and transportation to get to them was a significant perceived barrier as expected from the HBM. This barrier could prevent women from obtaining screening and treatment for breast cancer.

Chapter V

Conclusions and Summary

Breast cancer (BC) is considered the most frequent malignancy threatening women's lives worldwide and the leading cause of cancer deaths (Bray et al., 2018). Incidence rates of BC vigorously increase in the last years of women's lives, reported among 4.7 million women (23%) worldwide (Parkin et al., 2005; Jemal et al.,2011). The mortality incidence increased among women with breast cancer and reached up to 502,000 deaths in 2010 (World Health Organization, 2010).

In 2017, BC in Saudi Arabia, was considered as the second leading cause of cancer death after lung cancer (Alrashidi et al.,2017). Approximately 30% of new cases of breast cancer were diagnosed every year in Saudi Arabia, which may increase in the upcoming decades due to the rapid growth of the Saudi population and the increase in life spans (Yaghmour et al.,2020). The increased incidence of BC was observed among younger and premenopausal Saudi women who were diagnosed at advanced stages (Khan et al.,2015; Abolfotouh et al.,2015).

Late diagnosis was the most common reason leading to a poor prognosis in Saudi women (Alotaibi et al.,2018). Therefore, early diagnosis and detection of breast cancer would have a crucial role in controlling and managing the disease, which would result in an improved survival rate (Khakbazan et al.,2014). Additionally, early diagnosis might decrease the morbidity and mortality rate and could prevent from 20% to 40% of deaths (Lenner, & Jonsson, 1997). Also, early diagnosis and detection of breast cancer has been shown to improve the outcome and, in turn, the quality of life of women (Allen et al.,

2010). Varied strategies were recognized to detect breast cancer in the early stages, such as regular breast self-examination and mammography screening (Sherma, & Hossfeld, 1977).

Mammography screening utilization for breast cancer was inversely associated with a death rate reduction in that the mortality rate among women with breast cancer decreased by 23% using mammography screening (Saggu et al.,2015; Elmore et al.,2005).

In Saudi Arabia, underutilization of mammography was reported among women and low participation rates in other preventive activities (Khan et al., 2015). The noncompliance rate of mammography among Saudi women reached 89% in 2015, despite the availability of free healthcare services (Gonzales et al.,2018).

Similar to our results, El Bcheraoui et al., (2015) reported that 92% of women did not utilize mammography screening. The high percentage of underutilization of mammography was attributed to poor knowledge and incorrect beliefs among women regarding screening methods (Sung et al.,1997). Also, cultural norms regarding women's interaction with males, modesty, and the privacy of their bodies might restrict women's access to mammography screening, according to Azaiza, & Cohen (2006).

Studies indicate that women's knowledge about breast cancer and screening services is highly associated with seeking medical help and delayed presentation with advanced stages which is linked to knowledge deficiency and the absence of benefit from any therapy (Ferlay et al.,2007) Although mammography screening (MS) is provided free of charge in Saudi Arabia, it remains underutilized as a screening tool due to lack of

knowledge about the importance of early diagnosis and benefits of mammogram screening (Abdel-Salam et al., 2020). Very low utilization, 3% to 8% of mammography screening was reported in earlier Saudi studies (Ravichandran et al.,2011).

Lack of knowledge and awareness among Saudi women regarding mammography screening was the most frequently reported reason in previous studies leading to delay of diagnosis and presentation at an advanced stage of diagnosis. Barriers restricting women from accessing mammography screening were frequently observed among Saudi women, such as incorrect beliefs about screening services, cultural norms, and modesty violation. In addition, barriers included knowledge about risk factors of breast cancer, economic barriers in the healthcare system, and personal barriers, such as limited utilization of mammography screening (Alshahrani et al.,2019; Katapodi et al.,2004; Azaiza, & Cohen, 2006). However, the current study may assist in identifying barriers and create programs targeting them to encouraging and motivating Saudi women to face these barriers and increase mammography screening utilization. Increasing knowledge and awareness of Saudi women toward the necessity of early diagnosis for breast cancer and the benefits of mammography screening would increase mammography utilization and decrease the incidence of breast cancer.

Therefore, the current study had three main aims, the first one was to assess knowledge and cultural values related to breast cancer among Saudi women in Saudi Arabia. The second aim was to assess knowledge and cultural values related to mammography screening among Saudi women in Saudi Arabia. The third aim was to explore how

knowledge and cultural values of Saudi women may act as barriers to mammogram screening.

Research findings for Aims 1 and 3 revealed that knowledge about breast cancer significantly influenced breast cancer beliefs and the barriers about mammography and mammogram screening. Regarding the interaction of receiving a mammogram, knowledge about breast cancer affected breast cancer beliefs and receiving a mammogram.

Aims 2 and 3 analyses found that religious beliefs influenced treatment of BC and led to the reflection of treatment options. The analysis of Aim 3 revealed that religious beliefs about treatment were significant perceived barriers to health promoting behaviors as expected from the Health Belief Model, which could impede a person's intention to adhere to healthy behaviors.

Overall, the above research findings revealed several gaps in knowledge of breast cancer that were influenced by religious beliefs. For Aim 3, findings showed that knowledge and cultural values have a significant impact on practicing mammogram screening. Lack of information about mammogram screening and its importance led to low practices of screening. Moreover, support from family and husband played a significant role in obtaining mammogram screening. With the help and support of family, the women can be expected to reach screening facilities more easily and utilize mammogram screening.

Strengths and Limitations

This study has strengths and limitations which are discussed in this section.

The main strength of this study is its generalizability to women in the eastern province region in the Saudi Arabia. Our large sample (n=600) was recruited from twelve hospitals. This enhanced the representation of the sample through improving the diversity of volunteered participants. The sample was recruited from different types of facilities, cities in the region, educational levels, economic status and beliefs about screening, disease and healing.

Another strength includes collecting data on many variables that had not been included in previous research. Our study reported women's knowledge of breast cancer. Additionally, beliefs about mammogram screening behaviors, including knowledge, practices, barriers, religious beliefs, and religious health fatalism were reported. In particular, the focus on religious beliefs and religious health fatalism were two subjects that were not investigated greatly in previous studies.

Additionally, the study used a mixed-methods approach, where quantitative analysis was conducted, followed by a qualitative analysis to thoroughly identify the knowledge, practices, barriers, and religious beliefs of women. As far as we know, there is no previous study on this topic in this population that utilized a mixed-methods design.

Moreover, the suitability of the utilized theoretical framework to the scope of the study improved its quality. With the lack of data in Saudi Arabia, people's attitudes are mainly driven by mere perceptions as opposed to facts or concrete education. The HBM has an evidence-based capability to dissect these perceptions and to provide thorough analyses of individual factors.

However, this study has some limitations. The first limitation is its limited generalizability to only women in one geographic region. The study was carried out in three cities in the eastern province in Saudi Arabia: Dammam, Khobar, and Dhahran. However, findings were not meant to represent all women in the Saudi Arabia. Future plans of conducting similar studies in other regions in the Saudi Arabia may improve the sample representation of all women in Saudi Arabia, allowing for further comparisons based on demographic differences.

Another limitation is the bias that could result from lost meanings in the translation process. The study was conducted on primarily Arabic speaking women. Hence, the questionnaire given to participants was written in Arabic after translating it from the original design in English. All data were back translated to English by an expert in the same field. Similarly, focus group discussions were conducted in Arabic and then translated to English. To avoid bias, a professional local translator translated all data, and then a researcher colleague reviewed the transcripts.

Recommendations for Future Research

This study identified factors that affected women's level of knowledge about breast cancer and reported barriers to mammogram screening among Saudi women. So, further studies can identify which of these factors are present in other communities and can facilitate their management.

This study also provided culturally appropriate suggestions for women to overcome barriers to mammogram screening. These suggestions should be adopted by the Ministry

of Health which includes making mammogram screening free of charge and to establish and specify centers for mammogram screening to be available to every woman.

Further studies are recommended to be conducted in different regions and hospitals in Saudi Arabia to potentially identify more barriers for screening and identify the level of women's knowledge to increase the knowledge of those who require factual information.

We recommend increasing the knowledge of women about breast cancer and its causes and risk factors by establishing periodic awareness campaigns, like those of the World Health Organization (WHO), that cover the entirety of Saudi Arabia. This can be accomplished by providing booklets containing information such as risk factors for breast cancer, causes, symptoms, age for mammogram screening, and how mammogram screening is performed.

Also, findings may be used to further investigate the role of religiosity on health behaviors, especially the uptake of preemptive screening for some diseases such as breast cancer and cervical cancer. Also, further studies are recommended to investigate the role of religiosity on women's health behavior in other areas in Saudi Arabia.

Finally, findings from this study can be used in future interventions aimed at implementing culturally acceptable messaging strategies to increase knowledge of Saudi women regarding breast cancer, its risk factors and causes and to increase women's knowledge about mammogram screening and the importance of early diagnosis and screening for obtaining a good outcome. Other interventions with doctors and providers

are encouraged by these findings. Doctors can discuss breast cancer with all their women patients on regular visits.

New Knowledge Contributed by this Study

Previous research was used as a guide for this study and further studies and investigations. We provided both qualitative and quantitative analysis of collected data which resulted in more detailed information about the investigated aims.

This study covered several points and reported valuable information about subjects that had not been investigated thoroughly. We focused on the religious beliefs of women and their impact on participants' knowledge, behavior, and practice of screening, whereas there was no previous research that reported such detailed information.

Findings highlighted from this study are new and hence, enrich the existing literature. Among these findings are barriers women face in seeking mammography screening. These barriers included transportation, lack of knowledge about facilities and physicians that provided screening, and fear of pain and embarrassment about receiving a mammogram. Understanding these barriers may help design culturally appropriate interventions that overcome the obstacles Saudi women encounter in seeking breast cancer screening.

Moreover, this study revealed the importance of the role of family in adopting either a positive or negative attitude or behavior towards mammography. Family members' support would increase the probability of getting a mammogram. On the other hand, their

lack of knowledge about breast cancer or opposing behavior towards mammography negatively influence the participants' probability of getting one.

Finally, this mixed-methods study on breast cancer screening in women in the east province of Saudi Arabia revealed the importance of knowledge and religious beliefs on adopting mammography screening behavior. Findings demonstrated how age, income, and level of religious fatalism affect knowledge about mammography screening, which consequently affect screening behavior. Utilizing these findings in designing breast cancer intervention programs may help them achieve their goal of preventing breast cancer.

References

Abdel-Aziz, S.B., Amin, T.T., Al-Gadeeb, M.B, Alhassar, A.I., Al-Ramadan, A., Al-Helal, M., Bu-Mejdad, M., Al-Hamad, L.A. and Alkhalaf, E.H.. (2018). Perceived barriers to breast cancer screening among Saudi women at primary care setting. J Prev Med Hyg, 2018;59(1):20–29. doi:10.15167/2421-4248/jpmh20 18.59.1.689

Abdelhadi, M.S. (2008). Breast cancer management delay-time for improvement: a reflection from the eastern province of Saudi Arabia. Journal of Family & Community Medicine, 15(3):117122.Availableat:http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3377124/Accessed 05 Nov 2015.

Abdel-Salam, D. M., Mohamed, R. A., Alyousef, H. Y., Almasoud, W. A., Alanzi, M. B., Mubarak, A. Z., & Osman, D. M. (2020). Perceived Barriers and Awareness of Mammography Screening Among Saudi Women Attending Primary Health Centers. Risk Management and Healthcare Policy, 13, 2553.

Abolfotouh, M.A., Ala'a A.B., Mahfouz, A.A., Al-Assiri, M.H., Al-Juhani, A.F., &Alaskar, A.S. (2015). Using the health belief model to predict breast self-examination among Saudi women. BMC Public Health. 2015;,15(1):,1163.

Abu-Helalah, M.A., Alshraideh, H.A., Al-Serhan, A.A., Kawaleet, M., &Nesheiwat, A.I. (2015). Knowledge, barriers and attitudes towards breast cancer mammography screening in jordan. Asian Pac J Cancer Prev;16(9):3981-90.

Adams, M.L., Becker, H., &Colbert, A., (2001). African American women's perceptions of mammography screening. J. Natl. Black Nurses' Assoc. JNBNA 12 (2), 44–48.

Adunlin, G., Cyrus, J.W., Asare, M., Sabik, L.M. (2019). Barriers and Facilitators to Breast and Cervical Cancer Screening Among Immigrants in the United States. J Immigr Minor Health;21(3):606-658.

Ahmed, N.U., Fort, J.G., Elzey, J.D, & Bailey, S. (2004). Empowering factors in mammography: insights from the stoires of underserved women. J Ambulatory Care Manage; 27:348–55.

Ahmed, N.U., Fort, J.G., Elzey, J.D., &Belay, Y. (2005). Empowering factors for regular mammography screening in under-served populations: pilot survey results in Tennessee. Ethn Dis;15(3):387–394.

Alam, A.A. (2006). Knowledge of breast cancer and its risk and protective factors among women in Riyadh. Ann Saudi Med;26:,272-277.

Al-Amoudi, S., W. SaitW., and &H. Abdul Jabbar, H. (2010). Health care provider's role in facing the future burden of breast cancer in Saudi. The Saudi Medical Journal; 31(12): 1359-1362.

Al-Azri, M., Al-Awisi, H., & Al-Rasbi, S, El-Shafie, K., Al-Hinai, M., Al-Habsi, H., & Al-Moundhri, M. (2014). Psychosocial impact of breast cancer diagnosis among Omani women. Oman Med J;29:437–44.

Al-Azri, M., Al-Rubaie, K., Al-Ghafri, S., Al-Hinai, M., & Murthi Panchatcharam, S. (2020). Barriers and Attitudes toward Breast Cancer Screening among Omani Women. Asian Pac J Cancer Prev;21(5):1339-1347.

Aldabal, B.K., & Koura, M.R. (2016). Risk factors of breast cancer among the primary health-care attendees in Eastern Saudi Arabia. Int J Med Sci Public Health;5,: 276-281.

Al-Eid, H. & Manalo, M. (2011). Cancer Incidence and Survival Report Saudi Arabia 2007 Special Edition. Riyadh, Saudi Arabia: Saudi Cancer Registry, Ministry of Health.

Al-Eid, H.,& Garcia, A. (2012). Cancer Incidence Report, Saudi Arabia, 2009. Riyadh, Saudi Arabia: Saudi Cancer Registry, Ministry of Health.

Ali, S. I., Al-Suroj, H. R., Al Ali, F. B., Al-Saleh, K. H., & Al-Hammar, L. E. (2018). Awareness and attitude among Saudi females toward breast cancer screening in Al-Ahsa, KSA. The Egyptian Journal of Hospital Medicine; 71(2), 2516-2522.

Aljohani, S., Saib, I., &Noorelahi, M. (2016). Women's performance of breast cancer screening (breast self-examination, clinical breast exam and mammography). Advances in Breast Cancer Research;6(1):,16-27.

AlJunidel, R., Alaqel, M., AlQahtani, S.H., AlOgaiel, A.M., ALJammaz, F., Alshammari S. (2020). Using the Health Belief Model to Predict

the Uptake of Mammographic Screening Among Saudi Women. Cureus;12(10):e11121.

Al-Khamis, N.K., (2016). Low Awareness of Breast Cancer and Considerable Barriers to Early Presentation among Saudi Women at a Primary Care Setting. Journal of Cancer Education, 1-7.

Allen, T.L., Van Groningen, B.J., Barksdale, D.J., &McCarthy, R. (2010). The breast self-examination controversy: What providers and patients should know. The Journal for Nurse Practitioners;6(6):,444-51.

Alotaibi, R.M., Rezk, H.R., Juliana, C.I., &Guure, C. (2018). Breast cancer mortality in Saudi Arabia: Modelling observed and unobserved factors. PloS one;113(10).

Alrashidi, A.G., Ahmed, H.G., &Alshammeri, K.J.K, Alrashedi SA, ALmutlaq BA, Alshammari FN, Alshudayyid AA, Alshammari AA, Anazi FM, Alshammari WM, Alshammari HS. (2017).Knowledge and perceptions of common breast cancer risk factors in Northern Saudi Arabia. Asian Pac J Cancer Prev; 18:,2755-61.

Alshahrani, M. S., Sultan, S. A. A., Alhammam, S. Y., Alshaghath, I. H., Alfayez, E. H. A., Alyami, M. A. M., &Alfayez, E. H. A. (2020). Assessment and Practice of Female Health Care Workers Regarding Risk of Breast Cancer and Screening Methods Cross-Sectional Study, Saudi Arabia. Open Journal of Obstetrics and Gynecology; 10(02), 201.

Alshahrani, M., Alhammam, S. Y. M., Al Munyif, H. A. S., Alwadei, A. M. A., Alwadei, A. M. A., Alzamanan, S. S. M., &Aljohani, N. S. M. (2019). Knowledge, attitudes, and practices of breast cancer screening methods among female patients in primary healthcare centers in Najran, Saudi Arabia. Journal of Cancer Education, 34(6), 1167-1172.

Al-Wassia, R. K., Farsi, N. J., Merdad, L. A., & Hagi, S. K. (2017). Patterns, knowledge, and barriers of mammography use among women in Saudi Arabia. Saudi medical journal, 38(9), 913.

Al-Zalabani, A.H., Alharbi, K.D., & Fallatah, N.I, et al. (2018). Breast Cancer Knowledge and Screening Practice and Barriers Among Women in Madinah, Saudi Arabia. Journal of Cancer Education: the Official Journal of the American Association for Cancer Education;33(1):201-207.

Amin, T. T., Al Mulhim, A. R. & Al Meqihwi, A. (2009). Breast cancer knowledge, risk factors and screening among adult Saudi women in a primary health care setting. Asian Pac J Cancer Prev; 10**,** 133-8.

Amoran, O.E., &Toyobo, O.O. (2015). Predictors of breast self-examination as cancer prevention practice among women of reproductive age-group in a rural town in Nigeria. Niger Med J; 56:185– 189.

Anderson, B.O., Braun, S., Lim, S., Smith, R.A., Taplin, S., &Thomas,D.B:. (2003). Early detection of breast cancer in countries with limited resources. Breast J; 9(2):,S51–S59.

Anwar, S.L., Tampubolon, G., Van Hemelrijck, M., Hutajulu, S.H., &Watkins, J., Wulaningsih, W.(2018). PILAR Research Network. Determinants of cancer screening awareness and participation among Indonesian women. BMC Cancer; 6;118(1),:208.

Azaiza, F., &Cohen, M. (2006). Health beliefs and rates of breast cancer screening among Arab women. J Womens Health (Larchmt);15 (5),:520–530.

Azami-Aghdash, S., Ghojazadeh, M., &GarehSheyklo S, Daemi A, Kolahdouzan K, Mohseni M, Moosavi A.. (2015). Breast cancer screening barriers from the womans perspective: a meta-synthesis. Asian Pac J Cancer Prev;16:3463–71.

Babay, Z. (2004). Age at menarche and the reproductive performance of Saudi women. Age;15**,** 14.1.

Bamidele, O., Ali, N., Papadopoulos, C., &Randhawa, G. (2017). Exploring factors contributing to low uptake of the NHS Breast Cancer Screening Programme among black African women in the UK. Divers Equal Health Care;14(4):212-9.

Bawazir, A., Bashateh, N., Jradi, H., &Breik, A.B. (2019). Breast Cancer Screening Awareness and Practices Among Women Attending Primary Health Care Centers in the GhailBawazir District of Yemen. Clin Breast Cancer ;19(1):,e20-e29.

Bener, A., El Ayoubi, H.R., Moore, M.A., Basha, B., & Joseph, S., Chouchane L. (2009) Do we need to maximise the breast cancer screening awareness? Experience with an endogamous society with high fertility. *Asian Pac J Cancer Prev*, *10*(4), 599-604.

Bernard, H. R., & Ryan, G. W. (1998). Qualitative and quantitative methods of text analysis. Handbook of research methods in cultural anthropology; 595-646.

Bray. F., Ferlay, J., Soerjomataram, I., Siegel, R.L., Torre, L.A., & Jemal, A. (2018). Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: A cancer journal for clinicians, 68(6),394-424.

Centers for Disease Control and Prevention (CDC) (2017). State, Tribal, Local.

Central Department of Statistics and Information. Educational characteristics (Provinces). In: Atlas of Population And Housing 2010. Available at http://www.cdsi.gov.sa/pdf/atlas2508.pdf .

Champion, V.L.,(1999). Revised susceptibility, benefits, and barriers scale for mammography screening. Res. Nurs,. Health 22, 341–348.

Creswell, J. W., & Creswell, J. D. (2005). Mixed methods research: Developments, debates, and dilemmas. Research in organizations: Foundations and methods of inquiry, 315-326.

Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Location? Sage Publications.

Dandash, K., &Al-Mohaimeed, A. (2007). Knowledge, attitudes, and practices surrounding breast cancer and screening in female teachers of Buraidah, Saudi Arabia. Int J Health Sci (Qassim); 1: ,61e-71.

Dardas, N.M.Y., & Taha, A.Z. (2013). Knowledge and Awareness About Breast Cancer Among Primary Care Attendees in Al-Khobar City, Eastern Saudi Arabia. Int J Med Health Sci; 2:95-105.

Darvishpour, A., Vajari, S.M., &Noroozi, S. (2018). Can health belief model predict breast cancer screening behaviors? Open Access Maced J Med Sci;6:949–53.

Davie, B. (2007). Pain during mammography: possible risk factors and ways to alleviate pain. Radiography, 13(3), 229-234.

Davis, T.C., Arnold, C., Berkel, H.J., Nandy, I., Jackson, R.H., &Glass, J. (1996). Knowledge and attitude on screening mammography among low-literate, low-income women. Cancer;78:1912-20.

Donnelly, T.T., Al Khater, A.-H., &Al-Bader, S.B, Al Kuwari MG, Malik M, Al-Meer N, Singh R, Fung T. (2014). Factors that influence awareness of breast cancer screening among Aarab women in Qatar: results from a cross sectional survey. Asian Pac J Cancer Prev,15, 10157.

Donnelly, T.T., Al Khater, A.H., Al-Bader, S.B., Al Kuwari, M.G., Al-Meer, N., Malik, M., Singh, R. and Jong, F.C.D. (2013). Arab women's breast cancer screening practices: a literature review. Asian Pacific Journal of Cancer Prevention, 14(8), 4519-4528.

Dreier, M., Borutta, B., Töppich, J., Bitzer, E.M., &Walter, U. (2012). Früherkennung von Brust- und Gebärmutterhalskrebs--einsystematischer Review zu Wissen, Einstellungen und Inanspruchnahmeverhalten der Frauen in Deutschland [Mammography and cervical cancer screening--a systematic review about women's knowledge, attitudes and participation in Germany]. Gesundheitswesen;74(11):,722-35. German.

DU, J., ZHOU, C, & ZENG L (2011). Analysis on the General Survey Result of Gynecological Diseases in Tujia-Miao Autonomous Prefecture from 2006 to 2010 in Xiangxi. Chinese Primary Health Care, 9, 023.

Dündar, P.E., Ozmen, D., Oztürk, B., Haspolat, G., Akyildiz, F., Coban,S,.&Cakiroglu, G. (2006). The knowledge and attitudes of breast self-examination and mammography in a group of women in a rural area in western Turkey. BMC Cancer;6:43.

Earp, J.A., Eng, E., O'Malley, M.S., Altpeter, M., Rauscher, G., Mayne,L., Mathews, H.F., Lynch, K.S., &Qaqish, B:. (2002). Increasing use of mammography among older, rural African American women: results from a community trial. Am J Public Health;92(4):, 646–654.

Editorial, (2009): Breast cancer in developing countries. Lancet; 374(9701),1567.

El Asmar, M., Bechnak, A., Fares, J., Al Oweini, D., Alrazim, A., El Achkar, A., & Tamim, H. (2018). Knowledge, attitudes and practices regarding breast cancer amongst Lebanese females in Beirut. Asian Pacific journal of cancer prevention: APJCP, 19(3), 625.

El Bcheraoui, C., Basulaiman, M., &Wilson,S, Daoud, F., Tuffaha, M., AlMazroa, M.A., Memish, Z.A., Al Saeedi, M. and Mokdad,

A.H.(2015). Breast cancer screening in Saudi Arabia: free but almost no takers. PLoS One;10:1–10.

Eldridge, S., & Kerry, S. (2012). A practical guide to cluster randomized trials in health services research (Vol. 120). John Wiley & Sons.

Elkum, N., Dermime, S., Ajarim, D., Al-Zahrani, A., Alsayed, A., Tulbah, A., Al Malik, O., Alshabanah, M., Ezzat, A. & Al-Tweigeri, T. (2007). Being 40 or younger is an independent risk factor for relapse in operable breast cancer patients: the Saudi Arabia experience. BMC Cancer,7**,** 222.

Elmore, J.G., Armstrong, K., Lehman, C.D., &Fletcher, S.W. (2005). Screening for breast cancer. J Am Med Assoc;293(10):,1245–56.

El-Mouzan, M.I., Al-Salloum, A.A.., Al-Herbish, A.S., Qurashi, M.M., &Al-Omar, A.A. (2007). Regional variations in the prevalence of consanguinity in Saudi Arabia. Saudi Med J; 28(12),:1881–4.

Elobaid, Y.E., Aw, T.C., Grivna, M., &Nagelkerke, N. (2014). Breast Cancer Screening Awareness, Knowledge, and Practice among Arab Women in the United Arab Emirates: A Cross-Sectional Survey. PLoS ONE, 9(9):, e105783.

Elsaba, H. A. H. F., & Abd El-Maksoud, A. S. A. (2020) Relationship of fear and fatalism with breast cancer screening among women using health belief model. International Journal of Advanced Nursing Studies, 9(2):52-60.

Eltwansy, M. S. (2018). Early Detection of Breast Cancer: Knowledge, Perception and Barriers among Females: A Cross Sectional Study at Zagazig District. Egyptian Journal of Community Medicine, 36(4).

Eun-Hyun, L. (2003). Breast examination performance among Korean nurses. Journal For Nurses In Staff Development;19:,81-87.

Fatimi, Z., &Avan, I. (2002). Demographic, Socio-economic and environmental determinants of utilization of antenatal care in rural setting of Sindh Pakistan. J Pak Med Assoc;52:138-42.

Ferdous, M., Lee, S., Goopy, S., Yang, H., Rumana, N., Abedin, T., &Turin, T.C. (2018). Barriers to cervical cancer screening faced by immigrant women in Canada: a systematic scoping review. BMC Womens Health;18(1):165.

Ferlay, J., Autier, P., Boniol, M., Heanue, M., Colombet, M., &Boyle P. (2007). Estimates of the cancer incidence and mortality in Europe in 2006. Ann Oncol;18,: 581-e592.

Flynn, P., Betancour, H., Tucker, J., Garberoglio, C., & Riggs, M. (2007, August). Culture, emotions, and breast self-examinations among culturally diverse women. In Annual Conference for the American Psychological Association.

Gang, M., Kim, J.I., Oh, K.O., Song, Y .(2013). Factors associated with mammography adherence among married Chinese women in Yanbian, China. Asian Pac J Cancer Prev, 14, 7207-13.

Gibbons, R. D., & Mann, J. J. (2011). Strategies for quantifying the relationship between medications and suicidal behaviour. Drug safety, 34(5), 375-395.

Gonzales, A., Alzaatreh, M., Mari, M., A., Saleh, A., &Alloubani, A. (2018):. Beliefs and behavior of Saudi women in the University of Tabuk toward breast self-examination practice. Asian Pac J Cancer Prev;19,121-6.

Granado, M., Guell, C., Hambleton, I., Anselm, J.M., Hennis, A., Angela, M.C,. et al. (2013). Exploring breast cancer screening barriers among Barbadian women: a focus group study of mammography in a resource-constrained setting. Crit PublHealth;24(4):429e44.

Green, L. W., Kreuter, M. W., Deeds, S. G., Partridge, K. B., & Bartlett, E. (1980). Health education planning: a diagnostic approach. Palo Alto, Calif: Mayfield Press.

Greenland, S., Senn, S. J., Rothman, K. J., Carlin, J. B., Poole, C., Goodman, S. N., & Altman, D. G. (2016). Statistical tests, P values, confidence intervals, and power: a guide to misinterpretations. European journal of epidemiology, 31(4), 337-350.

Gullatte, M. M., Brawley, O., Kinney, A., Powe, B., & Mooney, K. (2010). Religiosity, spirituality, and cancer fatalism beliefs on delay in breast cancer diagnosis in African American women. Journal of religion and health, 49(1), 62-72.

Gürdal, S.Ö., Saraçoğlu, G.V., Oran, E.S., Yankol, Y., Soybir, G.R. (2012). The effects of educational level on breast cancer awareness: a cross-sectional study in Turkey. Asian Pac J Cancer Prev;13 (1):295–300.

Habib, F., S. Salman, M.,Safwat,and S.S.,&Shalaby,,(2010). Awareness and knowledge of breast cancer among university students in Al Madina Al Munawara Region. Middle East Journal of Cancer, 1(4): 159-166.

Hagi, S.K., &Khafaji, M.A. (2013). Do Women in Saudi Arabia "Think Pink"? American J Res Comm, 2013;1:, 43-58.

Han, Y., Williams, R.D., &Harrison, R.A. (2000) Breast cancer screening knowledge, attitudes, and practices among Korean American women. Oncol Nurs Forum, 27:1585–1591.

Hasnain, M., Menon, U., &Ferrans, C.E, Szalacha L. (2014). Breast cancer screening practices amongst first generation immigrant Muslim women. J Women's Health;23:602-12.

Hassan, E., Seedhom, A.E., &Mahfouz, E.M. (2017). Awareness about Breast Cancer and Its Screening among Rural Egyptian Women, Minia District: a Population-Based Study. Asian Pac J Cancer Prev;18(6):,1623-1628.

Hassan, N., Ho, W.K., Mariapun, S., &Teo, S.H. (2015). A cross sectional study on the motivators for Asian women to attend opportunistic mammography screening in a private hospital in Malaysia: the MyMammo study. BMC Public Health;12;(15):,548.

Ho, V., Yamal, J.M., Atkinson, E.N., Basen-Engquist, K., Tortolero-Luna, G., & Follen, M., (2005). Predictors of breast and cervical screening in Vietnamese women in Harris County, Houston, Texas. Cancer Nurs,. 28 (2), 119–129.

Howlader, N., Noone, A. M., Krapcho, M., Garshell, J., Neyman, N., Altekruse, S. F., Kosary, C. L., Yu, M., Ruhl, J., Tatalovich, Z., Cho, H., Mariotto, A., Lewis, D. R., Chen, H. S., Feuer, E. J. & Cronin, K. A. (2012). SEER Cancer Statistics Review, 1975-2010 [Online]. Bethesda, MD: National Cancer Institute. Available: http://seer.cancer.gov/csr/1975_2010/ posted to the SEER web site, April 2013.

Huaman, M.A., Kamimura-Nishimura, K.I., Kanamori, M., Siu, A., & Lescano, A.G. (2011). Validation of a susceptibility, benefits, and barrier scale for mammography screening among Peruvian women: a cross-sectional study. BMC Womens Health; 7,;11:54.

Huang, Y., Zhou, K., &Li, H. (2011). Knowledge, attitudes, and behaviour regarding breast cancer screening among women from different socio-economic regions in Southwest China: a cross-sectional study.. Asian Pac J Cancer Prev;12: 203-9.

Husaini, B.A., Emerson, J.S., Hull, P.C., Sherkat, D.E., Levine, R.S., Cain, V.A.,(2005). Rural-urban differences in breast cancer screening among African American women. J. Health Care Poor Underserved, 16 (4), 1–10.

Hussein, D.M., S.H. Alorf, Y.S., Al-Sogaih, S.H.,Alorf, R.S.,Alaskar, A.M., Al-Mahana, F.,Alsalhowb, A.K.,Alibrahim, M.Y., Saka, A.M.,Alhazimi and A. Baghirova, A. (2013). Breast cancer awareness and breast self-examination in Northern Saudi Arabia. A preliminary survey. Saudi Medical Journal, 34(7): 681-688.

Ibrahim, E., Al-Gahmi, A., Zekri, J., Awadalla, S., Elkhodary, T., &Fawzy, E, Bahadur, Y.A., Elsayed, M.E., Zeeneldin, A., Al-Ahmadi, R.H. and Linjawi, A.H. (2009). Pre-operative systemic therapy in locally advanced breast cancer: a single institution experience. Ecancermedicalscience ;3:, 161.

Jahan, S., Al-Saigul, A.M., &Abdelgadir, M.H. (2006). Breast cancer. Knowledge, attitudes and practices of breast self-examination among women in Qassim region of Saudi Arabia. Saudi Med J;27(11):,1737–41.

Jemal, A., Bray, F., Center, M.M., Ferlay, J., Ward, E., &Forman, D. (2011). Global cancer statistics. CA Cancer J Clin, 61(2):,69–90.

Jing, L. (2011). Survey of 1616 cases of gynecological diseases in different nationalities married women. Bull Dis Control Prev, 26, 67-8.

Kashgari, R.H. and&A.M. Ibrahim, A.M. (1996). Breast cancer: Attitude, knowledge and practice of breast self-examination of 157 Saudi women. Journal of familyand community medicine, 3(1): 10-13.

Katapodi, M.C., Lee, K.A., Facione, N.C., &Dodd, M.J. (2004). Predictors of perceived breast cancer risk and the relation between perceived risk and breast cancer screening: a meta-analytic review. Prev Med;38 (4):,388–402.

Khakbazan, Z., Taghipour, A., LatifnejadRoudsari,L.R., &Mohammadi, E. (2014). Help seeking behavior of women with self-discovered breast

cancer symptoms: a meta-ethnographic synthesis of patient delay. PLoS One, 9,:e110262.

Khan, T.M., Leong, J.P., Ming, L.C., Khan,&A.H.(2015). Association of knowledge and cultural perceptions of Malaysian women with delay in diagnosis and treatment of breast cancer: a systematic review. Asian Pac J Cancer Prev,16,:5349-57.

Khazir, Z., MorrowatiSharifabad, M.A., Vaezi, A.A., Enjezab, B., Fallah-zadeh, H., &Yari, F. (2019). Predictors of mammography based on Health Belief Model in Khorramabad women. J Educ Health Promot, 30;8-:180.

Kissal, A., Ersin, F., Koc, M., Vural, B., &Çetin, Ö. (2018). Determination of women's health beliefs, breast cancer fears, and fatalism associated with behaviors regarding the early diagnosis of breast cancer. International Journal of Cancer Management, 11(12).

Kretzler, B., König, H. H., & Hajek, A. (2020). Religious attendance and cancer screening behavior. Frontiers in Oncology, 10, 2133.

Krueger, R. A. (1997). Analyzing and reporting focus group results (Vol. 6). Sage publications.

Krueger, R. A., & Casey, M. A. (2014). Designing and conducting focus group interviews. Social Analysis Selected Tools and Techniques.

Labrie, N.H., Ludolph, R., &Schulz, P.J. (2017). Investigating young women's motivations to engage in early mammography screening in Switzerland: results of a cross-sectional study. BMC Cancer., 21;17(1),:209.

Labrie, N.H.M., Ludolph, R.A., &Schulz, P.J. (2020). Mammography perceptions and practices among women aged 30-49: The role of screening programme availability and cultural affiliation. Patient Educ Couns;103(2):,369-375.

Lagerlund, M., Hedin, A., Sparén, P., Thurfjell, E., &Lambe, M. (2000). Attitudes, beliefs, and knowledge as predictors of nonattendance in a Swedish population-based mammography screening program. Prev Med;31(4):,417-28.

Lamyian M, Hydarnia A, Ahmadi F, Faghihzadeh S, Aguilar-Vafaie ME. (2007). Barriers to and factors facilitating breast cancer screening

among Iranian women: a qualitative study. Eastern Mediteranean Health Journal, 13(5).

Latif, R. (2014). Knowledge and attitude of Saudi female students towards breast cancer: A cross-sectional study. Journal of Taibah University Medical Sciences, 9(4), 328-334.

Lawal, O., Murphy, F.J., Hogg, P., Irurhe, N., &Nightingale, J. (2015). Mammography screening in Nigeria e a critical comparison to other countries. Radiography;21: 348-53.

Lee-Lin, F., Menon, U., Nail, L., Lutz, K.F., (2012). Findings from focus groups indicating what Chinese American immigrant women think about breast cancer and breast cancer screening. J. Obstet. Gynecol. Neonatal Nurs, 41 (5), 627–637.

Lee-Lin, F., Menon, U., Pett, M., Nail, L., Lee, S., &Mooney, K. (2007). Breast cancer beliefs and mammography screening practices among Chinese American immigrants. J ObstetGynecol Neonatal Nurs;36(3):,212-21.

Lenner, P., &Jonsson, H. (1997). Excess mortality from breast cancer in relation to mammography screening in northern Sweden. J Med Screen;4(1):,6–9 .

Lera, T., Beyene, A., Bekele, B., Abreha, S. (2020). Breast self-examination and associated factors among women in WolaitaSodo, Ethiopia: a community-based cross-sectional study. BMC Womens Health; 8;20(1),:167.

Lim SK1, Teo XL, Ng JL, Li FX, Tan SM. A Survey on Singaporean Women's Knowledge, Perception and Practices of Mammogram Screening. *Ann Acad Med Singapore [Internet]*, *44*(9), 317-25.

Mahfouz, A.A., Hassanein, M.H., Nahar, S., Farheen, A., Gaballah, I.I., Mohamed, A., Rabie, F.M. and Aftab, R. (2013). Breast cancer knowledge and related behaviors among women in Abha city, southwestern Saudi Arabia. Journal of Cancer Education, 28(3), 516-520.

Malhotra, C., Bilger, M., Liu, J., &Finkelstein, E. (2016). Barriers to breast and cervical cancer screening in Singapore: a mixed methods analysis. Asian Pac J Cancer Prev;17(8):3887-95.

Mamdouh, H.M., El-Mansy, H., Kharboush, I.F., Ismail, H.M., Tawfik, M.M., &El-Baky, M.A., & El Sharkawy, O. G.(2014). Barriers to breast cancer screening among a sample of Egyptian females. J Family Community Med;21: 119-124.

Manzour, A. F., &Eldin, D. A. G. (2019). Awareness about breast cancer and mammogram among women attending outpatient clinics, Ain Shams University Hospitals, Egypt. Journal of the Egyptian Public Health Association, 94(1), 1-9.

Marzouq,MuhannaM.A., &Floyd, M.J. (2019). A qualitative study to determine Kuwaiti Women's knowledge of breast cancer and barriers deterring attendance at mammography screening. Radiography (Lond);25(1),:65-71.

Mathers, S.A., McKenzie, G.A., Robetson, E.M. (2013).'It was daunting': experience of women with a diagnosis of breast cancer attending for breast imaging. Radiography;19:156-63.

Mauad, E.C., Nicolau, S.M., Moreira, L.F., Haikel, R.L.,Jr, Longatto-Filho, A., &Baracat,E.C .(2009). Adherence to cervical and breast cancer programs is crucial to improving screening performance. Rural Remote Health, 9(3):,1241.

Medina-Shepherd, R., &Kleier, J.A. (2012). Using the health belief model for predicting mammography screening behavior among Spanish-speaking Hispanic women of southeastern Florida. Hisp. Health Care Int,. 10 (2), 61–69.

Momenimovahed, Z., Tiznobaik, A., Taheri, S., Hassanipour, S., &Salehiniya, H. (2020). A review of barriers and facilitators to mammography in Asian women. ecancermedicalscience, 14.

Murphy, F., Nightingale, J., Hogg, P., Robinson, L., Seddon, D., &Mackay, S. (2015). Compression force behaviors: an exploration of the belief and values influencing the application of breast compression during mammography. Radiography;21:30-5.

Nageeb, S., Vu, M., Malik, S., Quinn, M. T., Cursio, J., & Padela, A. I. (2018). Adapting a religious health fatalism measure for use in Muslim populations. Plos one, 13(11), e0206898.

Nagler, R.H., Lueck, J.A., &Gray, L.S. (2017). Awareness of and reactions to mammography controversy among immigrant women. Health Expect;20(4),:638-647.

National Cancer Institute (NCI):, (2010). National Cancer Institute fact sheet: Mammograms. NCI, 2010. Available from http://www.cancer.gov.

Nazzal, Z., Sholi, H., Sholi, S., Sholi, M., &Lahaseh, R. (2016). Mammography Screening Uptake among Female Health Care Workers in Primary Health Care Centers in Palestine - Motivators and Barriers. Asian Pac J Cancer Prev;17(5):,2549-54.

Network NCC (2016): Breast Cancer Screening and Diagnosis. Available from: https://www.nccn.org/professionals/physician_gls/f_guidelines.asp.

Nur, N. (2010). Breast cancer knowledge and screening behaviors of the female teachers. Women Health, 50, 37-52.

Oeffinger, K.C., Fontham, E.T., &Etzioni, R, Herzig, A., Michaelson, J.S., Shih, Y.C.T., Walter, L.C., Church, T.R., Flowers, C.R., LaMonte, S.J. & Wolf, A.M. (2015). Breast cancer screening for women at average risk: 2015 guideline update from the American Cancer Society. JAMA;314(15):,1599–1614.

Pape, R., Spuur, K.M., &Umo, P. (2016). Factors contributing to low participation in mammography services in Papua New Guinea. Radiography;22:151-8.

Parkin, D., Bray, F., Ferlay, J., &Pisani, P. (2005). Global cancer statistics, 2002. Ca J Clin;55:,74–108.

Paskett, E.D.1, Tatum, C., Rushing, J., Michielutte, R., Bell, R., &Foley, K.L., Bittoni, M. & Dickinson, S.(2004). Racial differences in knowledge, attitudes, and cancer screening practices among a triracial rural population. Cancer;101:2650-9.

Pearlman, D.N., Clark, M.A., &Rakowski, W. (2008). Screening for Breast and Cervical Cancers: The Importance of Knowledge and Perceived Cancer Survivability Screening for Breast and Cervical Cancers. Women & Health, 28: 37–41.

Praznowska, B., Puto, G., & Huras, H. (2010). Factors influencing the frequency of performing mammographic examinations - preliminary research. Med Ogolna,16.

Qamar, A.H. (2013). The concept of 'evil' and the 'evil eye' in Islam and Islamic faith healing traditions. J Islam Thought CivilisationCivilization;3(2):44-53.

Radi, S.M. (2013). Breast Cancer awareness among Saudi females in Jeddah. Asian Pac J Cancer Prev; 14: 4307-4312.

Rasheed, P., &Al-Sowielem, L.S. (2013). Knowledge and Perception of Breast Cancer and Practice of Breast Self-Examination among Female Patients Attending Primary Health Care Centers in Al Khobar City, Saudi Arabia. Kuwait Medical Journal; 45 (2): 123 – 129.

Ravichandran, K., Al-Hamdan, N.A., &Mohamed, G. (2011) Knowledge, attitude, and behavior among Saudis toward cancer preventive practice. J Family Community Med,18,:135–142.

Raymond, N.C., Osman, W., O'Brien, J.M., Ali, N., Kia, F., Mohamed, F., Mohamed, A., Goldade, K.B., Pratt, R., &Okuyemi, K., (2014). Culturally informed views on cancer screening: a qualitative research study of the differences between older and younger Somali immigrant women. BMC Public Health, 14 (1), 1188.

Rehmani, R., Elzubair, A.G., Al Maani, M., Chaudary, I.Y., Al Qarni, A., &Khasshogi, T, & Al Shuaibi A.(2013). Population-based health survey in Eastern region of Saudi Arabia. Eastern Mediterr Health J, 2013; 19: 417-425.

Richards, M. A., Westcombe, A. M., Love, S. B., Littlejohns, P. & Ramirez, A. J. (1999b). Influence of delay on survival in patients with breast cancer: a systematic review. Lancet,353**,** 1119-26.

Saeedi, M.Y., F. Al-Amri, F., A.K. Ibrahim, A.K.,and &K. Kassim, K. (2014).Knowledge, attitude and practice of breast cancer screening among female general practitioners in Riyadh, Saudi Arabia. Cancer research Journal, 2(6): 108-113.

Saggu, S., Rehman, H., Abbas, Z.K., Ansari, A.A. (2015):. Recent incidence and descriptive epidemiological survey of breast cancer in Saudi Arabia. Saudi Med J, 36:1176-80.

Sait, W. A., Al-Amoudi, S. M., Tawtai, D. A. &Abduljabbar, H. S. (2010). The knowledge of breast cancer among young Saudi females. Saudi Med J, 31**,** 1242-4.

Savage, S.A., &Clarke,V:.(1996). Factors associated with screening mammography and breast self-examination intentions. Health Education Research: Theory and Practice, 11:,409-421.

Schnoor, M., Hallof, A., Hergert-Lüder, D., Katalinic, A., &Waldmann, A. (2013). Gründefür die Nicht-Teilnahme am Mammographie-Screening--eineQuerschnittsuntersuchungaus Schleswig-Holstein [Reasons for non-participation in mammography screening--a survey in Schleswig-Holstein, Germany]. Dtsch Med Wochenschr;138(45):,2289-94. German.

Schoueri-Mychasiw, N., Campbell, S., &Mai, V. (2013). Increasing screening mammography among immigrant and minority women in Canada: a review of past interventions. J Immigr Minor Health; 5:149-58.

Sherma, C.D.,and&Hossfeld, D.K. (1977). Breast cancer in manual of Oncology.Boschfx International Union Against Cancer. Middle East 5 th edition, Springer Verlog Berlin Heidlberg USA 257-276.

Shirzadi, S., Allahverdipour, H., Sharma, M., &Hasankhani, H. (2020). Perceived Barriers to Mammography Adoption among Women in Iran: A Qualitative Study. Korean J Fam Med;41(1),:20-27.

Sim, H.L., Seah, M., & Tan, S. (2009). Breast cancer knowledge and screening practices: A survey of 1,000 Asian women. Singapore Med J;50:137-44.

Spaczynski, M., Nowak-Markwitz, E., &Januszek-Michalecka L, & Karowicz-Bilińska, A. (2009). Women's social conditions and their participation in Cervical Cancer Population Screening Program in Poland. Ginekol Pol, 80, 833-8.

Sterlingova, T., &Lunden, M. (2018). Why do women refrain from mammography screening? Radiography ;24,:e19-24.

Sung, J.F., Blumenthal, D.S., Coates, R.J., &Alema-Mensah, E. (1997). Knowledge, beliefs, attitudes, and screening among inner-city African American Women. J Natl Med Assoc; 89 (6):, 405-11.

Taha, H., Nyström, L., Al-Qutob, R., &Berggren, V. (2014). Home visits to improve breast health knowledge and screening practices in a less privileged area in Jordan. BMC Public Health,14:,428.

Taymoori, P., &Habibi, S. (2014). Application of a health belief model for explaining mammography behavior by using structural equation model in women in Sanandaj. Sci J Kurdistan Univ Med Sci;19:103–15.

Territorial Public Health Professionals Gateway. Assessment & Planning Models, Frameworks & Tools. https://www.cdc.gov/stltpublichealth/cha/assessment.html.

Thomas, V., Saleem, T., &Abraham, R. (2005). Barriers to effective uptake of cancer screening among black and minority ethnic groups. Int J PalliatNurs;11(11):562-4.

Thompson, H.S., Littles, M., Jacob, S., &Coker, C. (2006). Post treatment breast cancer surveillance and follow-up care experiences of breast cancer survivors of African descent: An exploratory qualitative study. Cancer Nurs, 2006;29:478‑87.

U.S. Preventive Services Task Force, 2016. Breast cancer: screening. [online]. Available at: https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/breast-cancer-screening.

Wells, A.A., Shon, E.J., McGowan, K., &James, A., 2017. Perspectives of low-income African-American women non-adherent to mammography screening: the importance of information, behavioral skills, and motivation. J. Cancer Educ,. 32 (2), 328–334.

World Health Organization (WHO), (2010):, C Cancer. WHO, 2010.Available from http://www.who.int/.

Wu, S., Crespi, C. M., & Wong, W. K. (2012). Comparison of methods for estimating theintraclass correlation coefficient for binary responses in cancer prevention cluster randomized trials. Contemporary Clinical Trials, 33(5), 869-880.

Wu, T.Y., Hsieh, H.F., &West, B.T., (2008). Demographics and perceptions of barriers toward breast cancer screening among Asian-American women. Women Health, 48 (3), 261–281.

Wu, T.Y., Hsieh, H.F., &West, B.T.,(2009). Stages of mammography adoption in Asian American women. Health Educ. Res,. 24 (5), 748–759.

Yaghmour, K.A., Alamri, S.J., Alfaqeh, R.H., Alnashri, L.M., Alamri, B. J., & Makin, M. A. (2020). Awareness and Knowledge of Breast

Cancer Screening Methods among Women in Al-Qunfudah, Saudi Arabia. Journal of Advances in Medicine and Medical Research, 32(17), 81-95.

Yakout, M.S., M.A. El-Shatby, S.,Moawad,and &O. Salem, O. (2014). Awareness, knowledge and practice of breast self-examination among groups of female nursing students. Riyadh, Kingdom of Saudi Arabia. International Research Journal of Biological Sciences, 3(2): 58-63.

Young, J. L., Roffers, S. D., Ries, L. a. G., Fritz, A. G., &Hurlbut, A. A. & (Eds.) (2001). SEER Summary Staging Manual - 2000: Codes and Coding Instructions. Bethesda, MD: National Cancer Institute.

Yousuf, S.A.,(2010). Breast cancer awareness among Saudi nursing students. JKAU Med Sci, 17(3): 67-78.

Yu, M.Y., Wu, T.Y., Mood, D.W. (2005). Cultural affiliation and mammography screening of Chinese women in an urban county of Michigan. J TranscultNurs;16(2):107-16.

Yusof, A., Chia, Y.C., &Hasni, Y.M. (2014) Awareness and prevalence of mammography screening and its predictors—a cross sectional study in a primary care clinic in Malaysia. Asian Pac J Cancer Prev, 15:8095–8099.

Appendices:

Appendix A. Questionnaire

Demographic Questions:

1. Age …….

2. What is the highest level of education you have completed to date?

- ☐ No formal education
- ☐ Less than High School
- ☐ High School Diploma or Equivalent
- ☐ Some College
- ☐ Bachelor's Degree
- ☐ Graduate/Professional Degree

3. What best defines your current work status?

- ☐ Employed Full-time
- ☐ Employed Part-time
- ☐ Own business
- ☐ Not Employed but looking for work
- ☐ Housewife
- ☐ At home
- ☐ Student
- ☐ Retired

4. Your Monthly Income in Saudi Riyals:

- ☐ Less than $2000
- ☐ $2000-6000
- ☐ $6500-10000
- ☐ $10500-14000
- ☐ $14500-19000
- ☐ More than $20000

5. Your Average Family Monthly Income in Saudi Riyals:

- ☐ Less than $8,000
- ☐ $9000 to 15,000
- ☐ $16,000 to 25,000
- ☐ $26,000 to 40,000
- ☐ More than $40,000
- ☐ Don't know

6. In general, how would you describe your family's economic status?

☐ Poor ☐ Fair ☐ Good ☐ Excellent

7. Current Relationship Status?

☐ Single ☐ Married ☐ Divorced ☐ Separated ☐ Widowed

8. If you are married, how old were you when you got married? ……..

9. How many children do you have? …….

Health Status Questions & Family History of Breast Cancer:

1. Please indicate below which chronic condition(s) you have. Indicate as many as needed:

- ☐ None
- ☐ Diabetes
- ☐ Asthma
- ☐ Osteoporosis
- ☐ Heart disease
- ☐ High Cholesterol
- ☐ Obesity
- ☐ High Blood Pressure
- ☐ Rheumatic disease
- ☐ Arthritis
- ☐ Thyroid diseases
- ☐ Other (Please specify) …….

2. In general, how would you rate your health?

☐ Excellent ☐ Good
☐ Very good ☐ Fair ☐ Poor

3. What is your weight …… Height ……

4. How do you consider your weight?

☐ Underweight Normal Overweight Very overweight

5. Do you take birth control pills?

☐ Yes ☐ No

6. If you are older than 50, do you take any kind medication (hormones)?

☐ Yes ☐ No ☐ I don't know

7. Smoking Status:

☐ Never ☐ Not every day, but sometimes
☐ I used to smoke, but have since quit ☐ Every day, at least once

8. What are your smoking choices? Choose as many as are applicable.

☐ Hookah ☐ Electronic Cigarettes
☐ Cigarettes ☐ Other kinds of Tobacco

9. Did your mother, sister, any of your female relatives or daughters have breast cancer?

☐ Yes ☐ No ☐ I don't know

10. If yes, please specify who? **……**

The following statements assess knowledge about breast cancer:

Please select one statement for each question.		Yes	No	don't know
1.	The most frequently occurring cancer in women is breast cancer.			
2.	Breast cancer is more common in 65-year-old women than 40-year-old women.			
3.	Heredity may play a role in the development of breast cancer.			
4.	Contraceptive hormones may increase the risk of developing breast cancer.			

5. Being overweight or obese increases the risk of developing breast cancer.			
6. Breastfeeding may decrease the risk of breast cancer development.			
7. Bearing one's first child after the age of 30 increases the risk of breast cancer.			
8. Women over the age of 70 rarely get breast cancer.			
9. Late menopause may increase the risk of breast cancer.			
10. Breast cancer is caused by bacterial infections.			
11. Mammography is recommended yearly above the age of 40 years for early detection.			
12. The irritation of a tight bra can over time cause breast cancer.			
13. Breast cancer usually presents as a painful lump.			

14. In your opinion, what are the causes of breast cancer? Mark as many as you find applicable.

- ☐ Genetics/ genes
- ☐ Environmental factors
- ☐ Nutrition
- ☐ Eye and envy
- ☐ Magic and sorcery
- ☐ It is God's punishment
- ☐ It is fate or destiny
- ☐ It is bad luck
- ☐ Cancer is contagious

15. If you suspected that you had breast cancer, where would you go?

- ☐ Gynecologist
- ☐ Primary care physician
- ☐ Sheikhs
- ☐ Alternative medicine

The following questions assess knowledge about the practice of mammogram screening:

1. Have you heard about mammogram screening?

- ☐ Yes
- ☐ No

2. If yes, from where or whom did you hear about mammogram screening? Mark as many as you find applicable.

- ☐ Your doctor
- ☐ A doctor, but not your doctor
- ☐ A nurse
- ☐ A health professional but not a medical doctor or nurse
- ☐ Your husband
- ☐ A female relative
- ☐ A male relative
- ☐ A close friend
- ☐ Social media, tv, and radio
- ☐ Internet
- ☐ Other, please specify …….

3. Did anyone explain to you how mammogram is done?

- ☐ Yes
- ☐ No

4. When do you think, a woman should start having mammograms?

- ☐ 20-30 years old
- ☐ 31-40 years old
- ☐ 41-50 years old
- ☐ Over 50 years old
- ☐ I don't know

5. Do you intend to get mammograms?

- ☐ Yes

If yes, when? …….

- ☐ No

If no, why not?.....

6. **Are mammograms free?**

☐ Yes ☐ No ☐ I don't know

7. **Are mammograms really necessary?**

☐ Yes ☐ No ☐ I don't know

8. **Does mammography help with the early detection of any type of breast cancer?**

☐ Yes ☐ No ☐ I don't know

9. **Does mammography reduce the chance of dying from breast cancer?**

☐ Yes ☐ No ☐ I don't know

10. **Does a mammogram take a very long time?**

☐ Yes ☐ No ☐ I don't know

11. **Can radiation from mammograms cause cancer?**

☐ Yes ☐ No ☐ I don't know

12. **Is Mammogram screening important?**

☐ Yes ☐ No ☐ I don't know

13. **Is mammogram screening painful?**

☐ Yes ☐ No ☐ I don't know

14. **Is it embarrassing to go for a mammogram?**

☐ Yes ☐ No ☐ I don't know

15. **Does having a mammogram change the appearance of the breast?**

☐ Yes ☐ No ☐ I don't know

If you are 35 or older:

1. **Do you know where you can get mammogram screening?**

☐ Yes ☐ No

2. **If yes,** can you name a place where mammogram screenings are done**? …….**

3. **If the first mammogram is normal, is there a need for subsequent mammograms?**

☐ Yes ☐ No ☐ I don't know

4. **Usually I forget when I have to do a mammogram.**

☐ Strongly disagree ☐ Unsure ☐ Strongly agree
☐ Disagree ☐ Agree

5. I am busy with things more important to me than a mammogram.

☐ Strongly disagree ☐ Unsure ☐ Strongly agree
☐ Disagree ☐ Agree

6. How many mammograms have you had?

☐ Never ☐ One ☐ Two ☐ Three ☐ Four or More

7. When was your last mammogram? ……

8. Who advised you to get a mammogram?

☐ Doctor ☐ Family member ☐ Health educator
☐ Self-referred ☐ Friend ☐ Other, please specify ……

9. What is the reason for you having a mammogram?

☐ Being over 40 years old ☐ Having risk factors for breast cancer ☐ Having breast changes/symptoms

10. How frequently should a woman have a mammogram?

☐ Never ☐ Every year to two years ☐ If she feels a lump in her breast
☐ Every six months ☐ Every five years ☐ I don't know

Religious Health Fatalism Questions:

Please select one statement for each question.	**Strongly Disagree**	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**
1. "I don't worry about my health because it's in Allah's hands."					
2. "If I am sick, I have to wait until it is Allah's time for me to be healed."					
3. "When I have a health problem, I pray for Allah's will to be done."					
4. "As long as I stay focused in prayer, I will be healed of any sickness."					
5. "I trust Allah, not doctors to heal me."					
6. "If a person has enough faith, healing will occur without doctor's having to do anything."					
7. "Sometimes Allah allows people to be sick for a reason."					
8. "If I become ill, Allah intended that to happen."					
9. "Whatever illness I have, Allah has already planned it."					

The following are statements that assess beliefs about breast cancer.

Please select one statement for each question.	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
1. I think it is god's will if I have breast cancer.					
2. People usually blame those with breast cancer for their condition.					
3. Having breast cancer would gain me favor with Allah.					
4. Suffering from breast cancer goes beyond just the affected woman and impacts the whole family.					
5. There are social consequences of having breast cancer.					
6. Knowing about breast cancer is my duty to family.					
7. Knowing about mammography is my duty to My-self.					

These are statements about barriers to participate mammogram screening program for women:

Please select one statement for each question.	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
1. I am skeptical of mammogram screening results.					
2. I am afraid of finding out I have breast cancer.					
3. I am concerned the results of a mammogram will affect my marriage.					
4. I am afraid of finding out I have a breast cancer, since my whole life will change					
5. I am concerned the results will jeopardize my daughter's chances of getting married.					
6. I am afraid of finding out if I have breast cancer because I may lose my breasts.					
7. I am afraid the screening results may affect my family.					
8. I am concerned the results will jeopardize my chances of getting married.					
9. I do not have anything wrong with my breasts.					
10. I do not think it's important.					
11. I do not know where to go.					
12. I do not want anyone to see/touch my private areas.					

13. I do not want the exposure to radiation.					
	Strongly Disagree	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**
14. The exam is painful.					
15. I do not have adequate transportation.					
16. I feel God will protect me.					
17. I do not have approval from my husband or Family					
18. I have not heard of breast screening before this survey.					
19. I am worried there may be male staff at the clinic.					
20. Mammogram facilities are not easily available.					
21. I Fear of hospitals and health facilities					
22. I Fear of physicians and examiners					
23. Awareness program are deficient					

The following are statements about encouraging participation in mammogram screening programs.

Please select one statement for each question.	**Strongly Disagree**	**Disagree**	**Unsure**	**Agree**	**Strongly Agree**
1. Women would be encouraged to participate if mammogram screening were required to obtain services, such as driver's licenses.					
2. Women would be encouraged to participate if screening could be done during a gynecologist visit.					
3. Women would be encouraged to participate if there were incentives for those who participated in the screening (e.g., loans, coupons).					
4. Women would be encouraged to participate if they had support from their partner or family.					
5. Women would be encouraged to participate if they heard stories or information from the media.					
6. Women would be encouraged to participate if they receive regular messages from health care professionals.					

7. Do you get any reminders for mammogram screening dates?

☐ Yes ☐ No

8. If yes, how would like to be reminded for mammogram screening dates?

☐ Smart messaging service (SMS) ☐ Phone calls ☐ Email

9. How do you feel before a mammogram appointment? Mark all that apply.

☐ I cannot sleep
☐ I do not want to go
☐ I am worried about the result
☐ I am scared of pain
☐ I am embarrassed
☐ I am indifferent

The next set of questions are about sources of health information.

1. Do you trust health information from the following sources?

Please select one statement for each question.	**Never**	**Rarely**	**Some-times**	**Often**	**Always**
Patients and their families					
Social media and celebrities who are not experts					
Doctors and healthcare providers					
Sheikhs					
Government officials such as the Ministry of Health					
Friends and Family					

Appendix B. Focus Group Guideline

1. **In your opinion, what are the causes of breast cancer?**
   (below, follow up topics to bring up for discussion, if not mentioned, by participants)

- Genetics/ genes Environmental factors Nutrition Eye and envy
- Magic and sorcery It is God's punishment It is fate or destiny It is bad luck
- Cancer is contagious

2. **If you suspect that you have breast cancer, where would you go?**
   (Below, follow up topics to bring up for discussion, if not mentioned, by participants)

- Doctor Sheikhs Alternative medicine

3. **Now, I will read you some quotes that I have heard other women say,** please indicate whether you agree or disagree with each and tell me why this is your opinion.
   - **"**When I have a health problem, I pray for Allah's will to be done." (**Agree, disagree and Why or Why not)**
   - "I trust Allah, not doctors to heal me." (**Agree, disagree and Why or Why not**)
   - "If a person has enough faith, healing will occur without doctor's having to do anything." (**Agree, disagree and Why or Why not)**
   - "Sometimes Allah allows people to be sick for a reason." (**Agree, disagree and Why or Why not)**
   - "Whatever illness I have, Allah has already planned it." (**Agree, disagree and Why or Why not)**
   -
4. **Have you heard about early screening for breast cancer "Mammogram"?**
5. **What do you know about "Mammogram"?**
6. **What does breast cancer screening mean to you?**
7. **what makes it difficult for women to do mammography? (And for you)**
   (Below, follow up topics to bring up for discussion, if not mentioned, by participants)

   - Approval from family members (e.g., husband, partner, sibling)
   - Arrange transport to clinic
   - get appointment
8. **what are the principal obstacles facing women in obtaining mammography services?**
9. **what motivates women to do mammography? (And you)**
10. **what are suggestions that would make it easier for women to do regular mammography? For you**
11. **in your community, are there any services available to women to raise awareness of mammogram?**

Appendix C. IRB approval letter

FIU | FLORIDA INTERNATIONAL UNIVERSITY

Office of Research Integrity
Research Compliance, MARC 414

MEMORANDUM

To:	Dr. Elena Bastida
CC:	Afrah Saif
From:	Elizabeth Juhasz, Ph.D., IRB Coordinator
Date:	February 6, 2020
Protocol Title:	"Examining the Role of Knowledge and Cultural Values on Utilization of Mammograms among a Sample of Women Living in Saudi Arabia"

The Social and Behavioral Institutional Review Board of Florida International University has approved your study for the use of human subjects via the **Expedited Review** process. Your study was found to be in compliance with this institution's Federal Wide Assurance (00000060).

IRB Protocol Approval #:	IRB-20-0052	**IRB Approval Date:**	02/03/20
TOPAZ Reference #:	108632	**IRB Expiration Date:**	02/03/23

As a requirement of IRB Approval you are required to:

1) Submit an IRB Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved by the IRB prior to implementation.
2) Promptly submit an IRB Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
3) Utilize copies of the date stamped consent document(s) for obtaining consent from subjects (unless waived by the IRB). Signed consent documents must be retained for at least three years after the completion of the study.
4) **Receive annual review and re-approval of your study prior to your IRB expiration date**. Submit the IRB Renewal Form at least 30 days in advance of the study's expiration date.
5) Submit an IRB Project Completion Report Form when the study is finished or discontinued.

HIPAA Privacy Rule: **N/A**

Special Conditions: **N/A**

For further information, you may visit the IRB website at http://research.fiu.edu/irb.

VITA

AFRAH SAIF

EDUCATION, ACADEMIC STUDIES & WORK EXPERIENCE:

2021: PhD in Public Health Student, Florida International University

2011- 2013: MPH, in infectious disease epidemiology and control New South Wales University, Sydney.

2007: Diploma in Networks Operations at New Horizons training and education, Saudi Arabia

2002: Bachelor of Science at King Faisal University, Saudi Arabia

2003-2004: Teacher of Biology and Health promotion at ministry of education.

2005: Basic Life Support Certificate, Saudi Arabia

2013: Specialist *in* the Preventive Medicine at Hospital of Saudi Aramco, Saudi Arabia

2013: License of P. H. Infectious Disease Epidemiology and control from the Kingdom of Saudi Arabia Commission for Health Specialties.

2020: National Association of State Boards of Accountancy (NASBA) Leadership strategies course

2018: The WHO Course on Communicable Disease Control Humanitarian Emergencies and Disasters

2013: Australian HIV/AIDS Conference, Sydney