MAMMOGRAPHY HEALTH BELIEFS AND AWARENESS LEVELS AMONG FEMALES WORKING AT A HIGHER EDUCATION INSTITUTION IN SOUTH AFRICA

by

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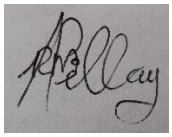
DECLARATION

I, Rosemary Melissa Pillay, declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.



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Signed **Date**

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DEDICATION

This document is dedicated to all females. We have often heard “prevention is better than cure”. When it comes to cancer, screenings are available as there is no way to prevent it. As frightening as you may feel when you think of breast cancer, screening is available. Let us stand together, share the knowledge we have gained from attending screenings and encourage those that are nearest and dearest to be screened.

ABSTRACT

Introduction: Mammography imaging is important for the early detection of breast cancer. With global breast cancer statistics rising annually, the utilisation of mammography services is important. However, many females are not undergoing mammography at regular intervals to ensure early detection of breast cancer. An individual's health belief towards breast cancer and in turn mammography influences utilisation thereof. The question of whether females are aware of mammography and their level of awareness is important to improve the utilisation of mammography.

Aim: This study aimed to determine the Mammography Health Beliefs and awareness levels of females working at a higher education institution (HEI) in South Africa (SA), in terms of mammography utilisation, in order to develop recommendations to promote mammography awareness.

Methods: A quantitative, descriptive correlational study was conducted. The research study included all females of 35 years and older, employed as a permanent staff member or employed on a full-time contract at the research site. The research tool was an online questionnaire that was adapted from the Champions Health Belief Model Scale. A response rate of 38% was achieved. Data analysis was conducted utilising the Statistical Package for Social Sciences (SPSS) version 26.0. Descriptive and Inferential statistics were obtained during data analysis.

Results: The study revealed that females will undergo mammography as they perceive that breast cancer is severe, however, they feel that they are not at risk for breast cancer. Further, the benefits of having a mammogram encourage them to have the procedure despite the barrier of cost and the perceived pain of a mammogram. A female is more likely to have a mammogram if their general practitioner (GP) or gynaecologist recommends the imaging modality. Despite the majority of females conducting breast self-examinations (BSE), they do not view it as a replacement for mammography.

This study further revealed that an increased education level results in an increase in the utilisation of mammography; however, the frequency (mammogram intervals) in which participants undergo mammography is lengthy.

Conclusion: This study ascertained the Mammography Health Beliefs of females working at an HEI and the relationship between their educational level and mammography utilisation. Additionally, based on the study findings there is evidence to suggest the need for the implementation of awareness programmes to further promote mammography services.

Keywords: Mammography, Health Beliefs, Awareness Levels, Champions Health Belief Model Scale, Education Levels, Breast Cancer

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ABBREVIATIONS AND ACRONYMS

BMI	**Body Mass Index**
BSE	**Breast Self-Examination**
CBE	**Clinical Breast Examination**
CHBMS	**Champion Health Belief Model Scale**
COVID-19	**Global Pandemic that placed the country (South Africa) in a National State of Disaster from March 2020.**
FoHS	**Faculty of Health Sciences**
GP	**General Practitioner**
Gynae	**Gynaecologist**
HBM	**Health Belief Model**
HEI	**Higher Education Institution**
IP	**Internet Protocol**
KMO	**Kaiser-Meyer-Olkin**
KZN	**KwaZulu-Natal**
MIS	**Management Information System**
POPIA	**Protection of Personal Information Act**

RSSA	**The Radiology Society of South Africa**
SA	**South Africa**
SES	**Socio-economic status**
SPSS	**Statistical Package for Social Sciences**
USA	**United States of America**
WCRF	**World Cancer Research Fund**
WHO	**World Health Organisation**

CLARIFICATION OF TERMS AND CONCEPTS

Axiology	The ethical considerations that are required prior to starting the research process (Kivunja & Kuyini, 2017: 28).
Breast Awareness	Knowing your breasts and being able to identify when there is an abnormality (NICE, 2019).
Breast Lump	"Localized swelling, protuberance, bulge, or bump in the breast that feels different from the breast tissue around it or the breast tissue in the same area of the other breast" (Brazier, 2018).
Breast Mass	Synonym for Breast Lump. See Breast Lump.
Breast Self-Examination (BSE)	A visual and physical examination of one's own breasts.
Diagnostic Mammography	Mammography performed to confirm the presence of breast pathology after a patient has experienced sign(s) and/ or symptom(s) (Holman, 2018).
Education Level	In this study education level refers to the highest level of study.
Epistemology	The nature of human knowledge and understanding that it can possibly be acquired through different types of inquiry and alternative methods of investigation (Antwi & Hamza, 2015:218)
Health Belief Model (HBM)	A theoretical framework that attempts to explain an individual's behaviour towards a medical screening procedure based on their perception of the threat of the disease (DePoy & Gitlin, 2016: 93; Jeong & Ham, 2017: 210)
Mammography	Mammography is defined as a medical procedure employing x-ray technology to detect lesions in the

	breast that may be indicative of breast cancer (Encyclopaedia Britannica Academic, 2019).
Methodology	The guidelines developed as a result of the ontologic and epistemologic principles to conduct the research (Antwi & Hamza, 2015: 220).
Methods	The research tool that was utilised to obtain the research data (Rehman & Alharthi, 2016).
Ontology	A branch of philosophy concerned with articulating the nature and structure of the world (Antwi & Hamza, 2015:218).
Research methodology	The procedures by which researchers go about their work of describing, explaining and predicting phenomena (Goundar, 2012: 9)
Screening Mammography	Mammography of the asymptomatic breast (Holman, 2018).
Variable	A condition or characteristic that takes on different values or categories (Johnson & Christensen, 2014:89).

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Mammography is a medical imaging modality that employs the use of low dose x-rays to image the tissue of the breast (Encyclopaedia Britannica Academic, 2019). This imaging modality has the ability to detect pathologies, specifically breast cancers, at least two (2) years prior to the presentation of a symptom (Lampignano & Kendrick, 2018: 746). There are two types of mammography services namely: screening and diagnostic. Screening mammography is defined as mammography of the asymptomatic breast whereas diagnostic mammography is mammography performed to confirm the presence of breast pathology after a patient has experienced sign(s) and/ or symptom(s) (Holman, 2018). Thus, the utilisation of screening mammography can improve breast cancer mortality rates through early detection (Alizadeh-Sabeg et al. 2020). Despite this fact, screening mammography practices are low globally and this low level of utilisation may be due to various factors.

The Health Belief Model is a behavioural theory that attempts to understand a person's utilisation of medical screening procedures based on their perceptions of the threat of the disease and expectations of the behaviour (Jeong & Ham, 2017). In the late 1980's Dr Victoria Champion developed the Champion Health Belief Model Scale (CHBMS) in relation to a female's utilisation of Mammography. This CHBMS was adapted for this study and attempted to determine the Mammography Health Beliefs and awareness levels of females working at a higher education institution (HEI) within the province of KwaZulu-Natal (KZN) in South Africa (SA), in terms of mammography utilisation, in order to develop recommendations to promote mammography awareness.

This chapter will provide a brief introduction to the research conducted. The background to the research problem together with an explanation of the problem identified will be discussed. This is followed by the aim, objectives and research questions that grounded this research study. A brief discussion of the research methodology utilised and the importance of the study is included. This chapter will also highlight the chapters to follow.

1.2 BACKGROUND

Cancer of the breast is the most common type of cancer and one of the leading causes of death amongst women around the world (Al-Azmy et al., 2013:282; Al-Mousa et al., 2020:231). According to the World Cancer Research Fund (WCRF) (2018), there were more than two (2) million new breast cancer cases reported in 2018 worldwide. This research also reported Belgium having the highest incidence of cancer with 113 in every 100000 females having breast cancer, followed by the United Kingdom reporting 93 in every 100000 females and the United States reporting 85 in every 100000 females. In South Africa, breast cancer is on the rise, affecting 27 females in every 100000 females and accounts for approximately 16% of cancer deaths (Dordley, 2018). In recent years, due to the increased awareness of this disease in first world countries, the mortality rate has decreased significantly owing to the available treatment options (Harbeck & Gnant, 2016: 1134). Therefore, early detection of breast cancer through screening practices, such as breast self-examination (BSE), clinical breast examination (CBE) and screening mammography, is vital (Al-Azmy et al., 2013:282; Al-Mousa et al., 2020:240).

Despite breast cancer being very common worldwide, females are still not utilising mammography services (Dordley, 2018). Women generally undergo mammography imaging upon discovering a change in their breast (Albeshan et al., 2020:194+). The World Health Organization (WHO) (2019) stated that screening mammography is the only effective method for early detection of breast cancer. This is due to the ability and sensitivity of mammography to detect breast cancers in the early stages i.e. before presenting as a sign or symptom (Lampignano & Kendrick, 2018: 746). Hence, the awareness and utilisation of screening mammography is important in order to reduce mortality rates (Davis et al., 2019: 40).

The Health Belief Model (HBM) is a theoretical framework that attempts to explain an individual's behaviour towards a medical screening procedure based on their perception of the threat of the disease (DePoy & Gitlin, 2016: 93; Jeong & Ham, 2017: 210). This model was first developed in 1950 to explain the reasons for patients' non-attendance in screening programs for tuberculosis (Sayegh & Knight, 2012:517). Since its development, this model has been adapted and revised by many researchers. Dr Victoria Champion derived a scale, the Champion's Health Belief Scale, from the HBM, that is used to determine the reasons females do not practice breast self-examination. This scale is a questionnaire designed to address each of the six (6) constructs of the HBM. The six (6) constructs are perceived susceptibility, perceived severity, perceived barriers, perceived benefits, cues to action and self-efficacy. The Champion's Health Belief Model Scale was amended (with permission – See Appendix B) and forms the theoretical framework for this research study.

One of the HEI's in the province of KZN in SA has a mammography unit that is licensed for training purposes within a Radiography Clinic that offers General X-Ray services to the staff members and the community at large. Even though a mammography unit is available, the services are not yet offered. There are plans for offering mammography services in the near future. The researcher tested the CHBMS with the females working at an HEI in KZN, in order to provide relevant information on mammography health beliefs and awareness levels that could assist the Radiography Clinic at the HEI in developing recommendations to promote mammography awareness.

Studies (Lai et al., 2014: 3372; Gathirua-Mwang et al., 2016:76; Al-Mousa et al., 2020: 240) have shown there to be an inverse ratio with regards to the education level and utilisation of screening mammography in females in various countries around the world. A study involving Spanish females, to increase screening mammography, revealed that the majority of participants did not have a tertiary education (Goel & O'Conor, 2016:411). However, after a video intervention, mammography referrals were increased (Goel & O'Conor, 2016:411). As far as could be ascertained, no research has been conducted in South Africa to correlate the relationship between education levels and Mammography utilisation, therefore this study was aimed at bridging this gap by providing knowledge in this area of research.

1.3 PROBLEM STATEMENT

The researcher had become aware that females at a particular HEI, within the province of KZN in SA, seek mammography imaging facilities only after experiencing changes to their breasts or having discovered a lump. The researcher became aware of this problem while working in the Radiography Clinic at the research site. The researcher had encountered numerous calls or emails from staff working at the HEI requesting information about mammography and the cost of the mammogram. During the conversation, it was revealed that the initiator (or relative of) had discovered a lump in their breast. Due to the rise in breast cancer statistics within South Africa, this type of behaviour is of concern.

A study conducted in Ghana revealed that females had decreased utilisation of cervical cancer screening (Binka, et. al., 2016). In addition, these screenings were influenced by the employment status of the participant. In a study in the USA comparing whites to the USA Asian population, it was revealed that there is a decreased utilization of cancer screenings services in the Asian population (Park, et al., 2019: 1). These services included pap tests, mammograms and colorectal screenings.

Literature illustrates that an individual's mammography health beliefs may be based on various factors such as their understanding of mammography, perceived benefits of the procedure as well as family history of cancer (Erdem & Toktas, 2016; Qin et al., 2017). While research studies have explored the mammography health beliefs of females working in schools, minimal studies have been conducted with females working at an HEI (Alharbi et al., 2011; Erdem & Toktas, 2016). Hence, this study had aimed to determine the mammography health beliefs and the level of mammography awareness of females working at this HEI in relation to mammography utilisation. It was anticipated that this study would assist in the development of recommendations to promote mammography awareness and improve the utilisation of screening mammography among females working at the HEI.

1.4 RESEARCH METHODOLOGY

A quantitative, descriptive correlational study was conducted at an HEI in KZN, SA. This HEI has a functional Radiography Clinic that offers General X-Ray services to its community (HEI and surrounding areas) with the potential to offer mammography imaging to the same community. The inclusion criteria were all females 35 years and older, employed as a permanent staff member or employed on a full-time contract. The total population for the research study was 645. Using a convenience sampling technique, a sample size of 242 participants was reached. A response rate of 38% was achieved.

This research study was conducted utilising a questionnaire that was adapted from the CHBMS. The HEI staff population received the link to the questionnaire, which was designed on the online platform, SurveyMonkey. There were three (3) sections to the questionnaire; with the majority of questions being closed-ended and a few open-ended questions. A detailed methodology will be described in Chapter 3.

This research attempted to answer 2 main research questions:

a. What are the mammography health beliefs of females working at an HEI?
b. What is the level of mammography awareness among females working at an HEI?

In addition to the main research question, the following were questions of interest:

a. What is the relationship between education levels and mammography awareness?
b. What are the reasons for females having a mammogram?
c. Is the fear of susceptibility to breast cancer an encouraging factor for Mammography imaging?

Based on these questions the following aim and objectives of the study were derived.

1.5 RESEARCH AIM AND OBJECTIVES

1.5.1 Aim of the Research Study

This study aimed to determine the Mammography Health Beliefs and awareness levels of females working at an HEI in SA, in terms of mammography utilisation, in order to develop recommendations to promote mammography awareness.

1.5.2 Objectives of the Research Study

- To establish the Mammography Health Beliefs of females working at the HEI.
- To determine the level of awareness of mammography amongst females working at the HEI.
- To determine the relationship between mammography awareness and education level.
- To develop recommendations to promote mammography awareness for females at the HEI.

1.6 SIGNIFICANCE OF THE RESEARCH STUDY

Mammography imaging is one of the three (3) diagnostic methods to detect breast cancer and/ or further evaluate breast pathologies. Breast cancer statistics around the world, as well as in SA are on the rise. In 2018 breast cancer was the most diagnosed cancer (14097 cases) in SA and had the third-highest mortality rate (8.2%) (ZAF, 2020). It is estimated that in 2040 the number of breast cancer cases will be 22648. In order to reduce the breast cancer mortality rates, it is important to improve breast cancer awareness thereby improving mammography utilisation (Harbeck & Gnant, 2016: 1134). South Africa does not have a national breast cancer screening programme, however, the RSSA does provide guidelines regarding the ages that females should undergo mammography (RSSA, 2012). With October being labeled “Breast Cancer Awareness Month”, numerous organisations do run awareness programmes, however, these are not ongoing. As previously discussed, the research site does have a Radiography Clinic (offering General X-Ray Services) with an unlicensed mammography unit therefore staff have enquired about mammography imaging (either for themselves or a family member). This enquiry is often due to having discovered a breast lump. Based on this, it is evident that some females do not undergo screening mammography. One of the objectives of this research study aimed to determine the level of mammography awareness of females at the HEI.

In SA there is limited research on Mammography, additionally, there is no research on the HBM utilised in a SA context. This research study utilised the HBM as the theoretical framework. The first objective of the study was to determine the Mammography health beliefs of the females working at the HEI. This study is important as it is expected to add to the body of existing knowledge of mammography and the HBM by providing data on the KZN population in SA. Further, there is minimal information available on the mammography health beliefs of females employed at an HEI. In addition, it is anticipated that this study is expected to improve mammography awareness thereby allowing for early detection of breast diseases by developing recommendations to promote mammography awareness.

1.7 OVERVIEW OF THE CHAPTERS

CHAPTER 1 - INTRODUCTION

This chapter provides an introduction to the research.

CHAPTER 2 – LITERATURE REVIEW

This chapter provides an in-depth review of the theoretical framework for the study, together with a review of mammography, the awareness of as well as the risk factors that contribute towards the use of mammography.

CHAPTER 3 – METHODOLOGY

This chapter will provide insight into the research methodology utilised for this study.

CHAPTER 4 – RESULTS

The results of the study are presented in this chapter.

CHAPTER 5 – DISCUSSION AND CONCLUSION

A discussion of the results in relation to literature is presented in this chapter. Additionally, the recommendations that were developed based on the study findings will be described. This chapter will also present the limitations of this study and recommendations for further research areas.

1.8 SUMMARY

Breast cancer incidences are on the rise in South Africa. Many females may be aware of the disease however, they may not know about their options for early detection. Furthermore, females have preconceived notions that may prevent them from embracing available opportunities. The HBM was designed to determine these notions and promote the use of medical treatments available. In this research study, the HBM was used as the theoretical framework, with the adapted CHBMS being utilised as the research tool to establish the health beliefs for the utilisation of mammography. Additionally, the level of mammography awareness was determined. The literature review chapter will follow next.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Mammography is the gold standard of diagnostic imaging for the detection of breast cancer for females over the age of 40 years. Breast cancer is the most common female cancer and the leading cause of cancer death worldwide (Al-Azmy et al., 2013:282; Kirag & Kizilkaya, 2019: 1). With breast cancer statistics increasing annually, the need for mammography awareness, to increase utilisation of screening mammography is becoming more and more important (Khzair et al., 2019: 1; ZAF, 2020). In SA there are no Mammography Guidelines thus there are no Mammography Screening programmes. However, it is important for females to understand and know the signs and symptoms of breast cancer, how to detect these and what should be done once they experience a sign or a symptom associated with the breast disease (Al-Mousa et al., 2020: 240).

The Health Belief Model (HBM) is a theoretical framework that is used in this study to understand the perceptions of females with regards to breast cancer and mammography usage. The HBM has six (6) constructs each used to measure a different perception.

A discussion on breast cancer, its signs and symptoms and detection methods will follow. Mammography, as an imaging detection method, will be discussed in detail along with the barriers and awareness levels of mammography utilisation. The HBM in relation to mammography will be discussed together with methods used in different countries to promote mammography.

2.2 BREAST CANCER

Breast cancer is the second most common type of cancer in the world and the most common type of female cancer in SA. According to the 2018 SA cancer statistics, there were 107467 cases, of which 13.1% were breast cancer (ZAF, 2020). There were 57373 deaths from cancer with 8.2% breast cancer deaths coming in third to lung cancer (13.5%), followed by uterine cancer. The 2020 statistics by the WHO, revealed that breast cancer accounted for 14.3% (15491) of the total cancers (108168) in SA (Globocan, 2020).

2.2.1 Signs and Symptoms of Breast Cancer

The most common sign or symptom of breast cancer experienced and generally the first is a lump in the breast (Larsen et al., 2020). The lump may be benign or malignant. The benign lesions can grow to a size that could cause redness of the skin due to the skin becoming taut (Nall, 2020). The differentiation of a benign versus a malignant lesion can be observed on the mammogram and confirmed through a biopsy. On imaging, a benign lesion would appear well-circumscribed and have an even shape such as circular or oval. The malignant lesion would be spiculated, microlobulated and has no clear margins (Deng & Niknejad, 2019). Furthermore, the presence of calcification can either be benign or malignant.

Other symptoms include but are not limited to changes in the skin and nipple (MFMER, 2021). Further, the nipple may retract, or discharge can be excreted. Some of these signs or symptoms may occur in addition to the lump or as stand-alone signs or symptoms (Nall, 2020). Paget's disease is a condition of the skin and nipple whereby the breast takes on the characteristics of eczema (NHS, 2019). The discharge from the nipple may be thin or thick and could be different colours for example, milky, yellow, green or red (Nall, 2020). Nipple retraction is when the nipple is "pulled" into the breast, thus the nipple is termed to be introverted (Krans, 2020). This can happen at any point in a lifespan, however, it can also be a sign of breast cancer (Nall, 2020). Skin dimpling is an appearance on the surface of the breast. It has the appearance of an orange peel (Nall, 2020). One of the other symptoms is the increase in the size of the breast due to swelling.

The signs and symptoms of breast cancer are multifaceted. In order to detect these signs and symptoms, a clinical breast examination (CBE) by a doctor (general practitioner or gynaecologist) and more frequently a breast self-examination (BSE) is required.

2.2.2 Breast Examinations

A CBE and BSE are the same procedure conducted by a doctor or self respectively. Breast examination involves a visual and physical examination of the breasts (Maurerfoundation, 2009). For the visual examination, the individual stands in front of a mirror and examines the breast (by sight) in terms of the shape, skin and nipple changes. This is followed by a physical examination involving the individual lying supine and moving the fingertips in circular motions around the breast and into the armpit to feel for any lumps and then squeezing the areola region to check for nipple discharge. When performed correctly and monthly, BSE has the ability to detect acute changes (of the breast) in the early stages whereby treatment options are more conservative (Maurerfoundation, 2009).

2.2.3 Risk Factors

A risk factor is defined as an item or a condition that predisposes a person to a disease (Stoppler, 2021). In terms of breast cancer, there are a few factors that increase a person's risk. Factors such as a family history of breast cancer, age of onset of first menstrual period, the total number of children a woman has given birth to and the age at which a female had her first child are all factors that affect a person's risk for developing breast cancer (Lee et al., 2020: 47). A positive maternal family history of breast cancer increases a female's chance of getting breast cancer (Al-Mousa et al., 2020). In addition, if the female or a relative (maternal or fraternal) has had ovarian cancer, their chances of developing breast cancer increases (CDC, 2021). Early-onset of the first menstrual period (younger than 12 years of age) as well as the age at which a female has her first child increases a female's risk of breast cancer (Al-Mousa et al., 2020). If the first pregnancy is after the age of 30 years or if there have been multiple births before the age of 30 years, the chance of developing breast cancer is greater. However, an absence of these factors does not exempt a female from breast cancer. There are other factors that increase a person's chance of cancer such as lifestyle; exercising, smoking and alcohol consumption. Therefore, the awareness and utilisation of screening mammography is important in order to improve early detection thereby reducing mortality rates of breast cancer (Davis et al., 2019: 40).

In Jordanian females, the main risk factors of developing breast cancer were increased age, menarche at a younger age, menopause at a later age, family history, use of oral contraceptives and infertility drugs (Al-Mousa et al., 2020). This Jordanian study further stated that females have an increased risk of developing breast cancer when they smoke and have a high body mass index (BMI). However, factors such as breastfeeding, and a healthy lifestyle (diet and physical activity) were factors that decreased a female's risk for breast cancer.

In first world countries the mortality rate, due to breast cancer, has decreased significantly owing to the available treatment options. In order for treatment to be effective, early detection is needed. Early detection is effective with an increased awareness level (knowledge of the risk factors and the signs and symptoms) of breast cancer (Harbeck & Gnant, 2016: 1134). Therefore, early detection of the disease through screening programmes, such as BSE, CBE and screening mammography, is vital (Al-Azmy et al., 2013:282).

2.3 MAMMOGRAPHY

Mammography, as previously explained, is a diagnostic imaging tool that utilises x-ray technology to detect pathologies in the breast (Encyclopaedia Britannica Academic, 2019). Although predominantly females undergo mammography, the procedure is used for males as well. According to the Cancer Treatment Centers of America (CTCA, 2019), men are less likely to develop breast cancer due to their lower oestrogen levels. Due to the different types of breast tissue at different phases in a female's life span, mammography is recommended for females over the age of 40 years as the tissue is less dense (Sree et al., 2020: 9). However, mammography for females between 35-39 years is recommended for females that have an increased risk for breast cancer (Sree et al., 2020: 9). The density of breast tissue is an important factor that needs to be considered because pathologies can be masked by the surrounding dense tissue (Lian & Li, 2020: 3), which could result in the mammogram being reported as normal (Lian & Li, 2020: 4). If there are any abnormalities concerned in the younger age group (younger than 35 years), the patient may be referred for an Ultrasound scan (Paluch-Shimon et al., 2020: 677).

There are two types of mammograms namely; Diagnostic and Screening Mammography. Diagnostic mammography is mammography performed to confirm the presence of breast pathology after a patient has experienced sign(s) and/ or symptom(s) whereas screening mammography is defined as mammography of the asymptomatic breast (Holman, 2018). In countries with a breast cancer screening programme, diagnostic mammography is considered a standard of care for patients with signs and/ or symptoms of breast cancer (Fallenberg et al., 2016: 2752). Diagnostic Mammography is performed when a female or male over the age of 35 years experiences any change to the breast tissue (as discussed above).

When evaluating a mammogram, the reporting radiologist evaluates the breast composition, the presence of masses (the shape, margin, density, location), calcifications (benign or malignant, distribution), other findings (distortion of anatomy, asymmetries, lymph nodes, skin lesions, ducts) (Deng & Niknejad, 2019; Weerakkody & Niknejad, 2010). This is in alignment with the breast imaging-reporting and data system (BI-RADS) (Weerakkody & Niknejad, 2010). This lexicon was developed by the American College of Radiology (ACR) for the assessment of Mammograms, Ultrasound and MRI of the breast. The BIRADS score ranges from 0 – 6 for breast cancer findings within the breast. Interestingly, the rating is as follows: 1, 2, 3, 0, 4, 5 and 6. BIRADS 1 indicates the breast is negative, BIRADS 0 indicates that additional imaging is required and BIRADS 6 indicates that the present lump or calcification is malignant. The density of the breast in terms of the breast tissue classifications (discussed in detail below) is also reported in terms of the BIRADS. There are 4 categories a – d, with category "a" indicating

the breast being nearly entirely fatty tissue. Whilst category “d” indicates that the breast is extremely dense (Murphy, 2021).

Conversely, a screening mammogram is performed biennially or annually on females above the age of 40 years with no signs or symptoms of breast cancer. Brennan and Houssami (2016: 151) report that screening mammography should be an option for all asymptomatic females, however, symptomatic females require the triple test assessment method which includes a CBE, a diagnostic mammogram and pathological assessment. It is important to note that while there have been concerns raised regarding the negatives of screening mammography, there is no research to confirm this.

2.3.1 Breast Tissue Classifications

Throughout a female’s lifespan, the breast tissue has three (3) different densities (Radswiki & Murphy, 2021). The types of breast tissue classifications are fatty, fibrous and glandular (Lampignano & Kendrick, 2018: 749- 750). Breast density can increase or decrease due to medications, weight loss or gain, pregnancy and lactation, breast pathology or age (Radswiki & Murphy, 2021). The table below describes the breast classifications in relation to age, pregnancy and radiographic density.

Table 2.1: Breast Classifications

FACTORS AFFECTING TISSUE TYPE	BREAST CLASSIFICATIONS		
	Fibro-Glandular Breast	**Fibro-Fatty Breast**	**Fatty Breast**
Age Group	15 – 30-year-old and childless women> 30 years old	30 – 50 year old	Women>= 50 years old, children and men
Pregnancy Status	Pregnant or lactating	Young women with three or more pregnancies	Postmenopausal
Radiographic Density	Dense	Average density	Minimal density
Fat Tissue	Very little fat	50% fat and 50% fibroglandular	Majority Fatty tissue

(Lampignano & Kendrick, 2018: 749- 750)

As can be seen in Table 2.1 females under the age of 30 years have very dense breasts. Therefore, mammography is not advisable as breast pathologies can be hidden. Females between the ages of 30 – 50 years and younger females with more than two (2) pregnancies have fibro-fatty breasts. A fibro-fatty breast is composed of 50% fatty tissue and 50% fibro-glandular tissue. Due to this distribution of tissue, breast pathologies can be identified on mammograms (Lampignano & Kendrick, 2018: 749- 750).

2.3.2 Screening Guidelines

Mammography is the worldwide standard for breast cancer screening (Kuo et al., 2016:1). Generally, each country has their own screening policy however, some countries such as South Africa do not have formal policies or guidelines on breast cancer screening. A Wisconsin (USA) study stated that females between the ages of 50-74 years should be screened for breast cancer every 1 – 2 years (Jewett et al., 2017: 65).

According to Zamorano-Leon et al. (2019:27+), Spain has the lowest breast cancer mortality rates amongst the European Union States. It is explained that this low mortality is due to the breast cancer screening guidelines. Biennial screening is for all females between the ages of 50 to 69 years, however, private institutions screen all females over the age of 40 years annually. Korea on the other hand recommends a screening mammogram for all females over the age of 40 years every two (2) years (Lee et al., 2020: 47).

In Taiwan, the breast cancer screening policy suggests that females between the ages of 40 – 69 years be screened biennially (Kuo et al., 2016:1). While the United Kingdom (UK) guidelines recommend biennial mammograms for females 50 years and older although, frequent mammograms are recommended for females with a risk of breast cancer. The guidelines of the USA and Canada are similar in that females between the ages of 50 and 74 years should be screened biennially (Gilfoyle et al., 2019: 136; Miller et al., 2019: 2). Saudi Arabia does not have any screening guidelines however, they have started to compile guidelines owing to the increased number of breast cancer cases (Albeshan et al., 2020: 197).

To date, there is no national breast cancer screening programme available in South Africa. The Radiology Society of South Africa (RSSA) Policy document (2012) indicates that all departments that offer mammography should have their own guidelines for mammography imaging in terms of the age when required and frequency of breast imaging. Nonetheless, the RSSA does advise that females between 40 – 70 years of age should undergo mammography. The RSSA policy document further states that mammography can be performed on females, 35 years and older, who present with any breast abnormality, as well as females with a positive maternal history of breast cancer. Patients are further advised to perform BSE on a monthly

basis to assess any changes and should there be any changes to the breast, patients are advised to return immediately for a triple assessment (Biganzoli, 2020: 68).

A triple assessment includes a clinical assessment by the doctor, radiological imaging and histology assessment (a biopsy sample is analysed). The doctor would examine the breast clinically and note all findings. The patient is then referred for a mammogram and/ or an ultrasound which would be followed by a biopsy of the pathology imaged (Biganzoli, 2020: 68). Although regulations for mammography, performed in SA, are as per the American guidelines, radiologists do advise on mammography frequency or "follow-up" imaging according to their departmental protocol and the patients' personal risk factors.

South Africa does not have guidelines for screening mammography therefore it is important to determine the level of awareness of mammography services and breast cancer among females in SA in order to promote mammography utilisation. This study aimed at bridging this gap by describing the mammography health beliefs of females working at one of the HEI's in SA.

2.4 RESEARCH FRAMEWORK

Research frameworks are the structural maps of a research study (Brink et al. 2018: 21). It is added that the framework provides context to the research problem, the methodology and the data analysis. Further, there are two (2) types of frameworks, namely: theoretical framework and conceptual framework. According to Adom and Hussein (2018: 438), a theoretical framework is the blueprint of a study, based on an existing theory (or theories) used to describe human behaviour. Conversely, a conceptual framework provides an explanation of the research problem and is aimed at theory development (Adom & Hussein, 2018: 439-440). The theoretical framework for this research study was the Health Belief Model with the use of the Champion's Health Belief Model Scale (CHBMS) being adapted as the research tool. In a study conducted by Lawal et al. (2017: 122+) the HBM was compared to three other theories; with the advantages and limitations of each theory being identified. One of the limitations (of the HBM) identified was the fact that the theory does not explore the effect of socioeconomic factors on behaviour. The HBM was suitable for this research as this study did not explore the effect of socioeconomic factors on the utilisation of mammography services. The CHBMS was adapted from the original HBM to specifically investigate breast cancer screening behaviours and beliefs (Champion, 1999). This scale has been adapted and used in the development of the questionnaire for this research study to evaluate the mammography health beliefs and awareness levels among females working at an HEI in SA.

2.5 HEALTH BELIEF MODEL

The Health Belief Model (HBM) was originally proposed, by psychologists Hochbaum, Rosenstock and Kegels, to aid in the study and promotion of the use of health services (Sayegh & Knight, 2012:517). The original model was developed to investigate the screening behaviours of patients with regards to tuberculosis in the 1950s (Lawal et al., 2017: 123). The HBM suggests that individuals undergo screening procedures for one of two reasons and these reasons are further divided as follows:

1. Threat of the disease
    a. Perceived susceptibility to the risk.
    b. Perceived severity of the consequences of those threats.
2. Expectations about the behaviour
    a. Perceived benefits in reducing their susceptibility to the condition or its severity.
    b. Belief that a behaviour is effective in reducing the threat of the disease or if the action may seem expensive, inconvenient or unpleasant. (Dodel & Mesch, 2017:361).

Further research on this model introduced two (2) additional constructs namely “Cues to Action” and “Self-Efficacy”. The HBM is based on six (6) constructs, four (4) of which are perception driven. Perception is defined as “a process by which we give meaning to our environment by organizing and interpreting sensory impressions” (Robbins et al., 2017:233+). In addition, a perception is unique to each individual due to their characteristics and thus influences the way in which individuals behave and interpret other people.

Although the HBM is mainly used in health research, a 2017 study by Dodel and Mesch reports the findings of the research for Cyber-victimisation. The research utilised the HBM to determine the preventative behaviour of participants. The study was conducted on 1850 Israeli internet users (38% response rate) and provided information on anti-virus prevention behaviors. Thus, the study was successful in predicting anti-virus preventive behaviours and provided an additional application for the use of the HBM.

The HBM has also been used to study South Korean customers with reference to their use of menu labels in restaurants (Jeong & Ham, 2018). Due to the high obesity rates, the use of nutritional information labelling on menus was to provide additional information to the customer to make informed choices when ordering. The HBM was the chosen theory as it is well researched and is able to predict preventative behaviours. Jeong and Ham (2018) used an online survey that was conducted on 1020 participants, the survey achieved a response rate of 32.8% (n=335). The research provided a validation of the use of health beliefs as a predictor

for the menu labels for restaurant menus as individuals would perform preventative behaviours in line with their health beliefs.

Despite the use of the HBM in areas outside of the health field, it has been utilised in numerous screening research studies including those related to mammography to promote utilisation. A cross-sectional study was conducted by Gilfoyle et al. (2019:135-142) in Alberta, Canada, with 1803 participants to examine the link between breast cancer and mammography screening in terms of perceived susceptibility. The study concluded that understanding how perceived susceptibility factors related to breast cancer was important in order to increase mammography utilisation.

Each of the six (6) constructs; Perceived Susceptibility, Perceived Severity, Perceived Benefit, Perceived Barrier, Cues to Action, Self-Efficacy, have an equal contribution in motivating a patient towards taking positive health-related action (Maseko et al., 2019:2). Grounded on this notion and the above literature, the HBM was deemed appropriate for this study. These constructs will be discussed in detail in the sections which follow.

2.5.1 Health Belief Model Constructs

The HBM has six (6) constructs that are used to determine the outcome of a behaviour. The first construct, “Perceived susceptibility” is an individual’s perception of their vulnerability towards the health problem (Dewi, 2018:434). This translates into whether the individual would utilise the treatment or procedure. A Canadian study conducted by Gilfoyle et al. (2019: 135-142), indicated that perceived susceptibility was significantly associated with mammography screening, i.e. a female would undergo mammography if they felt they were susceptible to breast cancer. The research study further revealed that females who rated their perceived susceptibility of developing cancer a five (5) on the Likert scale (“I am at a much higher risk than others”) were two times more likely to have a mammogram than females that rated it as a one (1) (“I am at a much less risk than others) (Gilfoyle et al., 2019: 135- 142). According to Maseko (2019: 11), perceived susceptibility for mammography could be if patients either have risk factors for breast cancer or have awareness of mammography and its benefits. For the current research study, perceived susceptibility is based on the participant’s perception that they might develop breast cancer therefore they undergo mammography screening.

“Perceived severity”, the second HBM construct, is an individual’s perception of the consequences of the health problem related to screening (Dewi, 2018:434). Chen et al. (2019: 3431) added that perceived severity relates to an individual’s opinion of the level of seriousness of a health condition. In the current research study, the perceived severity of getting breast

cancer can either instil fear into a female to have a mammogram or not have one. An individual could opt to not have a mammogram in the fear that it could affect their image (i.e. physical, social, professional and personal lives). Their image in terms of the manner in which they believe they are viewed by their colleagues or partner/ spouse could influence an individual's decision to have a mammogram. For the research population, breast cancer could mean that they are weak thus preventing them from having a mammogram, or the possibility of discovering a lump and having to have it removed would imply a life-long scar (no matter how big or small) which affects their image.

The third construct "Perceived benefits" is the individual's perception of the benefits of undergoing the screening mammogram (Dewi, 2018:434). This can in turn create a positive expectation of the mammogram encouraging the individual to utilise it due to its associated benefits. The current research study refers to the perceived benefit of mammography as the advantage that breast cancers can be identified at least two (2) years prior to a breast mass or a sign or symptom presenting, among other factors.

A study by Chen et al. (2019: 3432) revealed that an individual is more likely to seek a preventive screening measure if the perceived benefit outweighs the perceived barriers. The opposite is also true, in that an individual will avoid a preventive screening measure if the perceived barrier outweighs the perceived benefit. Thus, it can be assumed that if there is a balance between the perceived benefit and barrier, an individual would participate in the preventive screening.

The fourth construct, "Perceived barriers" is an individual's perception of obstacles that prevent them from undergoing screening (Dewi, 2018:434). In relation to mammography, perceived barriers to utilisation include, but are not limited to, lack of knowledge of the availability of screening facilities, lack of finance and "lack of referral from physician" (Calys-Tagoe et al., 2019:41). A perceived barrier could also be a negative experience deterring an individual from having a mammogram. However, the knowledge of the benefits of mammography, in terms of early detection having the potential to improve survival rates, motivates individuals towards having a mammogram (Chen et al. 2020).

Barriers to mammography as cited by Kwok et al. (2016: 3), based on previous studies, include the lack of transportation to a mammography facility, lack of health insurance (in a South African context it is known as medical aid), and the fear of cancer diagnosis. A mammogram involves the use of low doses of radiation being passed through the breast. Due to the conical shape of the breast, and a uniform dose of radiation being exposed, the breast is compressed to ensure a uniform image (Lampignano & Kendrick, 2018: 752). Depending on the technique and the amount of breast moved onto the imaging surface, the amount of compression applied

will vary. Patients can and have expressed that the compression is painful. The use of compression can deter patients from returning for future mammograms therefore this can be considered a potential barrier to mammography utilisation.

According to Brennan and Houssami (2016:151) screening mammography improved the quality of life for females as breast cancers were discovered in the early stages of the disease. As a result, the treatment options were not aggressive. In an American study by Davis et al. (2018: 44), it was revealed that education of the screening mammography guidelines, was one of the factors that could improve uptake of mammography. South Africa, unfortunately, does not have such guidelines for screening mammography; hence it can be argued that educating females about mammography could improve utilisation.

A retrospective study by Park et al. (2019: 1- 7) analysed preventive screening services data, which revealed that amongst the American Asian population the screening for cancer is low. It was found that the utilisation of screening procedures for colorectal cancers, pap smears and mammography decreased after 2013. It is suspected that this decrease is due to a lack of awareness of the benefits and importance of these procedures. Further, it reported that certain groups of Asians did not have health insurance, their English proficiency was low and cultural beliefs were barriers to utilisation of preventive screenings. It is evident that identifying barriers to mammography utilisation is critical in order to increase mammography usage therefore this study aimed to determine the possible barriers that females working at an HEI encountered.

Park et al. (2019) recommended ethnic-specific strategies to be implemented in order to increase preventive screenings. It is interesting to note the studies by Park et al. (2019) and Gilfoyle et al. (2019) both addressed the need for “education programmes”. Education programmes can be considered as “Cues to Action”, the fifth construct of the HBM.

“Cues to Action” is an individual’s “perception of the symptom, social influence, or health education” which influences their decision to undergo the health screening (Dewi, 2018:434). Therefore, there can be internal but mostly external factors that prompt an individual to utilise the treatment or procedure. The external factor may be linked to a person that is considered important in the individual’s life therefore their word and or experience is highly weighted and or valued (Al-Mousa et al., 2020). The current research study aimed to establish these cues to develop recommendations to promote mammography awareness.

Gilfoyle et al. (2019: 135 – 142) concluded that understanding the link between perceived susceptibility and screening behaviour is important for improving and addressing the underutilisation of screening programmes or procedures. The aforementioned authors identified that while screening rates for breast cancer were high in North America, a

considerable number of females do not utilise mammography thus the need for an awareness programme was recognised.

The last construct is “Self-efficacy” which is an individual’s perception that they are capable of performing a health behaviour to detect the illness early (Dewi, 2018:434). Self-Efficacy can be considered negative or positive depending on the treatment or procedure. It is negative when the individual’s methods to prevent the disease worsens the disease due to not using the treatment or procedure at the onset. It is a positive when the individual is capable of monitoring the disease and is able to make a judgement call when help is needed (Albeshan et al., 2020: 198). It was added that teaching the population the signs and symptoms of the disease added greater value (Albeshan et al., 2020: 198). In the study by Dewi (2018:434) the health behaviour under investigation was breast self-examination. In the research study conducted, self-efficacy was established in terms of an individual’s confidence in breast examination (by GP and/ or gynaecologist and self) and the ability of breast examinations to detect breast cancers in its early stage.

A study conducted in Turkey about knowledge, attitudes and behaviours of breast self-examinations, revealed that primary healthcare workers had insufficient knowledge of breast self-examination and decreased levels of mammography utilisation (Erdem & Toktas, 2016:1-6). This low level of screening mammography utilisation was surprising due to the study population consisting of healthcare workers. A similar study conducted in Kuwait revealed that 21% of women attending a primary healthcare facility practiced BSE and six (6) females of a total of 109 were aware of mammography (Al-Azmy et al. 2013:285). The aforementioned study concluded that increased awareness of breast cancer and the necessary screening practices were required to improve life span among females (Al-Azmy et al. 2013:285).

2.6 AWARENESS AND EDUCATION LEVELS

Awareness is defined as “the knowledge or perception of a situation or fact” or “the concern about and well-informed interest in a particular situation or development” (Lexico, 2019). Numerous studies have been conducted to evaluate the level of awareness of females with regard to mammography worldwide. Research shows that with an increase in educational levels, there is a subsequent increase in the utilisation of mammography screening services for breast imaging (Alharbi et al., 2011; Erdem & Toktas, 2016). A study amongst females attending an outpatient clinic in Nigeria particularly revealed that with increased education levels came increased awareness levels (Obajimi et al., 2013: 3). Of the 818 participants, 32% had a tertiary level education with results further revealing that participants younger than 40 years had better knowledge than those older than 40 years.

Studies conducted in Kuwait (Alharbi et al., 2011: 75-82) amongst teachers at primary and secondary school level revealed that females were not breast aware and had not been screened for breast cancer (clinical or self-examination nor mammography imaging). A study by Gathirua-Mwangi et al. (2016) on African American females revealed that knowledge of mammography was poor in females with a lower education level. Additionally, studies have shown there to be an inverse ratio with regards to the education level and utilisation of screening mammography in females in various countries around the world. A study involving Spanish females, to increase screening mammography, revealed that the majority of participants did not have a tertiary education. However, after a video intervention, mammography referrals were increased (Goel & O'Conor, 2016:411). Brizuela et al. (2019) revealed that in order to increase awareness levels, there is a need for training programmes and campaigns. Based on literature demonstrating the possibility of educational levels impacting the level of mammography awareness, the current research study will serve as a comparison by providing information on the mammography awareness levels of females at an HEI with varying levels of education.

2.7 CONCLUSION

Breast cancer cases are increasing globally. Early diagnosis of breast cancer is through breast examinations (BSE and CBE) and screening mammography. In first-world countries, it has been shown that increased utilisation of screening mammography has improved early detection of breast cancer thus reducing mortality rates. However, in third world countries, due to the decreased levels of mammography awareness, utilisation is decreased. A mammography health belief is an individual's perception of mammography. The six (6) constructs (susceptibility, severity, barriers, benefits, cues to action and self-efficacy) are related to an individual's perception of breast cancer in relation to the utilisation of mammography. Although mammography has proven benefits, each individual (based on certain factors) would choose either to utilise mammography or not. Factors to utilise mammography, apart from those of the HBM, include the level of awareness of mammography and the individual's level of education.

This literature review provided the basis of the research study conducted and included the factors that influenced the adaptation of the CHBMS for the research tool. The CHBMS together with the research methods will be discussed in Chapter 3.

CHAPTER 3

RESEARCH METHODOLOGY

A quantitative, descriptive correlational approach was utilised for this research study. The purpose of this chapter is to discuss the research questions, objectives, research paradigm, research design, study population, research methods, data analysis, reliability and validity as well as the ethical consideration for this study. This chapter starts with an overview of the research questions and objectives that informed the research.

3.1 RESEARCH QUESTIONS AND OBJECTIVES

This research study attempted to answer two main research questions:

a. What are the mammography health beliefs of females working at an HEI?
b. What is the level of mammography awareness among females working at an HEI?

Based on these questions the following objectives were derived:

- To establish the Mammography Health Beliefs of females working at the HEI.
- To determine the level of awareness of mammography amongst females working at the HEI.
- To determine the relationship between mammography awareness and education level
- To develop recommendations to promote mammography awareness for females at the HEI.

3.2 RESEARCH PARADIGM

A research paradigm is described as a worldview or conceptual framework of a research study (Rehman & Alharthi, 2016). The elements of a paradigm include an understanding of reality and the beliefs associated with this reality, the areas still to be researched and the method to the research (Antwi & Hamza, 2015: 217). Thus, the components of a research paradigm are ontology, epistemology, methodology and methods (Rehman & Alharthi, 2016); these have been defined on page XII at the start of the thesis. Axiology is the ethical considerations required prior to starting the research process (Kivunja & Kuyini, 2017: 28). There are many research paradigms, however, the three (3) main paradigms are positivism, interpretivism and critical theory (Rehman & Alharthi, 2016). The current research study has a positivism paradigm.

Positivism is a branch of philosophy that makes the assumptions of the cause-effect relationship between phenomena (Kivunja & Kuyini 2017: 29). The assumption is that humans

play a role in reality. Thus, in positivism, the epistemological component, the researcher is an observer. Positivists present factual statements due to the belief that laws govern phenomena (Rehman & Alharthi, 2016). In the current research study, there are no laws to govern the research, however, the research was grounded on the theory of the HBM decided upon due to the pattern of behaviour that was noticed. This research paradigm is in keeping with the quantitative research design which was utilised in this study.

3.3 RESEARCH DESIGN

A research design is described as the overall plan and structure to conduct the research (Bowling, 2014:166). This research study was a quantitative study with a descriptive correlational design, using a survey, more specifically a questionnaire as a data collection tool (see Appendix A). Quantitative research involves quantities and relationships whereby the data obtained is highly structured in a positivist form (Bowling, 2014: 214). Further, the researchers distance themselves from the study to prevent human bias. The quantifying of data is possible through values being assigned to choices provided or through the use of a Likert Scale, which is then analysed using Statistical Analysis Software (Johnson & Christensen, 2014:87).

In quantitative research, the relationships between variables are examined (Ramlaul, 2010: 70). There are different types of variables, those that are grouped as a level of measurement (categorical and quantitative) and/or by the role taken (independent, dependent, mediating, moderator and extraneous) (Johnson & Christensen, 2014:89). According to Brink et al. (2018:96) in a descriptive study the variables are described to answer the research questions. Furthermore, descriptive designs do not determine the cause-effect relationship. In correlational research, the relationship between independent and dependent variables are quantified and studied (Johnson & Christensen, 2014:97). In addition, there is no manipulation of the independent variable therefore the cause is not identified, however, correlations may be determined (Brink, et al., 2018: 109). This study utilised a descriptive correlational design as relationships between variables were described and compared during statistical analysis (Brink et al., 2012: 115). In order to achieve the objectives of the study, the relationships between the participant's educational levels, level of mammography awareness and mammography utilisation were examined.

3.4 RESEARCH SITE AND RESEARCH POPULATION

The research site was a higher education institution (HEI) in the province of KZN, SA. This HEI has a functional Radiography Clinic that offers general radiography services to its community (HEI and surrounding areas) with the potential to offer Mammography imaging to the same community. The research population included all females permanently employed or employed on a fixed-term contract with the HEI. According to the data received from the Department of Management Information Systems (MIS), the research population was 645 females.

3.5 INCLUSION AND EXCLUSION CRITERIA

3.5.1 Inclusion Criteria

The research study included all females 35 years of age and above, that are permanently employed or employed on a full-term contract with the HEI.

3.5.2 Exclusion Criteria

The research study excluded the following categories of staff:

i. All females younger than 35 years of age. This is due to the fact that mammography is recommended for females above the age of 40 and all females between the age of 35 -39 years with a positive maternal history of breast cancer (RSSA, 2012).
ii. All males employed by the HEI as the researcher was interested in the female population due to the research problem. Further, due to rare incidences of male breast cancer, studies have focused on females, hence this research study was conducted to determine statistics for the female population of KZN, South Africa.
iii. All non-South African females as South Africa does not have recommended screening guidelines for breast cancer and the home country of the employee could have screening guidelines thus creating a research bias as the participants' awareness would be increased.
iv. All part-time female employees of the HEI as their full-time work environment could have mammography awareness programmes thus creating research bias.

3.6 RESEARCH SAMPLE AND SAMPLING METHOD

This research study focussed on all South African females 35 years of age and older, employed permanently or on a fixed-term contract with the HEI. The total population was 645 (Naidoo, 2020) and the sample size was calculated to be 241 participants (Singh, 2020). A convenience sampling technique was used as all females meeting the inclusion criteria were invited to participate in the study. However, due to work schedules, not all staff might have been able to

find time to answer the questionnaire. Due to the COVID-19 pandemic, a great percentage of staff worked remotely and some might not have had frequent access to emails (Brink et al., 2018:124). This sampling technique allowed the participants to respond to the questionnaire at a time and place that was convenient to them. As the researcher was interested in investigating the beliefs of the population, a convenience sampling was appropriate.

3.7 DATA COLLECTION TOOL

The questionnaire used was adapted from the Champions Health Belief Model Scale (CHBMS) that was developed by Dr Victoria Champion (see Appendix B for the permission letter for the use of the scale). Online questionnaires are an inexpensive method of conducting research in comparison to the alternatives, such as a hardcopy questionnaire, face to face answered questionnaires, but still effective (Brink et al., 2018:138). Additionally, due to COVID-19 this method was ideal. A link to the questionnaire was emailed to the participants' work email address. Due to the Protection of Personal Information (POPI) Act, the researcher was unable to obtain the email addresses of the total research population. Therefore, emails were sent to approximately 1500 employees (males and females), as the researcher was not able to distinguish the gender of the employees.

The data collected was primary data as it contained: Biographical details (gender, age, nationality, marital status, qualification (education level), Job Title, Contract vs Permanent, Medical Aid Benefit); information on mammography in terms of participants past experiences, awareness, utilisation of facilities at work if available; risk factors; possible interventions to increase awareness. Due to emails being sent to the research site population, the questionnaire was designed online to exclude participants that did not meet the inclusion criteria. Thus, when a female under the age of 35 years or a male started to answer the questionnaire, the opening questions were aligned to the inclusion and exclusion criteria and if they selected any of the exclusion criteria boxes, they were automatically directed to the end of the questionnaire. The questionnaire consisted of mainly closed-ended questions. These closed-questions were answered on a 5-point Likert Scale with a few requiring a Yes or No answer. The survey contained three (3) sections; Section A was based on the Demographics of the participant; Section B determined the participants risk factors for breast cancer and Section C determined the mammography health beliefs. The research tool has been designed to answer the objectives of the study as indicated by Table 3.1 that follows:

Table 3.1: Research Objectives and the Research Tool

RESEARCH OBJECTIVE	RESEARCH TOOL
Objective 1: To establish the Mammography Health Beliefs of females working at the HEI.	Section C – Contains the six (6) constructs of the HBM.
Objective 2: To determine the level of awareness of mammography amongst females working at the HEI.	Section B (risk factors for breast cancer in turn relates to mammography awareness) and Questions in Section C.
Objective 3: To determine the relationship between mammography awareness and education level	Section B (risk factors for breast cancer in turn relates to mammography awareness) and Questions in Section A.
Objective 3: To develop recommendations to promote mammography awareness for females at the HEI.	Questions in Section C.
	Section A is the demographics section- this is important due to the inclusion criteria of the study, as well as to perform any correlations during statistical analysis.

The questionnaire was designed on the online platform, SurveyMonkey. This method allowed for a wide and easy distribution of the questionnaire. SurveyMonkey in comparison to other online platforms allows for more than 100 responses as well as numerous questions to be asked at a monthly cost (SurveyMonkey, 2019). This platform further allowed for responses to be sent back to the researcher with anonymity being maintained (SurveyMonkey, 2019). This was achieved during the designing of the questionnaire on SurveyMonkey, whereby the researcher did not allow for the Internet Protocol (IP) address to be included in the feedback. The Privacy Policy of SurveyMonkey explains that the IP is only used to ensure participants do not attempt the survey twice, further, the IP is not distributed to a third party (SurveyMonkey, 2019).

3.8 VALIDITY AND RELIABILITY

Validity is the determination of whether the research tool is accurate and has generated the desired output (Ramlaul, 2010: 108). Distribution of a questionnaire was the only way in which the information will be obtained due to the population sample size. Responses to questionnaires are not very reliable as responses could vary depending on the participants' state of mind. However, due to the nature of this study, responses may be very informative. It was hoped that with the inclusion of an information sheet explaining the purpose of the study, responses would be honest and truthful. The Champions Health Belief Model Scale was revised in 1998 and the internal validity ranged from 0.75 to 0.88. This scale has been used in different research studies since being revised and has remained valid (Johnson, 2010).

The questionnaire was piloted by five (5) females employed at different HEI's in SA to ensure content validity. Content validity is an assessment of the questionnaire ensuring that it is measuring all aspects under investigation (Bolarinwa, 2015:198). Piloting a questionnaire is important as it allows for the detection and clarification of errors and questions that are ambiguous (Brink et al., 2016:174+). Further, it allows the researcher to confirm the amount of time required to complete the questionnaire. From the piloting of the questionnaire, the researcher was able to correct errors. The major problem identified was the flow of the questions as participants moved to different questions and sections. After communicating with the Technical Support of SurveyMonkey, the problem was rectified. Other concerns with the survey were around the wording of a few questions due to ambiguity. Initially, it was planned that participant consent would be deemed by the participant clicking on the survey link, however, the feedback received from piloting of the survey advised otherwise. Thus, introductory and consent pages were added (to the start of the questionnaire) as well as statements regarding the purpose of each Section or Page. The responses from the piloting of the research tool were not utilised as the purpose of the piloting was to ensure content validity.

Reliability is the ability of a research tool to be reproducible and consistent, as well as to be free of random error (Bowling, 2014: 170+). The questionnaire has been adapted from a reliable test tool that has been previously utilised and tested, therefore the tool is considered reliable. Due to the diversity of the population from previous studies in terms of ethnicity the results might differ. However, should the study be repeated at another institution with a similar context, the results should be similar. Additionally, Cronbach's Alpha test was conducted during statistical analysis to provide the internal consistency of all correlations (Bowling, 2014: 170+).

According to Bolarinwa (2015: 199), internal consistency is a test whereby one determines the extent to which the questionnaire is measured in duplicate. Further, coefficient alpha is generally used for questionnaires with a 5-point Likert scale; however, Cronbach Alpha is more common for quantitative research (Brink et al. 2016:170). The results for the Cronbach Alpha test should fall within the range of 0 – 1 (Bolarinwa, 2015:199). It is added, the closer the result to 1, the more reliable the questionnaire. A score of 0.7 or higher is considered reliable. However, for a newly developed construct, a reliability coefficient of 0.60 or higher is considered "acceptable" (Singh, 2021).

The reliability scores for Sections B-G exceed or approximated the recommended Cronbach's alpha value (Table 4.1 refers). This indicates that the scoring was acceptable and consistent for these sections (Singh, 2021).

3.9 DATA COLLECTION PROCEDURE

Data was obtained through the use of an online questionnaire (see Appendix A) that contained closed and open-ended questions. A link to the questionnaire was emailed to the entire population, as per the rationale explained in Section 3.3.3 regarding the POPI Act. After receiving Ethics Approval from the Health and Wellness Sciences Research Ethics Committee (See Appendix F), the researcher sought Gatekeepers Permission from the HEI where the study was conducted. Once Gatekeepers Permission from the HEI was received (See Appendix G), the link for the survey was emailed to the HEI sample population.

The email contained a brief description of the study as well as the target audience, followed by the link to the survey. In addition, the Letter of Information and Consent (see Appendix C) explaining the purpose of the study was attached to the email. The participants were advised that should they be willing to participate in the study they were to follow the link to the survey.

Data collection was over a period of four (4) months. This length of time was due to responses to the survey being poor. A possibility for this could have been that many staff were working remotely as a result of COVID-19 and had limited access to emails. Emails for participation in the survey were sent four (4) times. After the first email requesting participation in the research study, approximately 90 responses were received. One month later, a reminder email was sent to participants and 80 responses were received. After the second set of responses were received, the HEI was in the process of assessments followed by a vacation period. After returning from vacation a second reminder was sent to the HEI population, however, participants and recipients of the emails who had responded to indicate that they had already participated or were not part of the inclusion criteria were removed from the emailing list. A third reminder was sent after excluding the respondents as per above. Data collection was stopped when a total number of 242 responses were received. This was considered an acceptable sample size as a confidence level of 95% was used during calculation.

3.10 DATA ANALYSIS

Analysis of the data is an important part of the research process as the raw data collected cannot be reported as is (Brink et. al. 2012: 57). A statistician was consulted to assist the researcher to analyse the data received in order to answer the objectives. The Statistical Package for Social Sciences (SPSS) software version 26.0 was utilised to aid in the analysis of data. As the study had a descriptive correlation design, descriptive statistical analysis was required (Brink et al. 2018: 177). Descriptive statistics provide a summary and explanation of the data collected and are represented in tables and graphs illustrating the frequencies, mean, standard deviations and the relationships between variables (Brink et al. 2018: 166). The correlation coefficient and Chi-Square tests were conducted. The correlation coefficient

provided strength and the direction of the relationship between variables (Pallant, 2016: 140+). Further, the Chi-Square test explored the relationship between variables to determine if they are dependent or independent of the other. The Cronbach's Alpha test provided the internal consistency/ reliability (Bowling, 2014: 170+). The descriptive statistics will be presented in the form of graphs, cross-tabulations and other figures for the quantitative data that was collected (see Chapter 4). Inferential techniques include the use of correlations and Chi-square test values, which are interpreted using the p-values (Brink et al., 2018: 166). A p-value is generated from a test statistic. A significant result is indicated with "$p < 0.05$" and was applied during data analysis.

Factor analysis is a statistical technique with the main goal to ensure data reduction. This is generally applied to research conducted through surveys. Factor analysis is done only for the Likert scale items. Factor analysis can be used to establish whether all measures do, in fact, measure the same thing. In order to conduct a factor analysis, the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test was conducted. The requirement is that KMO should be greater than 0.50 and Bartlett's Test of Sphericity less than 0.05. In all instances, the conditions were satisfied which allowed for factor analysis.

3. 11 ETHICS

Ethical consideration is understood to be the most important part of research. This is due to the fact that no harm should come to research participants (Ramlaul, 2010:54). To ensure this, the research proposal was reviewed by the Health and Wellness Sciences Research Ethics Committee of the Cape Peninsula University of Technology. Once ethical approval was received (See Appendix F), Gatekeeper's permission was sought from the HEI where the research was conducted (See Appendix G). According to the Principles of the Declaration of Helsinki (WMA, 2018), every participant needs to be protected in terms of their life, dignity, health, integrity, privacy, right to self-determination and confidentiality. The four (4) fundamental ethical principles of research were adhered to namely: autonomy, non-maleficence, beneficence and justice.

3.11.1 Autonomy

The right to "self-determination" is termed autonomy (Brink, et al., 2018: 29). This allows for an individual to decide if they wish to participate without the threat of coercion or penalty. The link to the questionnaire was emailed to the research participants, thereby allowing them the right to choose to participate in the research. In addition autonomy allows for a participant the right to withdraw from the study should they so wish (Brink, et al., 2018: 29). As the questionnaire was electronic, a participant was able to decide at any point not to proceed with

the answering of the questionnaire. By closing the webpage, before the end of the questionnaire, participants were able to withdraw their response (Brink et al, 2012: 34). The questionnaire did not contain any aspects that would identify the participant, nor could the researcher obtain the Internet Protocol (IP) address of the participants which ensured anonymity.

3.11.2 Non-maleficence and Beneficence

This principle requires the researcher to “do no harm” to the participant (Brink, et al., 2018: 29). Therefore the researcher should avoid any harm to the participant in any form. The email containing the link to the questionnaire further contained the letter of information and consent as an attachment (See Appendix C). This letter contained the purpose of the research and information that the participant may need. The research participants were able to answer the questionnaire in the comfort of their home or at work (Sanjari et al., 2014). The researcher did not receive any information of harm being experienced by any participant. At the end of the questionnaire, participants were given the details of the Employee Wellness Office in the event of them requiring counseling services. Further, participants did not experience any direct/ monetary benefit. An indirect benefit was that a few participants emailed the researcher to indicate that the questionnaire served as a reminder to book their annual mammogram.

3.11.3 Justice

All participants have a right to a fair selection process and to be respected (Brink, et al., 2018: 30). The right to justice, equity, privacy and human dignity was abided by (Brink et al., 2012: 34). All participants that met the inclusion criteria were given equal opportunity to participate in the study (Sanjari et al., 2014).

3.11.4 Confidentiality and Privacy

Participant confidentiality and privacy was in line with the Privacy Policy of SurveyMonkey (2019), whereby all participants’ information remains confidential. Due to the capabilities of SurveyMonkey, a comprehensive data Excel sheet could be downloaded which contained all responses to the survey. Additionally, the responses did not contain any identifying information. This Excel sheet will be kept for five (5) years after which it will be deleted.

3.12 CONCLUSION

This chapter discussed the important areas of research methodology for a quantitative, descriptive correlational study focussed on determining the mammography health beliefs and awareness levels among females employed at a higher education institution. A quantitative research methodology focuses on quantifying data that was obtained through a research tool. The research tool employed in this research study was a questionnaire that was completed on the online platform, SurveyMonkey. This platform allowed for a questionnaire to be designed with multiple questions. Further, SurveyMonkey allowed for an unlimited number of responses. After receiving ethical approval and Gatekeeper's permission emails were sent to the sample population. The sample size required was 241 participants for data analysis to commence. The results of the data analysis will be discussed in Chapter 4.

CHAPTER 4

RESULTS

The Results Chapter is a statement of the findings of the research conducted. This chapter is presented in a logical manner to address each of the four (4) objectives:

- To establish the Mammography Health Beliefs of females working at the HEI.
- To determine the level of awareness of mammography amongst females working at the HEI.
- To determine the relationship between mammography awareness and education level.
- To develop recommendations to promote mammography awareness for females at the HEI.

The information will be presented using both descriptive statistics and inferential statistics in the form of narratives, tables, graphs and figures. Qualitative data extracted from open-ended questions will be presented in a descriptive format.

4.1 RESEARCH TOOL

The research instrument consisted of 80 items, with a level of measurement at a nominal or an ordinal level. The questionnaire was divided into 7 sections which measured various themes as illustrated in Table 4.1:

Table 4.1: Sections of the Research Tool

Section in Questionnaire	Title of Section
A	Biographical data
B	Susceptibility
C	Severity
D	Benefits
E	Barriers
F	Action
G	Efficacy

4.2 RELIABILITY OF THE QUESTIONNAIRE

The Cronbach's Alpha test was conducted on each of the six (6) constructs of the CHBMS. The results of the test should range between 0-1. The closer the score to 1 the higher the reliability of the questionnaire. The scores of the test are displayed in the table below:

Table 4.2: Cronbach's Alpha Scores per construct

Construct	Cronbach's Alpha
Susceptibility	0.813
Severity	0.615
Benefits	0.802
Barriers	0.785
Action	0.578
Efficacy	0.884

4.3 FACTOR ANALYSIS

In order for data to be reduced, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity was conducted on the six (6) constructs of the CHMBS. The results of these tests are recorded in the table below.

Table 4.3: KMO and Bartlett's Test

Section in Questionnaire	Construct	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett's Test of Sphericity		
			Approx. Chi-Square	df	Sig.
B	Susceptibility	0.807	239.759	10	0.000
C	Severity	0.729	283.796	10	0.000
D	Benefits	0.756	418.765	45	0.000
E	Barriers	0.758	408.754	66	0.000
F	Action	0.502	214.513	15	0.000
G	Efficacy	0.772	518.470	21	0.000

Sections B- G of the questionnaire were answered on a 5-point Likert Scale. The KMO is greater than 0.500 and the Bartlett's Test of Sphericity significance value is less than 0.05. In all instances, the conditions are satisfied which allows for the factor analysis procedure.

4.4 RESPONSE RATE

The total population was 645. A sample size of 241 was calculated, with 242 responses being received. Data analysis was conducted on 142 responses which equated to a response rate of 38%. All responses that did not meet the inclusion criteria (females younger than 35 years old, all males, and participants that identified as non-binary) and responses that were less than 80% complete were excluded from the analysis.

4.5 BIOGRAPHICAL DATA

This section summarises the biographical characteristics of the participants which are displayed in table 4.4.

Table 4.4: Biographical Data

Demographics	Frequency (n)	Percentage (%)
Age		
35 – 39	28	19.7
40 – 49	46	32.4
50 – 59	49	34.5
60 - 65	19	13.4
Marital Status		
Single	35	24.6
Married	78	54.9
Divorced	19	13.4
Companionship	4	2.8
Widow	6	4.2
Employment		
Permanent	128	90.1
Full-time contract	14	9.9
Faculty		
Accounting and Informatics	19	13.4
Applied Sciences	9	6.3
Arts and Design	14	9.9
Engineering and the Built Environment	6	4.2
Health Sciences	23	16.2
Management Sciences	20	14.1
No response	51	35.9
Highest Level of Education		
Degree/ Diploma/ Certificate	18	12.7
Honours/ B-Tech	34	23.9
Masters/ M-Tech	69	48.6
PhD/ D-Tech	21	14.8

All participants were South African females. The age frequency per age grouping are not similar as there are fewer participants younger than 40 years (p=0.001). More than 80% of the participants were older than 40 years. Participants in the age range 40- 49 and 50 – 59 were 32% and 34% respectively.

More than half of the sample are married (54.9%), with approximately a quarter (24.6%) being single (p<0.001). Further, a significant proportion of the participants (90.1%) were permanently employed (p<0.001).

There are six (6) faculties at the research site. A little more than a third of the participants (n=51) did not indicate which faculty they are employed in. This could be due to the fact that certain participants do not belong to a faculty but are rather employed by a department that caters to the entire HEI. The majority of the participants belong to the Faculty of Health Sciences (FoHS)(n=23), of which 11 participants have had a mammogram, followed by the Faculty of Management Sciences (n=20) of which 11 participants have had a mammogram as indicated in table 4.5 below.
The Faculties of Applied Sciences and Engineering and the Built Environment have the lowest number of participants (p<0.001).

Table 4.5: "Have you ever had a mammogram?" Vs "Which Faculty are you employed by?"

			Which Faculty are you employed by?							Total
			Accounting and Informatics	Applied Sciences	Arts and Design	Engineering and The Built Environment	Health Sciences	Management Sciences	No response	
Have you ever had a mammogram?	Yes	n	7	6	8	3	11	11	33	79
	No	n	12	3	6	3	12	9	18	63
Total		n	19	9	14	6	23	20	51	142

4.5.1 Medical Aid Benefits

Medical aid is a benefit for all staff employed permanently and on fixed-term contracts. A few of the medical aids do offer a mammography benefit. The table indicates whether the participants have medical aid and their awareness of mammography as a benefit.

Table 4.6: Medical Aid Responses

	Yes		No		Unsure	
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
Do you have medical aid (n=142)	140	98.6	2	1.4		
Does you Medical Aid have an annual Mammography Benefit (n=140)	74	52.9	19	13.6	47	33.6
Is your Mammogram charged to your Medical Savings? (n=69)	17	24.6	7	10.1	45	65.2

Most participants (98.6%) had medical aid except two (2) participants indicated that they did not have medical aid ($p<0.001$). The participants that do not have medical aid indicated the following reasons:

- “I am just appointed, still working around, on which one to choose”
- “I have not been working and could not afford one”

More than half of the participants (52.9%) indicated that their medical aid does provide a mammography benefit. A third (33.6%) were unsure, with 13.6% indicating that they did not have cover ($p<0.001$).

Approximately two-thirds of the participants (65.2%) were unsure whether the mammogram was charged to their Medical Aid Savings, with about a quarter (24.6%) indicating that the mammogram was charged to the Medical Aid Savings ($p<0.001$).

4.6 OBJECTIVE 1: TO ESTABLISH THE MAMMOGRAPHY HEALTH BELIEFS OF FEMALES AT THE HEI

There are six (6) constructs in the HBM which were answered using a 5-point Likert Scale. The constructs are as follows: Perceived susceptibility, perceived severity, perceived barrier, perceived benefits, cues to action and self-efficacy. Table 4.7 illustrates the frequency of statements per construct. The Chi-Square p-value was less than 0.001 for each statement. This indicates that there was statistical significance.

Table 4.7: Frequency per Construct

Construct	Total number of Statements
Perceived Susceptibility	5
Perceived Severity	5
Perceived Benefits	10
Perceived Barriers	12
Cues to Action	6
Self-Efficacy	7

As discussed in Chapter 3, Section 3.10, factor analysis was conducted on Likert Scale items. All statements under Sections B and G (as per table 4.3) measured what they were expected to measure ($p>0.5$) whilst Sections C-F demonstrated different trends. The results of each construct will be presented below.

4.6.1 Perceived Susceptibility

This section reports the perception of the participant in terms of their susceptibility to breast cancer in relation to mammography (refer to Table 4.8 and Figure 4.1). For all statements, the Chi-Square value was $p<0.001$. The statements have been coded as follows:

Table 4.8: Perceived Susceptibility Coding

Perceived Susceptibility Statement	Coding
My chance of getting breast cancer encourages me to have a mammogram	Susceptibility1
My poor physical health encourages me to have a mammogram	Susceptibility2
I feel that I have an increased (greater) risk/chance of getting breast cancer in the future therefore I have mammograms as recommended	Susceptibility3
My chances of getting breast cancer make me want to have a mammogram	Susceptibility4
My fear of getting breast cancer makes me want to have a mammogram	Susceptibility5

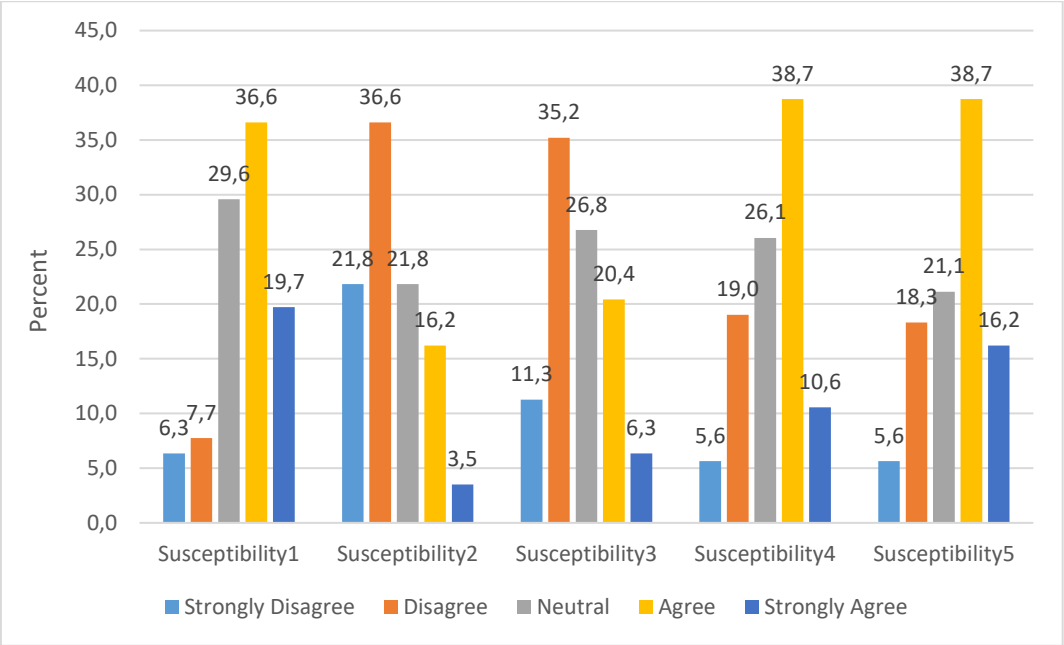

Figure 4.1: Analysis of Perceived Susceptibility

The majority of participants agreed with the statements for Susceptibility 1, 4 and 5 (36.6%, 38.7% 38.7% respectively) which is related to the participant's chances of getting breast cancer, therefore, they will have a mammogram ($p>0.05$). Susceptibility 2 and 3 illustrate that a majority of participants (36.6% and 35.2% respectively) “Disagree” that they will have a mammogram based on their personal risk i.e. their physical health and them having an increased risk of breast cancer ($p<0.05$). Two (2) statements: “My poor physical health encourages me to have a mammogram” and “I feel that I have an increased (greater) risk/chance of getting breast cancer in the future therefore I have mammograms as recommended” have mean scores less than three (3) indicating that participants disagreed with the statements. The first statement could translate to participants being in good health and therefore do not feel that they are susceptible to breast cancer, therefore, would not have a mammogram. The second statement when using Spearman’s Correlation coefficient against the Cue to Action “I have a mammogram at regular intervals (every year / every second year)” the value is 0.239 which indicates a significant correlation. When correlated against “Mammograms are not necessary as I am not at risk for breast cancer” the coefficient was -0.112 thus indicating an inverse relationship which is described as participants will have mammograms if they believe they are susceptible to breast cancer.

4.6.2 Perceived Severity

This section reports the perception of the participant in terms of the severity of breast cancer in relation to mammography (refer to Table 4.9 and Figure 4.2). For all statements, the Chi-Square value was $p<0.001$. The statements have been coded as follows:

Table 4.9: Perceived Severity Coding

Perceived Susceptibility Statement	Coding
The thought of breast cancer scares me into having a mammogram	Severity6
If I had breast cancer my career would be endangered, therefore I would rather not have a mammogram	Severity7
Breast cancer would endanger my relationship with my partner/ husband/ boyfriend/ etc therefore I would rather not have a mammogram	Severity8
Breast cancer is a hopeless disease; therefore I do not need to have a mammogram	Severity9
My feelings about myself would change if I was diagnosed with breast cancer, therefore I would rather not have a mammogram	Severity10

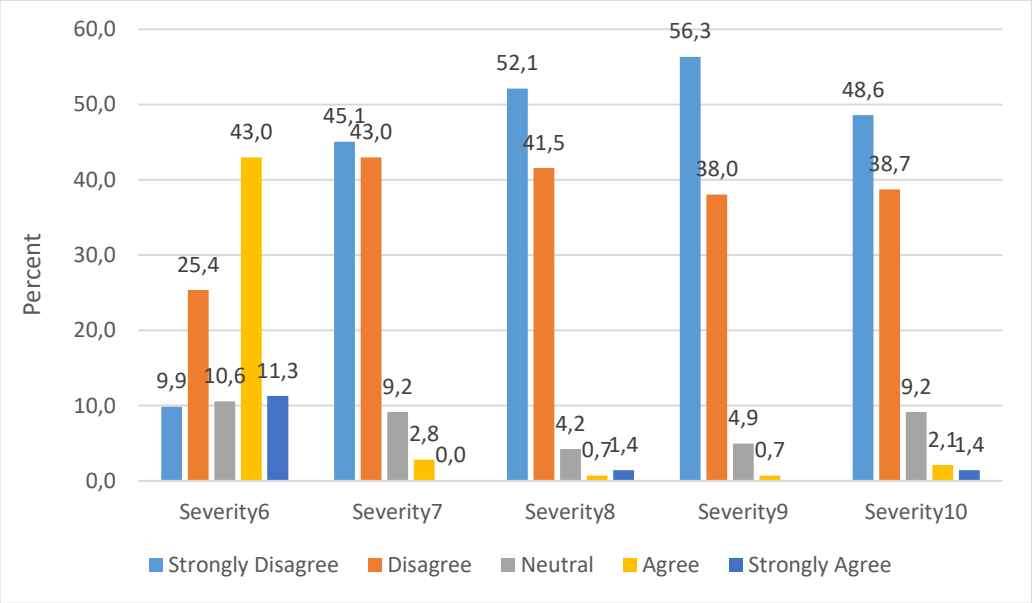

Figure 4.2: Analysis of Perceived Severity

The construct "Perceived Severity" had 5 statements (Severity6 – 10). As illustrated by Figure 4.2, Severity6 is the only statement whereby the majority of participants (43%) "Agree" that the thought of breast cancer encourages them to have a mammogram. Severity 7 – 10 illustrates that a greater percentage of participants either "Disagree" or "Strongly Disagree" with the statements. The majority of the participants indicated "Strongly Disagree" with Severity7 – 10,

with percentages being 45.1%, 52.1%, 56.3% and 48.6% respectively. Severity6 was not significant as p=0.0356 while Severity7 – 10 was significant (p<0.001).

The above frequencies are important to report due to Severity6 “Breast cancer would endanger my relationship with my partner/ husband/ boyfriend/ etc therefore I would rather not have a mammogram”. The Pearson Chi-Square p-value, when compared against age, was 0.402 and the value for marital status was 0.001 both indicating a positive relationship with Severity6. However, when compared against marital status p=0.001 indicates that there is a significant relationship between marital status and a female’s perception of the severity of breast cancer in relation to their personal relationships.

4.6.3 Perceived Benefits

This section reports the perception of the participant in terms of the benefits of mammography. This construct translates into the utilisation of mammography if the benefits are great. The Chi-Square value for each statement was p<0.001. The ten (10) statements related to this construct have been coded as shown in Table 4.10 with graphical presentation as shown by Figure 4.3.

Table 4.10: Perceived Benefit Coding

Perceived Susceptibility Statement	Coding
I would not be so anxious about breast cancer if I have regular mammograms	Benefits11
Mammograms will help me find breast lumps early	Benefits12
If I have a mammogram every 2 years, the mammogram might show a breast abnormality before it is discovered by breast self-exams	Benefits13
Mammograms can find breast lumps before a breast self-exam	Benefits14
Mammograms can help save my breasts in the long term	Benefits15
I don’t worry as much about breast cancer if I have a mammogram as recommended	Benefits16
If the university had a Mammogram Unit I would have my mammogram	Benefits17
When my GP (General Practitioner)/ Gynaecologist refers me for a mammogram, I feel good about myself	Benefits18
Having a mammogram will decrease my chances of dying from breast cancer	Benefits19
Having a mammogram will decrease my chances of requiring radical or disfiguring surgery if breast cancer occurs	Benefits20

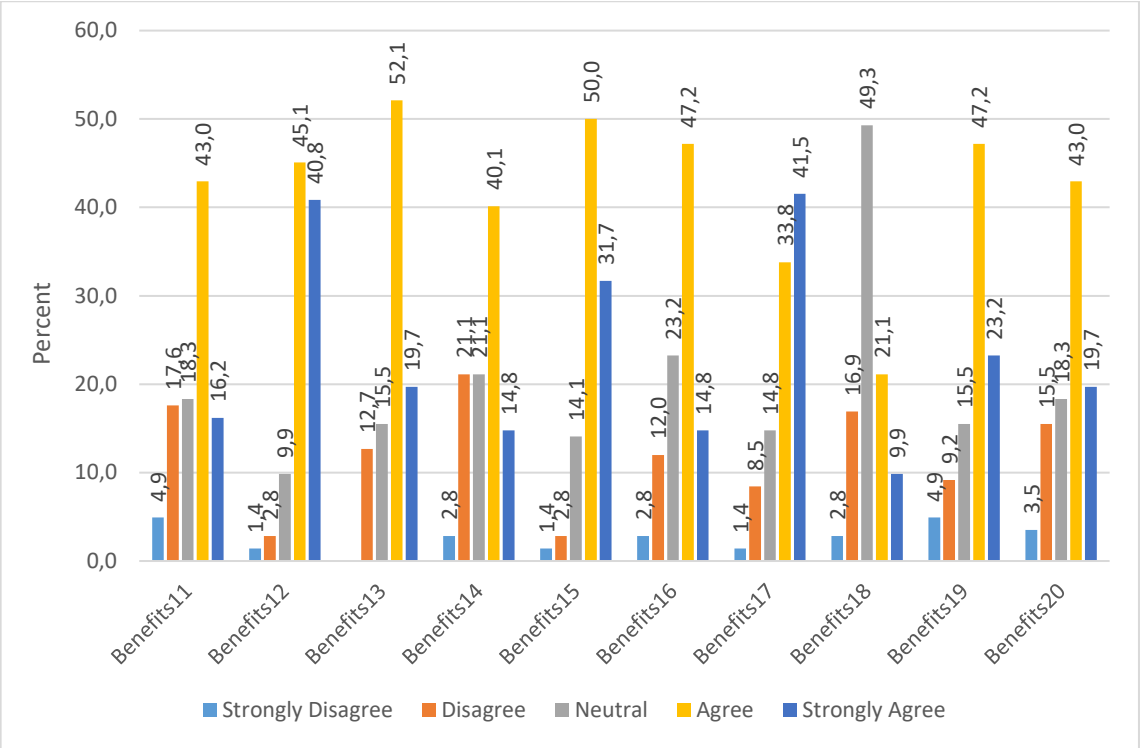

Figure 4.3: Analysis of Perceived Benefits

More than 40% of participants “Agree” to eight (8) of the ten (10) statements. Benefits11 demonstrates that 18.3% are unsure as to how they would feel about breast cancer despite regular mammograms whilst 17.6% “Disagree” with the statement (p=0.0360). Benefit14 has the same percentage (21.1%) of participants that are neutral and disagree with mammograms being able to detect breast lumps before BSE (p=0.2750). Benefit18 demonstrates that approximately 50% of participants are neutral about how they would feel when referred for a mammogram by their doctor.

4.6.3.1 Mammography Facilities at the HEI

The Benefits17 statement “If the university had a Mammogram Unit I would have my mammogram” was answered by all participants (p<0.001) (Table 4.11 refers).

Table 4.11: If the university had a Mammogram Unit I would have my mammogram

	Frequency (n)	Percent (%)
Strongly Disagree	2	1.4
Disagree	12	8.5
Neutral	21	14.8
Agree	48	33.8
Strongly Agree	59	41.5
Total	142	100.0

Less than 10% of the participants did not agree with the statement whilst 14.8% remained Neutral. 33.8% and 41.5% of participants “Agreed” and “Strongly Agreed” with the statement.

4.6.4 Perceived Barriers

This section reports the perception of the participants in terms of the barriers that would prevent an individual from undergoing a mammogram. There are twelve (12) statements in this construct. The Chi-Square value for each statement is $p<0.001$. The statements have been coded as shown in Table 4.12 followed by the graphical presentation as shown by Figure 4.4.

Table 4.12: Perceived Barriers Statement Coding

Perceived Susceptibility Statement	Coding
South Africa does not have guidelines for mammography and how often I should have a mammogram, therefore mammograms are not important	Barriers21
Mammograms are painful	Barriers22
Mammograms are time-consuming	Barriers23
Mammograms are expensive	Barriers24
I do not have the funding to have a mammogram	Barriers25
My schedule does not allow for me to have a mammogram during work hours	Barriers26
I do not have transport to have a mammogram	Barriers27
It is against my culture/ beliefs to have a mammogram	Barriers28
I do not know of any mammography facilities	Barriers29
I would have to travel far to get a mammogram	Barriers30
Mammograms are not necessary as I am not at risk for breast cancer	Barriers31
Having a mammogram would make me worry about breast cancer	Barriers32

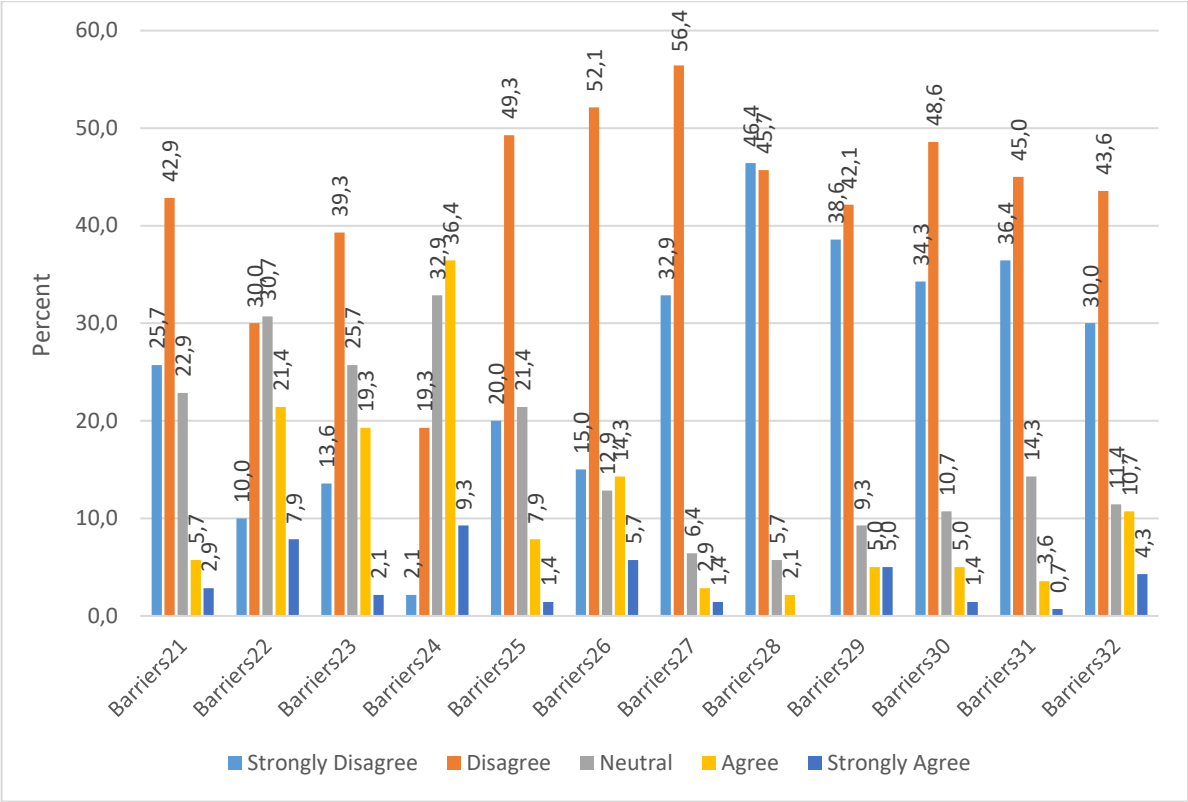

Figure 4.4: Analysis of Perceived Barriers

A greater percentage (approximately 40%) of participants disagreed with ten of the twelve statements. Barrier22 identified that 30% of participants disagreed that mammograms are painful, 30.7% of participants remained “Neutral” whilst 21.4% “Agree” that mammograms are painful. Barrier24 identified that 36.4% of participants agree that mammograms are expensive whilst 32.9% were “Neutral” on this statement. Barrier24 showed a slightly higher level of agreement (mean > 3.0) but was not significant (p= 0.353). Of the participants that remained “Neutral” (n=45), 22 participants were unsure if there was a mammogram benefit offered by their medical aid whilst 19 participants knew of the mammography benefit.

Table 4.13: "Mammograms are expensive" vs "Does your Medical Aid provide an annual Mammogram benefit"

		Does your Medical Aid provide an annual Mammogram benefit?			
		Yes	No	Unsure	Total
Mammograms are expensive	Strongly Disagree	1		2	3
	Disagree	18	5	3	26
	Neutral	19	4	22	45
	Agree	28	8	15	51
	Strongly Agree	8	2	3	13
Total		74	19	45	138

When comparing the results of the statement "I do not know of any mammography facilities" an equal percentage of participants (5%) agreed and strongly agreed with the statement. Further, the statement "My schedule does not allow for me to have a mammogram during work hours" was agreed to by approximately 20% of participants.

There are minimal barriers preventing participants from having a mammogram. This is evidenced by ten (10) of the twelve (12) statements being disagreed with by more than 39% of the participants.

4.6.5 Cues to Action

This section reports the construct of Cues to Action that would result in a participant having a mammogram. The Chi-Square value for each of the six (6) statements was $p < 0.001$. The six (6) statements have been coded as seen in Table 4.14 followed by a graphical presentation as shown by Figure 4.5.

Table 4.14: Cues to Action Coding

Perceived Susceptibility Statement	Coding
My GP (General Practitioner)/ Gynaecologist recommends that I have a mammogram annually/ every second year	Action33
I have a mammogram at regular intervals (every year / every second year)	Action34
If my GP/ Gynae advises me to have a mammogram I will attend	Action35
In October I have a mammogram because it is breast cancer awareness month	Action36
I have a mammogram after a family member/ friend/ colleague has had one	Action37
I have a mammogram after a family member/ friend/ colleague has been diagnosed with breast cancer	Action38

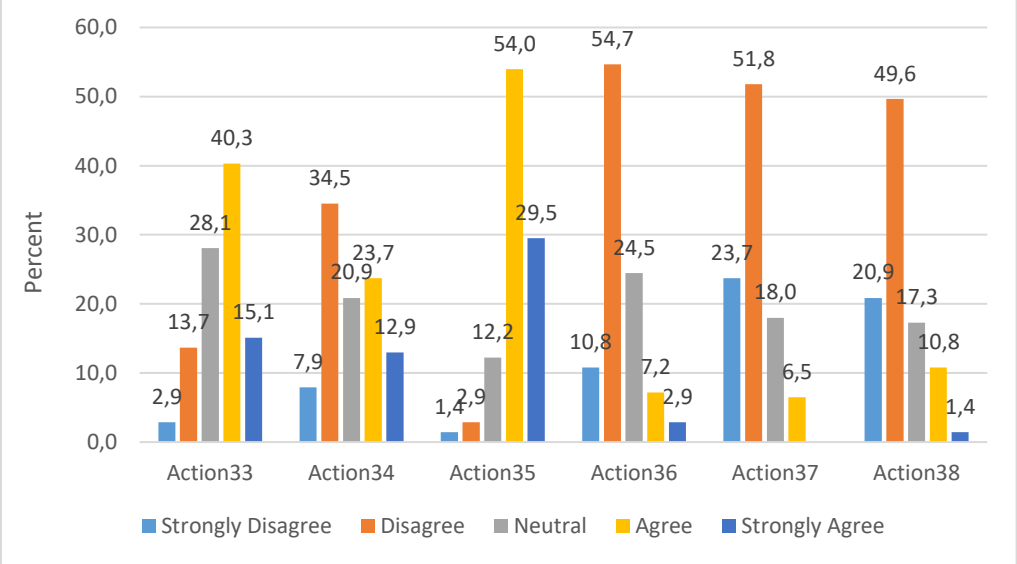

Figure 4.5: Analysis of Cues to Action

Two statements (Action33 -"My GP (General Practitioner)/ Gynaecologist recommends that I have a mammogram annually/ every second year" and Action35 -"If my GP/ Gynae advises me to have a mammogram I will attend") demonstrate a higher percentage of agreement (40.3% and 54% respectively). Action33 was not significant (p-value=0.235). Of the 39 participants that remained "Neutral", 24 participants have never had a mammogram. It is important to note that the majority of participants (40 and 18) who "Agree" or "Strongly Agree" have had mammograms before (Table 5.5 refers). Action35 showed a significantly higher level of agreement (mean>3.0; p-value>0.05). Action34 demonstrates that 42% (34.5% (Disagree) + 7.9% (Strongly Disagree)) do not have a mammogram at regular intervals with 20.9% of

participants remaining “Neutral”. The last three (3) statements (Action36 – 38) were disagreed with by more than 49% of the participants:

- Action36 - In October I have a mammogram because it is breast cancer awareness month
- Action37 - I have a mammogram after a family member/ friend/ colleague has had one
- Action38 - I have a mammogram after a family member/ friend/ colleague has been diagnosed with breast cancer

This indicates that nearly half the participants are not prompted to have a mammogram due to breast cancer awareness month or by a family member/ friend or colleague. Further to this, more than one-third of participants (34%) do not have mammograms at regular intervals.

4.6.5.1 Mammography regularity

Mammography regularity refers to the frequency at which a female undergoes mammography. The majority of participants (97.9%) answered the statement “I have a mammogram at regular intervals (every year / every second year)” ($p< 0.001$). Approximately 35% of participants have regular mammograms while more than 40% of participants do not have mammograms regularly (Table 4.15 refers).

Table 4.15: Frequency of Mammography Regularity (every year/ second year)

		Frequency (n)	Percent (%)
Valid	Strongly Disagree	11	7.7
	Disagree	48	33.8
	Neutral	29	20.4
	Agree	33	23.2
	Strongly Agree	18	12.7
	Total	139	97.9
Missing	System	3	2.1
Total		142	100.0

4.6.6 Self-Efficacy

This section reports the construct of self-efficacy in terms of a participant’s confidence in their self-care without the need for mammography. All seven (7) statements have a Chi-Square p-value<0.001. The seven (7) statements have been coded as seen in Table 4.16 with a graphical presentation that follows as shown by Figure 4.6.

Table 4.16: Self-Efficacy Coding

Perceived Susceptibility Statement	Coding
My GP/ Gynae performed a breast exam on me therefore I do not need to have a Mammogram	Efficacy39
I have a well-balanced diet, therefore I do not require a mammogram	Efficacy40
I exercise frequently, therefore I do not require a mammogram	Efficacy41
I know how to perform a breast self-exam therefore I do not require a mammogram	Efficacy42
I perform breast self-exams monthly, therefore I do not require a mammogram	Efficacy43
Breast self-exams are sufficient to discover breast abnormalities therefore I do not require a mammogram	Efficacy44
I feel confident that if I perform a breast self-exam, I would notice abnormalities in my breast, therefore there is no need for a Mammogram	Efficacy45

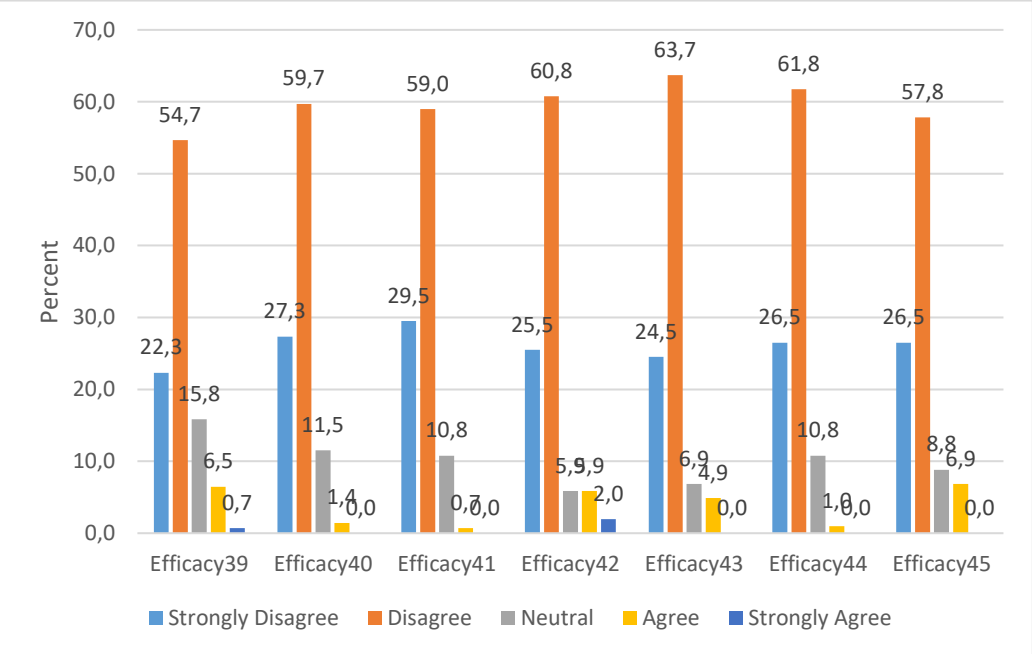

Figure 4.6: Analysis Percentages of Self-Efficacy

All statements were “Disagreed” by more than 54% of the participants. The p-values are significant as the values are <0.001 with the mean value<3.00. This indicated that participants do not rely on their abilities, nor that of breast examinations and would rather have a mammogram.

4.6.6.1 Breast Self-Examination

Four questions in the construct “Cues to Action” were related to BSE. Most of the participants (97.9%) answered the statement “Do you perform breast self-examinations?” ($p < 0.001$). More than one-quarter of participants do not perform BSE with the majority of participants (71.8%) performing BSE (Table 4.17 refers).

Table 4.17: Frequency of BSE

Do you perform breast self-examinations?			
		Frequency (n)	Percent (%)
Valid	Yes	102	71.8
	No	37	26.1
	Total	139	97.9
Missing	System	3	2.1
Total		142	100.0

4.7 OBJECTIVE 2: TO DETERMINE THE LEVEL OF AWARENESS OF MAMMOGRAPHY AMONGST FEMALES AT THE HEI

More than 50% of participants have had mammograms. The mean and standard deviation of the age at which the participant first had a mammogram was 41.14 and ± 6.85 years respectively, with the youngest being 20 years and the oldest being 57 years. The reason for the mammograms is indicated in Figure 4.7 and is as follows:

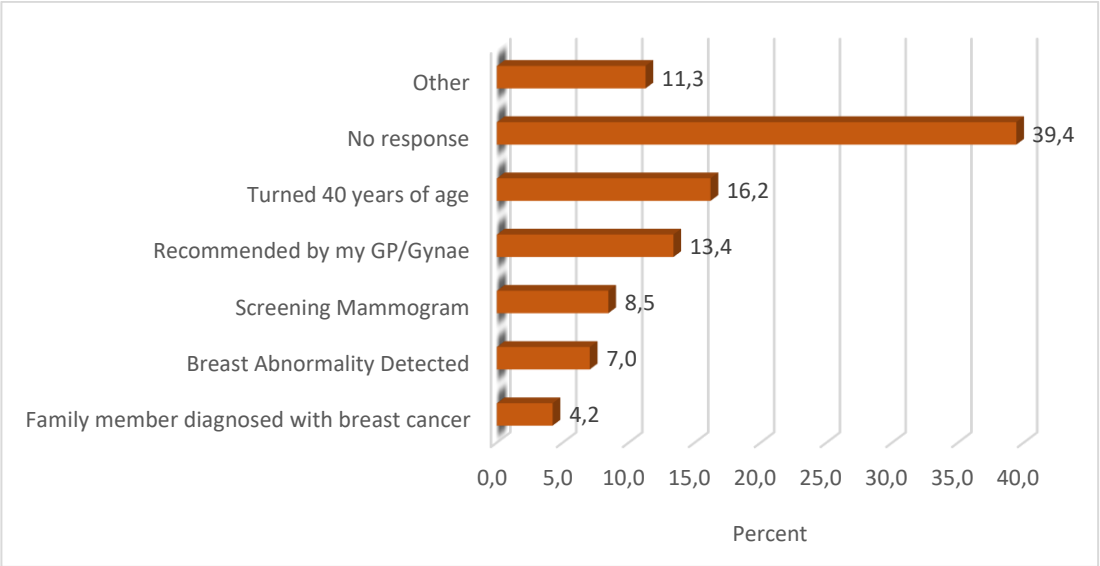

Figure 4.7: Reasons for First Mammogram

Themes highlighted for the category “Other” (11.3%) included:

- Screening
- Sign or symptom experienced

The regularity of having a mammogram is as follows:

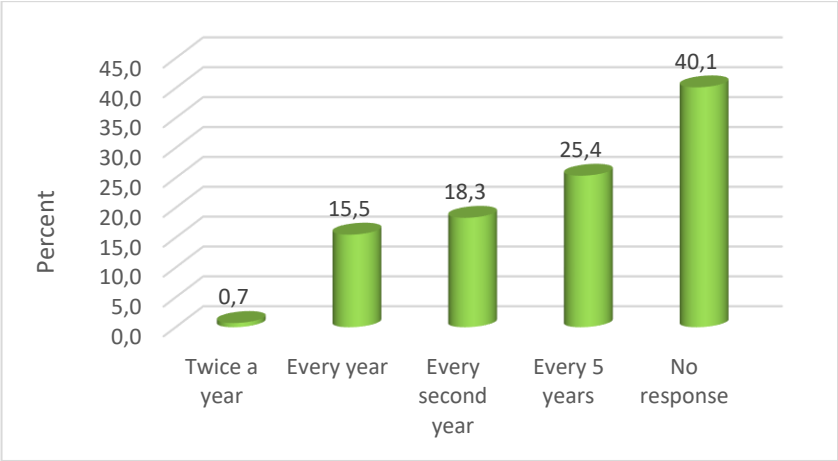

Figure 4.8: Regularity of Mammogram

The “No Response” category has a high percentage as participants that answered “NO” to the question “Have you ever had a mammogram?” would have “skipped the question related to regularity. One participant indicated having a mammogram “Twice a Year”. More than 50% of participants (n=36) that have mammograms, have one every five (5) years. The categories of “Every year” and “Every second year” indicated that 22 and 26 participants have mammograms in these two (2) categories respectively.

The information related to the biological risk factors to breast cancer was asked. There were four (4) questions as seen in Table 4.18.

Table 4.18: Breast Cancer Risk Factors

	Yes		No		Other	
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
Do you know of any maternal family member (from your mother's family) with breast cancer? (n=139)	37	26.6	102	73.4		
Have you had a mammogram before? (n=142)	79	55.6	63	44.4		
Do you have any children? (n=141)	107	75.9	34	24.1		
Have you started menopause? (n=142)	64	45.1	65	45.8	13	9.2

4.7.1 Risk Factor: Maternal Family History of Breast Cancer

More than one-quarter of participants (26.6%) have family members with breast cancer. The relationships were as follows:

- Aunts
- Cousins
- Daughter
- Sister
- Grandmother
- Mother

Table 4.19: "I have a mammogram at regular intervals (every year / every second year)" vs "Do you know of any maternal family member (from your mother's family) with breast cancer?"

		Do you know of any maternal family member (from your mother's family) with breast cancer?		
		Yes	No	Total
I have a mammogram at regular intervals (every year / every second year)	Strongly Disagree	1	10	11
	Disagree	9	38	47
	Neutral	6	22	28
	Agree	13	20	33
	Strongly Agree	6	11	17
Total		35	101	136

There are 64 participants that have started menopause with 47 participants having had a mammogram. The age of menopause was not established, however, 13 participants indicated "Other" providing reasons such as "having had a hysterectomy", or "Medication-induced menopause at an early age". Eleven (11) participants indicated that they have had mammograms.

4.7.2 Risk Factor: Age of First and Last Pregnancy

Three-quarters of the participants (75.9%) had children with the descriptive measures for the number of children, age at which the participant had their first child and last child as well as the age of menarche of the participant is shown in Table 4.20:

Table 4.20: Descriptive Measures

	n	Minimum	Maximum	Mean	Std. Deviation
Number of Children	107	1.00	4.00	1.99	0.81
Age of the participant at the birth of the first child	107	15.00	40.00	26.78	5.28
Age of the participant at the birth of their last child	107	18.00	43.00	30.83	4.94
Age of participant at menarche	141	9.00	18.00	13.03	1.60

4.7.3 Risk Factor: Menopause

There were as many participants who indicated that they were menopausal as those who were not (Table 4.18 refers). A small percentage of participants (9.2%) had indicated "Other" ($p<0.001$). Reasons for Other were as follows:

- Pre- or post-menopausal
- Hysterectomy
- Medication-induced menopause at an early age.

4.8 OBJECTIVE 3: TO DETERMINE THE RELATIONSHIP BETWEEN MAMMOGRAPHY AWARENESS AND EDUCATION LEVEL

All participants provided their Highest Level of Education. The frequency distribution per category were as follows:

- Degree/ Diploma/ Certificate: 18
- Honours/ B-Tech: 34
- Masters/ M-Tech: 69
- PhD/ D-Tech: 21

Approximately two-thirds of the participants (63.4%) had a postgraduate qualification ($p<0.001$). This indicates that a fair proportion of the participants have a higher qualification. This indicates that the responses gathered would have been from an informed (learned) source.

A Chi-Square test of independence was performed to determine whether there was a statistically significant relationship between the Highest Level of Education and various risk factors and awareness components. The results are illustrated in the tables that follow.

Table 4.21: Maternal Family History vs Highest Level of Education

			Select your Highest Level of Education				
			Degree/ Diploma/ Certificate	Honours/ B-Tech	Masters/ M-Tech	PhD/ D-Tech	Total
Do you know of any maternal family member (from your mother's family) with breast cancer?	Yes	n	5	8		8	37
		% of Total	3.6%	5.8%	11.5%	5.8%	26.6%
	No	n	13	25	51	13	102
		% of Total	9.4%	18.0%	36.7%	9.4%	73.4%
Total		n	18	33	67	21	139
		% of Total	12.9%	23.7%	48.2%	15.1%	100.0%

More than a quarter of females (26.6%) have a maternal history of breast cancer ($p=0.045$). Approximately 43% of these females have a Master's or M-tech. In a correlation between “Do you know of any maternal family member with breast cancer” with “Highest Level of Education” a value of 0.619 indicates that there is a positive correlation.

Table 4.22: Having a mammogram vs Highest Level of Education

			Select your Highest Level of Education				
			Degree/ Diploma/ Certificate	Honours/ B-Tech	Masters/ M-Tech	PhD/ D-Tech	Total
Have you ever had a mammogram?	Yes	n	9	12	41	17	79
		% of Total	6.3%	8.5%	28.9%	12.0%	55.6%
	No	n	9	22	28	4	63
		% of Total	6.3%	15.5%	19.7%	2.8%	44.4%
Total		n	18	34	69	21	142
		% of Total	12.7%	23.9%	48.6%	14.8%	100.0%

More than 50% of participants have had a mammogram. In the category of "Degree/ Diploma/ Certificate" there was an even distribution of participants that had a mammogram and those who did not. Approximately two-thirds (64.7%) of participants with an Honours/ B-Tech never had a mammogram while 60% of participants with a Masters/ M-Tech had a mammogram and 81% of participants with a PhD had a mammogram. Comparing post-graduate qualifications to undergraduate qualifications, 73.4% of post-graduate participants have had a mammogram. An equal distribution of undergraduate and postgraduate participants did not have a mammogram. Results indicate that the higher the level of education the more likely a participant is to have a mammogram (p=0.008).

Table 4.23: "How often do you have a mammogram" vs "Highest Level of Education"

			Select your Highest Level of Education				
			Degree/ Diploma/ Certificate	Honours/ B-Tech	Masters/ M-Tech	PhD/ D-Tech	Total
How often do you have a mammogram?	Every 5 years	n	3	8	17	8	36
		% of Total	2.1%	5.6%	12.0%	5.6 %	25.4%
	Every second year	n	5	6	13	2	26
		% of Total	3.5%	4.2%	9.2%	1.4 %	18.3%
	Every year	n	2	1	12	7	22
		% of Total	1.4%	0.7%	8.5%	4.9 %	15.5%
	No response	n	8	19	27	3	57
		% of Total	5.6%	13.4%	19.0%	2.1 %	40.1%
	Twice a year	n	0	0	0	1	1
		% of Total	0.0%	0.0%	0.0%	0.7 %	0.7%
Total		n	18	34	69	21	142
		% of Total	12.7%	23.9%	48.6%	14.8 %	100.0 %

There is an unequal distribution in the regularity of a mammogram across the highest level of education (p=0.025) (Table 4.23 refers). More than 25% of participants have a mammogram every five (5) years. Participants with a Masters/ M-Tech contributed a greater percentage to this 25%. Less than 20% of participants have a mammogram every two (2) years while 50% of the participants in this category have a Masters/ M-Tech. Participants with a PhD/ D-Tech

either have a mammogram every five (5) years (38.1%) or every year (33.3%). Only One participant indicated having a mammogram biannually.

In a crosstabulation between “Mammograms will help me find breast lumps early” and education level, there is no significance in the relationship as a greater percentage of participants either agreed or strongly agreed.

The crosstabulation of “If I have a mammogram every 2 years, the mammogram might show a breast abnormality before it is discovered by breast self-exams” illustrated that participants with a PhD or D-Tech have the highest level of agreement, followed by those with an Honours/ B-Tech, Degree/ Diploma/ Certificate and Masters/ M-Tech. It was also evident that a high number of participants with a Masters’ qualification remained “Neutral” or “Disagreed” with the statement.

Table 4.24: “Do you perform BSE” vs “Highest Level of Education”

			Select your Highest Level of Education				
			Degree/ Diploma/ Certificate	Honours/ B-Tech	Masters/ M-Tech	PhD/ D-Tech	Total
Do you perform breast self-examinations?	Yes	n	8	28		18	102
		% of Total	5.8%	20.1%	34.5%	12.9%	73.4%
	No	n	9	5	20	3	37
		% of Total	6.5%	3.6%	14.4%	2.2%	26.6%
Total		n	17	33	68	21	139
		% of Total	12.2%	23.7%	48.9%	15.1%	100.0%

The majority of participants (73.4%) do perform BSE. More than 50% of participants with a Degree/ Diploma/ Certificate do not perform BSE. A higher percentage of participants with an Honours/ B-Tech, Masters/ M-Tech and PhD/ D-Tech perform BSE, 84.8%, 70.6% and 85.7% respectively (Table 4.24 refers).

Table 4.25: "I feel that I have an increased (greater) risk/chance of getting breast cancer in the future therefore I have mammograms as recommended" vs "Highest Level of Education"

		Select your Highest Level of Education				
		Degree/ Diploma/ Certificate	Honours/ B-Tech	Masters/ M-Tech	PhD/ D-Tech	Total
I feel that I have an increased (greater) risk/chance of getting breast cancer in the future therefore I have mammograms as recommended	Strongly Disagree	3	2	8	3	16
	Disagree	4	10	30	6	50
	Neutral	9	10	14	5	38
	Agree	2	10	13	4	29
	Strongly Agree	0	2	4	3	9
Total		18	34	69	21	142

In a comparison of the statement "I feel that I have an increased (greater) risk/chance of getting breast cancer in the future, therefore, I have mammograms as recommended" compared against "Highest Level of Education", 142 responses were recorded (Table 4.25 refers). 37 participants indicated a family history of breast cancer (Table 4.18 refers). As indicated by Table 4.25, a total of 38 participants found the statement to be "Neutral" of which 8 participants (21.6%) had a family history. Similarly, for "Agree" and "Strongly Agree" 29 and 9 participants respectively. Half of the participants with a Degree/ Diploma/ Certificate remained neutral. Across all categories, a minority of participants "Agree" or "Strongly Agree" with the statement.

Table 4.26: "Mammograms will help me find breast lumps early" vs "Highest Level of Education"

			Select your Highest Level of Education				
			Degree/ Diploma/ Certificate	Honours/ B-Tech	Masters/ M-Tech	PhD/ D-Tech	Total
Mammograms will help me find breast lumps early	Strongly Disagree	n	0	1	1	0	2
		%	0.0%	2.9%	1.4%	0.0%	1.4%
	Disagree	n	0	0	3	1	4
		%	0.0%	0.0%	4.3%	4.8%	2.8%
	Neutral	n	4	2	5	3	14
		%	22.2%	5.9%	7.2%	14.3%	9.9%
	Agree	n	3	19	33	9	64
		%	16.7%	55.9%	47.8%	42.9%	45.1%
	Strongly Agree	n	11	12	27	8	58
		%	61.1%	35.3%	39.1%	38.1%	40.8%
Total		n	18	34	69	21	142

All participants answered the statement “Mammograms will help me find breast lumps early”. A minority of participants “Disagreed” (2.8%) and “Strongly Disagreed” (1.4%) with the statement. Approximately 80% of participants per Highest Level of Education category either “Agreed” or “Strongly Agreed” with the statement.

Table 4.27: “If I have a mammogram every 2 years, the mammogram might show a breast abnormality before it is discovered by breast self-exams” vs “Highest Level of Education”

			Select your Highest Level of Education				
			Degree/ Diploma/ Certificate	Honours/ B-Tech	Masters/ M-Tech	PhD/ D-Tech	Total
If I have a mammogram every 2 years, the mammogram might show a breast abnormality before it is discovered by breast self-exams	Disagree	n	0	4		1	18
		%	0.0%	11.8%	18.8%	4.8%	12.7%
	Neutral	n	5	4	11	2	22
		%	27.8%	11.8%	15.9%	9.5%	15.5%
	Agree	n	9	18	34	13	74
		%	50.0%	52.9%	49.3%	61.9 %	52.1%
	Strongly Agree	n	4	8	11	5	28
		%	22.2%	23.5%	15.9%	23.8 %	19.7%
Total		n	18	34	69	21	142

All participants (n=142) answered the statement “If I have a mammogram every 2 years, the mammogram might show a breast abnormality before it is discovered by breast self-exams”. A minority of participants (12.8%) “Disagreed” with the statement. Approximately 65% of participants per Highest Level of Education category either “Agreed” or “Strongly Agreed” with the statement.

4.9 CONCLUSION

This chapter presented the results of the research study. The sample size was calculated to be 241, with 242 responses being received. Of these, 142 questionnaire responses were analysed. Thus, the response rate was 38%. This chapter was structured to answer three (3) of the four (4) research objectives. Statistical significance was achieved for the majority of the Likert scale statements. Results were presented using tables, figures and narratives to explain the tables and figures.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 INTRODUCTION

This study aimed to determine the mammography health beliefs and awareness levels of females working at an HEI in SA, in terms of mammography utilisation, in order to develop recommendations to promote mammography awareness. This chapter is a discussion of the results that were presented in Chapter 4 in relation to literature. Further, a discussion of the recommendations derived from the research study as well as the limitations of the research is included. This chapter will also provide a conclusion of the research study. This chapter will provide a discussion to answer each research objective.

5.2 DEMOGRAPHICS

Two hundred and forty-two (242) responses were received for the research. One hundred and forty-two (142) responses were analysed. The responses of all participants that met the inclusion criteria were analysed provided that more than 80% of the questionnaire was completed. If participants did not meet the inclusion criteria when answering the questionnaire, they were directed to the end of the questionnaire. The criteria of citizenship and employment were important to prevent any research bias as South Africa does not have Mammography Guidelines. Further, part-time employees of the HEI may have other employment whereby they could have access to regular mammography awareness programmes.

5.2.1 Gender

In South Africa, there are three (3) gender classifications: male, female and non-binary. This study included females due to breast cancer affecting a greater percentage of females as compared to males. According to Woods et al. (2020), approximately 1% of the total number of breast cancer cases are males. Despite a rise in the number of male breast cancer cases globally, minimal research has been undertaken on this population. During the processing of data, two (2) participants that identified as “Non-Binary” were excluded from the data analysis as it was not the gender classification of interest for the research study**.**

5.2.2 Age and Marital Status

This research study included all females between the ages of 35 – 65 years old. The minimum age of participation was 35 years due to mammography being performed on females as young as 35 years when there is a maternal family history of breast cancer. The maximum age was set at 65 years due to the HEI not employing staff over the age of 65 years due to staff reaching retirement age (Procedure Manual, n.d).

In different countries, around the world, the age and frequency of mammography differ. However, it is advised that females undergo screening mammography after the age of 40. Research conducted in the different age categories generated differing results. Mammography in the age group 40 – 49 years resulted in a decrease in advanced-stage breast cancer diagnosis (Albeshan et al., 2020: 195). Moballeghi et al. (2014: 26) studied a similar population (to Albeshan et al.) in Iran, whereby the majority of participants were 43 years of age (SD= 6), with more than half of the population having a bachelor's degree and were married. However, research conducted by Ramli et al. (2019: 1914) in Kuantan, Malaysia, (to determine the relationship between health beliefs and Stage of Mammography Behaviour Adoption) on a similar age group received the majority of responses were from the age category 35-39 years, with 79.6% (n=520) of participants being married. A research study by Kirag and Kizilkaya (2019: 1+) on a Turkish Academic population, studied all females employed at a university. This was due to the study aiming to determine three (3) aspects surrounding breast cancer. The mean age of participants was 36 years (SD= 0.53) with more than 50% of the participants being married. The age of participation in the Turkish study was not in keeping with the findings of the current research study. In the current study more than 80% of the participants were older than 40 years (Table 4.4 refers).

From the different research reviewed, there is no predictable age at which females would participate in research related to mammography. It is however noted that the majority of married females would participate in mammography research. This is in keeping with the statistics of this research study as more than half the participants were married (Table 4.4 refers).

5.2.3 Faculty Distribution

The research site has a Faculty of Health Sciences (FoHS) that contains 13 departments offering health-related programmes. This faculty provided the second-highest number of responses (Table 4.4 refers). In a study conducted on healthcare workers employed at a tertiary health facility (in Nigeria), it was revealed that their level of awareness of breast cancer

and screening methods were high, however, there was a need to improve the attitude and practice amongst the population (Madubogwu et al., 2017: 268).

The majority of studies reviewed were conducted outside of an HEI. The current research study was the first of this nature to be conducted in SA, where the Mammography Beliefs at an HEI were determined. Literature reviewed discussed females as healthcare workers in hospitals or females in a general population, with the majority of females having less than a tertiary level of education. As explained by Madubogwu et al. (2017) it is important for healthcare professionals to have an increased awareness in order to educate patients. Interestingly, while the current research study revealed that although numerous participants were from the FoHS, more than half the participants never had a mammogram (Table 4.5 refers). This is an indication that there is a need for educational programs for females working in the HEI's irrespective of professional backgrounds (Nazzal et al., 2016: 2549+).

5.3 MAMMOGRAPHY AWARENESS

Mammography awareness would be any information that an individual has on mammography, inclusive of the fact that it is used to detect pathologies in the breast. Breast cancer is a deadly disease if not diagnosed or left untreated. Diagnosis includes a clinical breast examination (CBE), radiology imaging (mammography and ultrasound) and histology (post-biopsy). Breast cancer can present in many different forms, but the main presentation is a lump, either in the breast or the armpit (Madubogwu et al., 2017: 268+). Under the "Perceived benefits" section, regarding mammograms and lumps, females "Agreed" with the statements "Mammograms will help me find breast lumps early" and "If I have a mammogram every 2 years, the mammogram might show a breast abnormality before it is discovered by breast self-exams" (Benefits12 and Benefits13: Figure 4.3 refers). This demonstrated that females are aware of the benefits of mammography. Furthermore, participants do know of mammography, despite 63 participants (n=63/142) never having had a mammogram.

Research conducted amongst different populations (Alharbi et al., 2011; Obajimi et al., 2013: 3; Erdem & Toktas, 2016; Brizuela et al., 2019) revealed that there is a need to increase the mammography awareness levels. Awareness in terms of mammography, breast cancer risks, mammography cost with regards to medical aids are areas that require increased information to improve mammography utilisation. Khazir et al. (2019:5) highlighted that it is important to improve awareness as it leads to acceptance and uptake of the preventative behaviour, in this case, mammography. In addition to mammography awareness, the knowledge of breast cancer risk factors forms the basis of breast cancer prevention. Chin and Mansori (2019) hypothesised that there is a relationship between knowledge towards females' breast and their

screening intention. In their research, this hypothesis was made under the construct of “self-efficacy” as their rationale was that an increased awareness of breast cancer leads to increased knowledge and attitudes thus the perception that breast cancer screening would have a life-saving effect. This hypothesis was proven as the relationship between breast cancer knowledge and breast cancer intention was significant. Therefore, it is important to improve the level of awareness of both breast cancer and mammography among the participants in the current research. Methods to improve awareness will be discussed later in the chapter.

The level of mammography knowledge and usage was low in the study by Erdem and Toktas (2016) which was surprising as the study was conducted among primary healthcare workers (doctors, nurses, midwives, etc.). In a similar study by Madubogwu et al. (2017) among tertiary healthcare workers, that “aimed to assess the knowledge, attitude and practice of breast cancer screening” revealed that all three (3) elements (knowledge, attitude and practice) were high. In addition, there was a significant correlation between knowledge and practice with a participant’s level of education and occupation. The research concluded that an improvement in the attitude and practice of breast cancer screening was needed (Madubogwu et al., 2017).

In previous studies (Alharbi et al., 2011; Obajimi et al., 2013; Gathirua-Mwang et al., 2016) there was an inverse relationship between education level and mammography utilisation but a directly proportional relationship with awareness. Therefore, it can be rationalised that if a female is aware of mammography and its benefits they are more likely to undergo mammography screening (Alharbi et al.,2011; Obajimi et al.,2013; Erdem & Toktas, 2016; Goel & O’Conor, 2016). A study by Khazir et al. (2019:3) revealed a significant relationship (p=0.02) between education and mammography. Despite the study population being different, in that the majority of participants were housewives, more than a quarter of females had mammograms. A study by Rahime et al. (2020:35) on a population in Iran found that lower education levels significantly impact a female’s decision to have a mammogram.

In the current research study, the majority of participants had a postgraduate qualification. A great number of participants (n=69/ 142) indicated that they possess a Masters or M-Tech qualification. Despite the high levels of education among the participants in the current study, it is evident that there is a need for mammography awareness at the HEI.

Risk factors for breast cancer include a family history of breast cancer, the presence of the breast cancer gene (BRCA1/2), previous breast cancer, early menstrual period, late menopause, age of first pregnancy, number of pregnancies as well as density of breast tissue (Lee et al., 2020:47). There are other risk factors that can be grouped under the category of

“preventable risk factors”. These include overweight, decreased exercise, smoking and alcohol (Biganzoli, 2020: 67). The research by Omar et al. (2020: 4) on medical students in Syria, revealed the population had an average knowledge of the risk factors associated with breast cancer. More than half of the participants did not know that early onset of menstruation and late onset of menopause are risk factors. Further, being overweight was also not identified by more than half the participants as a risk factor for breast cancer. A study by Khazir et al. (2019:3) on the Iranian population revealed a significant relationship to mammography behaviour. In the current research study, the participant's risk for breast cancer varies (Table 4.20 refers) as there are participants that are at a higher risk for breast cancer due to the age at which a participant had their first child together with the number of pregnancies they had and the age of menarche. Furthermore, more than one-quarter of females have a family history of breast cancer (Table 4.18 refers) thus increasing their risk for breast cancer.

Breast self-examination (BSE) is a part of the screening process for breast cancer (Albeshan et al., 2020: 195). Females are advised to conduct a BSE at least once a month, 2 weeks after their menstrual period. The practice of BSE allows for females to be responsible for their own health (Erdem &Toktas, 2016: 1). Further, it encourages breast awareness. Research conducted by Kirag and Kizilkaya (2019: 2) in Turkey, reported that the country’s national guidelines are that all females over the age of 20 years must perform BSE monthly as well as have a CBE once every two (2) years. In the current research, it was revealed that the majority of females do conduct BSE. In addition to this, females realise the importance of mammography even with the use of BSE, as the majority of participants disagreed with the statement “I perform breast self-exams monthly, therefore I do not require a Mammogram” (Figure 4.6 refers). The study by Erdem and Toktas (2016) had a higher percentage of females that performed BSE, however, it was not performed regularly. A study by Omar et al., (2020) conducted on female medical faculty students in terms of BSE, revealed that fear is a barrier. Even though there is no pain in performing BSE, it was reported that fear of painful examinations prevents females from undertaking the examination. In the current research (Table 4.17 refers) the majority of the participants perform BSE, however, information on the frequency of BSE was not part of the current research.

Despite there being no Mammography Guidelines in South Africa, females over the age of 40 years are advised to have a screening mammogram biennially. Females that are at risk of breast cancer, are advised to have screening mammograms more frequently. A delay in screening mammography can lead to an increase in the number of deaths (Rahime et al., 2018: 36). From the results of the current research study, 37 participants (n=37/139) do have a maternal family history of breast cancer with 20 participants (n=20/37) indicating that “I don’t worry as much about breast cancer if I have a mammogram as recommended”.

In a Turkish Academia research setting (Kirag & Kizilkaya, 2019:4), where there are national breast cancer screening guidelines, more than one-third of the participants were screened for breast cancer in the six (6) months prior to data collection. This screening was in terms of mammography as more than 40% of the participants indicated having a BSE or CBE. Findings of a study by Lee et al. (2020: 47) is quoted as "the difference in access to screening could be a factor; while the national screening program covers a mammography every two years in women over the age of 40 years, the participation rate varies by household income and education (36.2% and 42.9% among the lowest and highest income groups, respectively, in 2005)". The current research revealed that the majority of participants (>50%, Table 4.5 refers) have had a mammogram. However, participants are not undergoing mammography as recommended. As seen in Table 4.15 approximately one-third of participants have mammograms every year or every second year (Figure 4.8 provides a further breakdown). This finding demonstrates the need for an awareness programme and will be discussed in the "Recommendations" section later in this chapter.

5.4 HEALTH BELIEF MODEL

The Health Belief Model has been used in research studies, in health and other research fields (DePoy & Gitlin, 2016; Dodel & Mesch, 2017; Jeong & Ham, 2017; Gilfoyle et al., 2019). The Health Belief Model has six (6) constructs. The CHBMS which is used for BSE practices was adapted to determine the mammography health beliefs of females at the HEI. This is the first research to be conducted on this population type, as far as could be ascertained by the researcher.

5.4.1 Perceived Susceptibility

An individual's perception in terms of their chance of developing breast cancer which leads them to have a mammogram is termed "perceived susceptibility" (Chen et al. 2020). In a study by Lee et al. (2020: 107) which evaluated the actual risk versus the perceived risk for breast cancer, the majority of females that were at a lower risk for breast cancer perceived their risk to be greater. A possible reason for this could be that the study, by Lee et al. (2020), was conducted in the USA where there is an active Mammography screening programme in place due to the national guidelines available. It can then be rationalised that such a programme increases a patient's awareness of mammography.

The Canadian study that evaluated the construct of perceived susceptibility (Gilfoyle et al., 2019:135+) revealed that female mammography screening utilisation was linked to participants' perception of their risk of breast cancer. This was similar to the findings of a Malaysian research study (Chin & Mansori, 2019:5).

The research tool, in the current study, contained five (5) statements related to perceived susceptibility in relation to mammography utilisation. There was a clear indication by the participants that they are more likely to have a mammogram if they perceive they are susceptible to breast cancer. However, many participants felt their risk for developing breast cancer in the future was low therefore it did not have any impact on their utilisation of mammography services. This could be due to their lack of knowledge of breast cancer risks and mammogram utilisation, as SA does not have Mammography screening guidelines.

5.4.2 Perceived Severity

Perceived Severity is the participant's perception of the severity of breast cancer thus increasing or preventing them from utilizing mammography (Chen, et. al. 2020). Moballeghi et al. (2015: 25+) studied a similar population as the population in the current study. The results of the study showed that females had poor knowledge of mammography. Further to this, the participants did not perceive breast cancer to be severe. An Iranian study among females with a low to a moderate perception of their severity revealed that the majority do not undergo mammography. This finding was due to the female's perceptions of the barriers, self-efficacy, motivation (cue to action), and susceptibility of mammography (Khazir et al., 2019:3). The research on the Malaysian population did not find a significant relationship between severity and breast cancer screening (Chin & Mansori, 2019:6).

In contrast to the literature findings, the current study's research tool, which contained five (5) statements related to perceived severity, revealed that participants view cancer as a threatening disease and would therefore have a mammogram.

5.4.3 Perceived Benefits

An individual's perception of the benefits of mammography encourages the utilisation of imaging (Chen et al. 2020). Previous studies cited by Khazir et al. (2019:4) explained the importance of a female understanding the benefits of mammography in order to improve mammography utilisation. Further, it was mentioned that females that utilised mammography and performed BSE had a higher perceived benefit of mammography. In the Malaysian population, there was a significant relationship between perceived benefits and a female's intention to utilise breast cancer screening tools (Chin & Mansori, 2019:6).

It was evident from the findings of the current study that the perceived benefits of mammography, such as early detection of lumps and breast abnormalities, encouraged the participants to have a mammogram. These findings are in keeping with literature. It is also

important to note that participants indicated that they would utilise mammography services if there were facilities available on-site and serves as evidence for the need for screening mammography services to be offered to staff members at the HEI.

5.4.4 Perceived Barriers

Perceived barriers are the perceptions of a participant which would prevent them from having a mammogram (Chen et al. 2020). Depending on the population, there are many barriers that could lead to females not having a mammogram. A study by Rahime et al. (2020:33+) identified finance, location of mammography facilities, the inability to make decisions based on culture and education levels as potential barriers to having a mammogram. In terms of cultural reasons, females may not attend screening mammograms because of the belief that only God can heal her (Rahime et al., 2020:33+), or the fact that the decision to attend a mammogram is that of the male authority e.g. her husband. South Africa is a very diverse nation, with many cultural and religious views and practices. The current research did not find culture to be a barrier to having a mammogram (Figure 4.4 Barrier28 refers).

The study by Gilfoyle et al. (2019: 141) concluded that despite a significant relationship between perceived susceptibility and mammography screening, the perceived barriers could also affect mammography screening. The relationship between barriers and breast screening intentions in the Malaysian population is an inverse relationship (Chin & Mansori, 2019: 6). In other words, the lower the number of barriers the greater the chance of a female undergoing mammography.

A study conducted in Iran identified 5 barriers to mammography including lack of time, knowledge of mammography facilities, fear of a lump, finance and the pain of a mammogram (Khazir et al., 2019:5). The current study revealed that cost and pain are possible barriers to mammography. Cost is a barrier to mammography as many participants are not aware of the benefits offered by their Medical Aid (Table 4.6 refers). A few medical aid companies do offer an annual Mammography screening benefit whereby the cost is charged directly to the Medical Aid. There is a need to highlight to the participants the benefits offered by the Medical Aid.

Mammography does utilise compression, which assists with image quality and reduces the radiation dose (Lampignano & Kendrick, 2018: 752). Compression may be painful to females depending on the presence of a pathology. This could result in a negative mammography experience thus causing a barrier to mammography. In addition, a negative experience of a close relative or friend could cause a barrier. This research study did not investigate the reasons behind pain as a barrier, however, this could be addressed in awareness programmes.

5.4.5 Cues to Action

A cue to action is an external stimulus that prompts the participant into having a mammogram (Chen et al., 2020). The Iranian study (Khazir et al., 2019:4+) did not utilise the construct "cues to action" rather the classification of "Motivation". Under this classification, it was revealed that females with a history of breast cancer utilised mammography more than females without a history of breast cancer. In a study by Chin and Mansori (2019), under perceived benefits, it was stated that if a female is advised and motivated by a family member, friend or sibling to have a mammogram there is a greater chance of having a mammogram. However, in the current research study, these statements are considered "CUES TO ACTION". In another research study, this construct was used as a "Moderator" to the main four (4) variables (Chin & Mansori, 2019:4). In addition, this "Moderator" included internal cues such as breast cancer signs. The current research study did not include any of the internal signs but rather focused on the external cues as the tool was an adaptation to CHBMS. The research by Chin and Masori (2019: 7+) discussed the importance of having a healthcare provider informing/ discussing/ encouraging females in terms of breast cancer (personal risks, benefits of early detection, BSE and mammography). In this way females have the information and are able to absorb information before making an appointment for a mammogram, rather than discovering a lump and going through the process with fear. Further, it was suggested that at health screening programmes, breast cancer screening be included. This will be discussed later in the chapter.

There were six (6) cues to action statements provided. As seen in Figure 4.5, the majority of participants Agreed and Strongly Agreed that their GP or gynae recommend that they undergo mammography. Therefore, participants will have a mammogram if a person of "status" advises them to have a mammogram (Meguerditchian et al., 2012).

5.4.6 Self-Efficacy

Self-efficacy refers to the participant's reliance on their own abilities to help detect breast cancer therefore they do not need mammography (Chen et al., 2020). A study by Rahime et al. (2020:35) revealed that females of a greater social influence are more likely to have a mammogram. Further, females are more likely (by a factor of five) to have a mammogram if there is a family history of breast cancer. This was similar to findings by Khazir et al. (2019) in the Iranian study as discussed earlier. Further, self-efficacy was one of the constructs which were associated with mammography utilisation.

There were seven (7) statements in the research tool for the construct “self-efficacy”. All statements were “disagreed” with by the majority of the participants. Although the majority “disagreed” there are a fair number of participants that believe in self-efficacy.

5.5 RECOMMENDATIONS TO PROMOTE MAMMOGRAPHY AWARENESS AT THE HEI

One of the objectives of this research study was to develop recommendations to promote mammography awareness at the HEI. Based on the responses obtained from the research tool recommendations to improve mammography awareness and utilisation, were developed. This is illustrated in Table 5.1 below:

Table 5.1: Recommendations to improve mammography awareness and Method to achieve the recommendation

Recommendation	Method to achieve the recommendation
To improve knowledge of medical aid benefits	Host an open day whereby the different medical aid companies would advise on their benefits.
To fast track the licensing of the mammography unit at the HEI	Approach the HEI for funding to start up the process. Source a radiologist from the surrounding area to partner with the Radiography Clinic.
To enhance awareness through workshops, pamphlets, reminders, support groups	Host at least two (2) Mammography Awareness workshops with the assistance of the Employee Awareness Programme (March and October) Distribution of a quarterly pamphlet highlighting the benefits of mammography Organization of a support group among HEI staff.

5.5.1 Recommendation 1: To improve knowledge of Medical Aid Benefits

More than a third of the participants were not aware of their medical aid benefits for mammography. Hence, a recommendation would be to have an Open Day at the HEI whereby the different medical aid companies would provide information on all the benefits they offer. Additional information on how a mammogram is to be covered can also be provided should medical aid companies not offer an annual mammography benefit. Both types of information can also be included in a comprehensive pamphlet. This pamphlet can also be included in the Human Resources induction programme for all new staff members to allow staff to make an informed choice about their medical aid. A total of 13.6% of participants indicated that their medical aids did not provide a mammogram benefit. There is a possibility that this could be

true. The Open Day could be scheduled for the fourth (4th) quarter to allow staff members to change medical schemes or plans in the new year. The Open Day can include a variety of health assessments as well as wellness assessments performed by suitable healthcare professionals of the medical companies. Staff members can also invite their families to the Open Day, as their dependents might require mammograms as well. In this way, the extended community of the HEI will gain valuable knowledge.

5.5.2 Recommendation 2: To fast track the licensing of the mammography unit at the HEI

This research study revealed that more than 75% of participants would have their mammograms at the HEI. As the HEI has a mammography unit installed, recommendations are to be made to fast-track the licensing of the unit in order to offer this service to the staff of the HEI. In order to license the Mammography unit a radiologist and a mammographer are needed. For screening mammography the radiologist does not have to be onsite. As the radiography department (at the HEI) has a mammographer, partnership with a radiologist is needed. The radiography department can approach higher management for funding to assist with the initial start-up costs that would be required as well as source a radiologist from the surrounding community that would be willing to run the mammography facilities. This study is a clear indication of the necessity of starting this process and engaging in negotiations to set up the mammography unit for patients.

5.5.3 Recommendation 3: To enhance awareness through workshops, pamphlets, reminders, support groups

It is important for breast awareness campaigns to be hosted in order to improve the knowledge and awareness of females. This will in turn improve utilisation of mammography for the detection of cancers in their early stages (Albeshan et al., 2020:197). Chin and Mansori (2019) suggested that breast cancer survivors should be invited to speak at awareness campaigns as this would help other females in their journey of mammography and help them know that life with a breast cancer diagnosis is possible.

The majority of participants (70%) do know that mammograms have the ability to discover breast lumps before BSE. BSE aids in the detection of signs of breast pathology apart from breast tumours. Females are advised and encouraged to conduct a BSE every month, at least two (2) weeks after their menstrual cycle. The research study revealed that 37 (n=37/139) participants do not perform BSE. Therefore, BSE can be promoted at the awareness programmes as well as pamphlets can be designed and distributed monthly to serve as a reminder for females to perform their BSE. The technique of BSE can be illustrated in the

pamphlets together with information on what to look for during the examination and what actions are to be taken in the event that abnormalities are discovered.

South Africa (SA) does not have Mammography Guidelines. Radiologists would recommend follow-up mammograms based on an individual's history and personal risk. It is advised that females have their first mammogram at 40 years of age. In the current research study, 79 participants (n= 79/142) have had a mammogram. However, the study revealed that participants do not have mammograms regularly, i.e. every two (2) years. As part of an awareness programme a breast surgeon can present a talk on the importance of mammography. This information can be included in a pamphlet that can be circulated to HEI staff on a quarterly basis. A breast surgeon is recommended due to the findings of the "Cues to Action", whereby the status of the communicator influences a female to have a mammogram.

The awareness programme can be held twice a year. The first programme can be held in February to coincide with World Cancer Day and a second programme at the beginning of October due to Breast Cancer Awareness Month.

5.6 LIMITATIONS OF THE RESEARCH STUDY

Due to COVID-19 and the country being in lockdown, the majority of staff were working remotely and had limited access to emails. The entire study population were sent emails to participate in the research study, however, a 38% response rate was achieved. A higher number of responses would have been preferred, however, as this research was conducted utilising online questionnaires, this rate was acceptable (Graglia, 2021).

There were 242 responses received. Of those responses, 100 were not used due to the following reasons:

- Participants that did not meet the inclusion criteria participated in the survey.
- Less than 80% of the questionnaire was completed.
- Participants in the gender category "Non-Binary" were excluded as the inclusion criteria specified "females". The inclusion of the statistics of this category would have rendered the results invalid.

The reasons for not having a mammogram should have been asked as these would have added to the barriers to mammography that females experience that might not have been asked in the "Perceived Barriers" section of the questionnaire. Furthermore, these reasons could be addressed during the awareness programme.

The questions related to “Risk Factors” in “Self-Efficacy” should have been asked under risk factors as well, i.e., physical health, exercise, diet. Further, questions on “smoking” should have been asked. These health-related factors have the ability to increase a female’s risk of breast cancer depending on how poorly maintained these areas are.

5.7 RECOMMENDATIONS FOR FUTURE RESEARCH

Research into the personal risk of females in relation to the utilisation of screening mammography can be conducted. The data will assist in providing targeted awareness and assistance programmes for females that are at a higher risk for breast cancer. Furthermore, should the HEI provide mammography screening services, females would be able to have their mammograms at the HEI.

Research to determine the relationship between the level of awareness and faculty can be conducted. In the research study conducted, the participant was not required to provide their faculty and department. The relationship between the level of awareness and faculty is important as employees that are healthcare workers can educate their students about mammography from a younger age. This will in turn improve mammography awareness levels for a larger population of individuals.

A qualitative study can be conducted to build on or unpack the data of the current research study further. This will gain understanding in areas that were not explored in this study, such as lifestyle or health factors that increase breast cancer risks and the reasons for not having a mammogram. The data from this type of research could assist in the motivation for National Mammography Screening Guidelines to be developed.

A similar study on the male population can be conducted as there is limited research on male mammography globally and there is no research in SA. The results of the current research study can be compared to the proposed research.

Future research studies can include the male population as breast cancer statistics in males is increasing globally.

5.8 CONCLUSION

This quantitative, descriptive correlational, research study established the Mammography Health Beliefs of females at an HEI, determined the mammography awareness levels, determined the relationship between awareness levels and derived areas to promote awareness. This study was conducted on a total population of 645 females, with ages ranging between 35 to 65. A sample of 242 females was reached. The response rate was 38%. The questionnaire contained three (3) sections (Demographics, risk factors and HBM Constructs) but data analysis divided the questionnaire into seven (7) sections (demographics and each of the six HBM constructs). Descriptive and inferential statistical analysis was performed on the responses through the use of SPSS 26.0.

It was noted that the majority of participants were between the ages of 40 and 59 years and held a Masters or M-Tech qualification. The analysed statistics aided in the answering of the research questions and objectives. The research showed that the majority of females have had a mammogram however, the regularity of mammograms is not within the advised frequency (either yearly or biennially). Further, a majority of females are well informed of the benefits of mammography and know that mammograms have the ability to detect breast lumps before breast self-examination.

This study was important to conduct as there is a lack of research among females about mammography screening in the South African context. Further, there were minimal mammography research studies based on staff employed by a tertiary education institution. Thus, this current research study added to the current body of knowledge.

The researcher is grateful to all participants of the study.
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APPENDICES

APPENDIX A: QUESTIONNAIRE

This Questionnaire pertains to your knowledge, beliefs, and awareness of mammography and the utilisation thereof. A maximum of 20 minutes of your time will be required. There are 3 Sections. Kindly complete all questions to the best of your ability as all responses are of value to the researcher.

Please mark with an **X** were appropriate.

Section A: Demographics

1. Gender: Female ☐ Male ☐
2. Age: < 35 ☐ 35 – 39 ☐ 40 - 49 ☐ 50 – 59 ☐ 60 – 65 ☐
3. Are you a South African Citizen: Yes ☐ No ☐
4. State your Ethnicity: _____
5. State your Marital Status: _____
6. Employment: Permanent ☐ Full time Contract ☐
7. Which Faculty are you employed by: _____
8. Which department or office do you work in: _____
9. State your Job Title: _____
10. State your Highest Level of Education: _____ (PhD/D-Tech, Masters/ M-Tech, Honours/B-Tech, Degree/ Diploma/ Certificate)
11. Do you have Medical Aid: Yes ☐ No ☐

    11.1 If Yes, answer the following:

    11.1.1 Is there an annual Mammogram benefit: Yes ☐ No ☐ Unsure ☐

    11.1.2 Is your Mammogram charged to your Medical Savings:

    Yes ☐ No ☐ Unsure ☐

    11.2 If No, Provide a reason: Cost ☐ Unnecessary ☐

Section B: (Mark with an X where appropriate)

Risk factors		
	Yes	**No**
1. Do you know of any family member with breast cancer? 1.1 If Yes, Provide relationship: _____		
2. Have you had a mammography before? (If yes answer questions 2.1 – 2.3) 2.1 State your age of first mammogram and reason: _____ 2.2 How often do you have a ,ammogram? 2.2.1 Every year 2.2.2 Twice a year 2.2.3 Every second year 2.2.4 Every 5 years 2.2.5 Other: Specify_____ 2.3 State the payment method for your mammogram? _____		
3. Do you have any children? (if yes answer questions 3.1 – 3.3) 3.1 How many children do you have? _____ 3.2 How old were you when your first child was born? _____ 3.3 How old were you at the birth of your last child? _____		
4. State the age of your first menstrual cycle: _____		

Section C: Mark with an X the most correct answer

	Strongly Agree (5)	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
Perceived Susceptibility					
1. My chance of getting breast cancer encourages me to have a mammogram.					
2. My poor physical health encourages me to have a mammogram.					
3. I feel that my chances of getting breast cancer in future are good therefore I have mammograms as recommended.					
4. My chances of getting breast cancer makes me want to have a mammogram.					
5. My fear of getting cancer makes me want to have a mammogram.					

	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
Perceived Severity					
6. The thought of breast cancer scares me into having a mammogram.					
7. If I had breast cancer my career would be endangered, therefore I would rather not have a mammogram.					
8. Breast cancer would endanger my relationship with my partner, husband, boyfriend therefore I would rather not have a mammogram.					
9. Breast cancer is a hopeless disease, therefore I do not need to have mammogram.					
10. My feelings about myself would change if I got breast cancer, therefore I would rather not have a mammogram.					
Perceived Benefits					
11. I would not be so anxious about breast cancer if I have regular mammograms.					
12. Mammograms will help me find lumps early.					
13. If I have a mammogram every 2 years, I may find a breast lump before it is discovered by breast self-exams.					
14. Mammograms can find breast cancer before a breast self-exam.					
15. Mammograms can help save my breasts in the long term.					
16. I don't worry as much about breast cancer if I have a yearly mammogram.					
17. If the university had a Mammogram Unit I would have my mammogram.					
18. When my General Practitioner/ Gynaecologist refers me for mammogram, I feel good about myself.					

	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
19. Having a mammogram will decrease my chances of dying from breast cancer.					
20. Having a mammogram will decrease my chances of requiring radical or disfiguring surgery if breast cancer occurs.					
Perceived Barriers					
21. South Africa does not have guidelines for having a mammogram, therefore it is not important.					
22. Mammograms are painful.					
23. Mammograms are time consuming.					
24. Mammograms are expensive.					
25. I do not have the funding to have a mammogram.					
26. My schedule does not allow for me to have a mammogram during work hours.					
27. I do not have transport to have a mammogram.					
28. It is against my culture/ beliefs to have a mammogram.					
29. I do not know of any mammography Facilities.					
30. I would have to travel too far to get a mammogram.					
31. Mammograms are not necessary as I am not at risk for breast cancer.					
32. Having a mammogram would make me worry about breast cancer.					
Cues to Action					
33. My General Practitioner/ Gynaecologist recommends that I have a mammogram annually/ every second year.					
34. I have a mammogram at regularly intervals.					
35. If my General Practitioner/ Gynaecologist advises a mammogram I will attend.					

	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
36. In October I have a mammogram because it is breast cancer awareness month.					
37. I have a mammogram after a family member/ friend/ colleague has had one.					
38. I have a mammogram after a family member/ friend/ colleague has been diagnosed with breast cancer.					
Self-Efficacy					
If you perform breast self- examinations, answer questions 39-42.					
39. I know how to perform a breast self-exam therefore I do not require a mammogram.					
40. Breast self-exams are sufficient to discover breast cancer therefore I do not require a mammogram.					
41. I perform breast self-exams monthly, therefore I do not require a mammogram.					
42. I feel confident that if I perform a breast self-exam, I would notice abnormalities in my breast, therefore there is no need for a Mammogram.					
43. My General Practitioner/ Gynaecologist performed a breast exam therefore I do not need to have a Mammogram.					
44. I have a well-balanced diet, therefore do not require a mammogram.					
45. I exercise frequently, therefore I do not require a mammogram.					

Kindly provide any further information regarding your knowledge of mammography that may not have been covered by the questionnaire.

_____

_____

_____

_____

Thank you for participating in this research.

If you require any emotional support please contact the Employee Wellness Office on 031 373 2250.

APPENDIX B: PERMISSION LETTER TO USE CHAMPION'S HEALTH BELIEF SCALE

INDIANA UNIVERSITY
SCHOOL OF NURSING

May 1, 2019

Mrs. R. Melissa Pillay

B Tech Radiography

Clinical Instructor

Cape Peninsula of Technology

Western Cape Province

South Africa

Dear Mrs. Pillay,

Thank you for your interest in my work. You have permission to modify and use the Champion Health Belief Model and mammography scale as long as you cite my work and send me an abstract of your work.

Sincerely,

Victoria Champion, PhD, RN, FAAN
Mary Margaret Walther Distinguished Professor
Edward W. and Sarah Stam Cullipher Endowed Chair
Assistant Director of Population Science
Indiana University Simon Cancer Center

APPENDIX C: PARTICIPANTS INFORMATION AND CONSENT LETTER

LETTER OF INFORMATION AND CONSENT LETTER

Mammography Health Beliefs and awareness levels among females working at a Higher Education Institution in South Africa

Principle Investigator/s/researcher:

Rosemary Melissa Pillay,

[redacted]

[redacted] / Melissa.naidoo@live.com

0791842908 / [redacted]

Supervisors:

Dr Kathleen Naidoo & Mrs Valdiela Daries

Ethical Clearance:

Faculty of Health and Wellness Sciences Research Ethics Committee (HWS-REC); duly registered with the National Health Research Ethics Council (NHREC): REC-230408- 014.

Brief Introduction and Purpose of the Study:

This study will identify if females working at [redacted] are breast aware and if you (in your personal capacity) have used mammography facilities in the past. It was noted that staff at [redacted] enquire about mammography facilities due to the functional radiography clinic available on the [redacted]. These females generally have discovered a breast lump. Therefore the researcher wishes to determine the Mammography Health Beliefs and awareness levels among females working at [redacted] in terms of mammography utilisation, in order to develop recommendations to promote mammography awareness.

Outline of the Procedures:

This study will be conducted amongst females 35 years of age and above and are permanently employed or employed on a fixed term contract by the [redacted] The following participants will be excluded from the study:

a. All females younger than 35 years of age. Mammography is recommended for females above the age of 40 and all females between the age of 35 -39 years with a positive maternal history of breast cancer.
b. All males employed by the HEI as the researcher is interested in the female population due to the research problem.
c. All non-South Africa females as South Africa does not have recommended screening guidelines for breast cancer.
d. All part-time female employees of the HEI as their full-time work environment could have mammography awareness programmes thus creating research bias.

Participation is on a voluntary basis. Therefore participants are free to withdraw from the study at any point without any consequences. All participants will be required to answer an online questionnaire, the link is provided below.

Risks or Discomforts to the Participant:

There are no risks or anticipated discomfort to you. Should the answering of the questionnaire result in emotional distress, please contact the Employee Wellness Office on 031 373 2250 and arrangements for counseling can be made.

Benefits:

There is no reward or remuneration for participating in the research. Once the research has been completed a thesis will have to be written up. The results will be shared with the Employee Wellness Office, published in a peer reviewed journal and possibly presented at a conference.

An objective of the study is to develop recommendations to promote mammography awareness, therefore a possible workshop will be held or pamphlet will be compiled for distribution to departments.

Reason/s why the Subject May Be Withdrawn from the Study:

You will be excluded should you not meet the inclusion criteria.

Remuneration:

There is no remuneration for participating in the research.

Costs of the Study:

Participants do not have to contribute towards the study.

Confidentiality:

Confidentiality will be ensured as the Internet Protocol (IP) addresses for each respondent will not be received, only the responses will be sent to the researcher.

Research-related Injury:

There are no injuries expected due to the nature of the data collection.

Clarification of terms in the questionnaire

Feedback to the participants:

Breast Awareness	Knowing your breasts and being able to identify when there is an abnormality (NICE, 2019)
Breast Lump	A breast lump is a localized swelling, protuberance, bulge, or bump in the breast that feels different from the breast tissue around it or the breast tissue in the same area of the other breast. Used interchangeably with the term “breast mass”
Breast Self-Examination (BSE)	Visual and physical examination of one’s own breasts.
Education Level	In this study education level refers to the highest level of study.
Recommended	Refers to a referral for a medical procedure from the doctor (General Practitioner (GP) / Gynaecologist (Gynae))

Feedback will be provided to the study population through email. Further, the findings of the study will be shared with Employee Wellness Office for distribution with the possibility of a workshop being hosted during Breast Cancer awareness month.

Persons to Contact in the Event of Any Problems or Queries:

Dr Kathleen Naidoo (Naidooka@cput.ac.za / 021 959 6848/5591)

Mrs Valdiela Daries (DariesV@cput.ac.za)/ 021 959 6538/ 5595)

For Health and Wellness Sciences Ethics enquiries e-mail
Ms C. Lackay - Lackayc@cput.ac.za

Thanking you for your participation

Melissa Pillay

APPENDIX D: PERMISSION LETTER TO CONDUCT STUDY AT HEI

102 Carmont

116 Mountain Rise

Carrington Heights

4001

The Professor [redacted]

[redacted]

01 March 2020

Dear Professor [redacted]

REQUEST FOR PERMISSION TO CONDUCT STUDY

I, Mrs Rosemary Melissa Pillay, [redacted] am currently registered as a part-time Master of Science in Radiography student at the Cape Peninsula of Technology (CPUT). My research is titled: Mammography Health Beliefs and awareness levels among females working at a Higher Education Institution in South Africa. This topic arose as staff had inquired from me (the Mammography Coordinator for the [redacted] regarding the availability of mammography facilities due to the functional Radiography Clinic facilities currently servicing the [redacted] community and community at large. However, it was noted that the inquiring staff were symptomatic for breast pathology.

I therefore require permission to conduct this study on all female employees (permanent and fixed term contract) at [redacted] above the age of 40 years as well as females between the ages of 35 and 39 with a maternal history of breast cancer. A Quantitative study will be conducted utilising SurveyMonkey. All qualifying females will be sent an email containing the Letter of Information and Consent and the link to the questionnaire and will be given 4 weeks to answer the questionnaire. Participation in the research is voluntary and I will have no access to the

information of those that did not participate in the research. Anonymity of [redacted] and the staff will be maintained as the name of the [redacted] will not be utilised nor will I have access to the details of the staff that participant. As the questionnaire takes approximately 20 minutes to complete, staff will be able to participate during their lunch break or complete it at home if preferred. Completion of the questionnaire will therefore not interfere with work responsibilities.

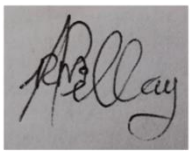
I further require permission to access the Management Information System (MIS) data for the most recent statistics for my study population as well as permission to obtain the [redacted] email addresses of staff that fall within the inclusion criteria, for research purposes.

My Supervisors are employees of the CPUT (Dr Kathleen Naidoo:Naidooka@cput.ac.za and Mrs Valdiela Daries: DariesV@cput.ac.za) and may be contacted on the details provided for further information.

My research proposal is attached for your perusal. Your support and permission (in writing) to perform this study will be greatly appreciated.

Yours sincerely

R. Melissa. Pillay



[redacted] / melissa.naidoo@live.com

APPENDIX E: LETTER TO CPUT RESEARCH ETHICS COMMITTEE

102 Carmont

116 Mountain Rise

Carrington Heights

4001

The Research Ethics Committee CPUT Health and Wellness

03 February 2020

Dear Sir/Madam Chair

REQUEST FOR PERMISSION TO CONDUCT STUDY

I, Mrs Rosemary Melissa Pillay, [redacted] am currently registered as a part-time Master of Science in Radiography student at the Cape Peninsula of Technology (CPUT). My research is titled: Mammography Health Beliefs and awareness levels among females working at a Higher Education Institution in South Africa. This topic arose as staff had inquired from me (the Mammography Coordinator for the [redacted]) regarding the availability of mammography facilities due to the functional Radiography Clinic facilities currently servicing the [redacted] community and community at large. However, it was noted that the inquiring staff were symptomatic for breast pathology.

I therefore require permission to conduct this study on all female employees (permanent and fixed term contract) at [redacted] above the age of 40 years as well as females between the ages of 35 and 39 with a maternal history of breast cancer. A Quantitative study will be conducted utilising SurveyMonkey. All qualifying females will be sent an email containing the Letter of Information and Consent and the link to the questionnaire and will be given 4 weeks to answer the questionnaire. Participation in the research is voluntary and I will have no access to the information of those that did not participate in the research. Anonymity of the HEI and the staff will be maintained as the name of the HEI will not be utilised nor will I have access to the details

of the staff that participant. As the questionnaire takes approximately 20 minutes to complete, staff will be able to participate during their lunch break or complete it at home if preferred. Completion of the questionnaire will therefore not interfere with work responsibilities.

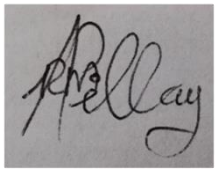
Further, I will have to obtain permission from the Research office of HEI in order to access the Management Information Systems (MIS) data for the most recent statistics for my study population as well as permission to obtain the email addresses of staff that fall within the inclusion criteria, for research purposes.

My Supervisors are employees of the CPUT (Dr Kathleen Naidoo:Naidooka@cput.ac.za and Mrs Valdiela Daries: DariesV@cput.ac.za) and may be contacted on the details provided for further information.

My research proposal is attached for your perusal. Your support and permission (in writing) to perform this study will be greatly appreciated.

Yours sincerely

R. Melissa. Pillay



melissa.naidoo@live.com [redacted]

APPENDIX F: ETHICAL APPROVAL

Cape Peninsula University of Technology

HEALTH AND WELLNESS SCIENCES RESEARCH ETHICS COMMITTEE (HW-REC)
Registration Number NHREC: REC- 230408-014

P.O. Box 1906 • Bellville 7535 South Africa
Symphony Road Bellville 7535
Tel: +27 21 959 6917
Email: simonsy@cput.ac.za

9 September 2020
REC Approval Reference No:
CPUT/HW-REC 2020/H18

Faculty of Health and Wellness Sciences

Dear Ms RM Pillay

Re: APPLICATION TO THE HW-REC FOR ETHICS CLEARANCE

Approval was granted by the Health and Wellness Sciences-REC to Ms RM Pillay for ethical clearance. This approval is for research activities related to research for Ms RM Pillay at Cape Peninsula University of Technology.

TITLE : Mammography Health Beliefs and awareness levels among females working at a Higher Education Institution in South Africa.

Comment :

Approval will not extend beyond 10 September 2021. An extension should be applied for 6 weeks before this expiry date should data collection and use/analysis of data, information and/or samples for this study continue beyond this date.

The investigator(s) should understand the ethical conditions under which they are authorized to carry out this study and they should be compliant to these conditions. It is required that the investigator(s) complete an **annual progress report** that should be submitted to the HWS-REC in December of that particular year, for the HWS-REC to be kept informed of the progress and of any problems you may have encountered.

Kind Regards

Ms Carolynn Lackay
Chairperson – Research Ethics Committee
Faculty of Health and Wellness Sciences

APPENDIX G: GATEKEEPERS PERMISSION

[redacted]

23rd September 2020
Mrs Rosemary M Pillay
c/o Department of Medical Imaging and Therapeutic Sciences
Faculty of Health and Wellness Sciences
Cape Peninsula University of Technology

Dear Mrs Pillay

PERMISSION TO CONDUCT RESEARCH AT THE [redacted]

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research and Innovation Committee (IRIC) has granted **Full Permission** for you to conduct your research "Mammography health beliefs and awareness levels among females working in a Higher Education Institution in South Africa" at the [redacted].

The [redacted] may impose any other condition it deems appropriate in the circumstances having regard to nature and extent of access to and use of information requested.

We would be grateful if a summary of your key research findings would be submitted to the IRIC on completion of your studies.

Kindest regards.
Yours sincerely

[redacted]

[redacted]