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**Knowledge, Attitude, Belief and Perception on Breast Cancer and
Screening Practices Among Ghanaian Immigrants Living in
Germany and Compatriots Living in Ghana.**

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Master's Degree of Public Health**

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DECLARATION

I Mandy Opoku- Amankwah, declare that this thesis titled KNOWLEDGE, ATTITUDE, BELIEF AND PERCEPTION ON BREAST CANCER AND SCREENING PRACTICES AMONG GHANAIAN IMMIGRANTS LIVING IN GERMANY AND COMPATRIOTS LIVING IN GHANA presented this original work carried out by me under the supervision of Prof. Dr. med. Ralf Reintjes and Mr. Ransford Asamoah .I confirm that this research work was carried out while I was still a master student at the Hamburg University of Applied Sciences. In this research work, I accessed past published research work of others and used all the sources appropriately.

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DEDICATION

I dedicated this research work to the ALMIGHTY GOD, the giver of all wisdom, knowledge and understanding, and to my family.

ACKNOWLEDGEMENT

I give thanks to Almighty God for the guidance and protection over me throughout this program. I give all the Glory to God for the strength and grace received throughout the duration of my study.

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LIST OF ABBREVIATION

Abbreviation	Meaning/Phrases
AJCC	American Joint Committee on Cancer
BC	Breast Cancer
BCSP	Breast Cancer Screening Practice
BSE	Breast Self-Examination
BSGI	Breast Specific Gamma Imaging
CDA	Child Development Association
DBT	Digital Breast Tomosynthesis
DM	Digital Mammography
DCIS	Ductal Carcinoma in Situ
FFDM	Full Filled Digital Mammography
FDG	Fludeoxyglucose
GLOBOCAN	Global Cancer Incidence, Mortality and Prevalence
CBE	Clinical Breast Examination
HG	Hamburg, Germany
IAEA	International Atomic Energy Agency
IARC	International Agency for Cancer Research
KG	Kumasi, Ghana
NHIS	National Health Insurance Scheme
PEM	Position Emission Mammography
SPSS	Statistical Package for Social Sciences
USPSTG	United State Preventive Services for Task Force
WHO	World Health Organization

ABSTRACT

Background: Breast cancer is the most common cancer in both developing and developed countries and is the leading cause of cancer mortality in women. Breast cancer in women is considered a huge public health problem in Ghana with critical effect on the healthcare systems and medical expenditure.

Objectives: The aim of this study is to investigate on the knowledge, attitudes, belief and perception on breast cancer and screening practices among Ghanaian immigrants living in Germany and compatriots living in Ghana.

Methods: A cross-sectional study was performed on 200 Ghanaian women between 20 to 60 years old living in Hamburg, Germany and Kumasi, Ghana. 100 participants from each countries of residence. The demographic characteristics, reproductive history, knowledge, belief, breast cancer, screening practices and the geographical differences on breast cancer screening. Participants were assessed through an online survey questionnaire.

Results: The mean age of the participants in the study for women living in Hamburg, Germany (30.44 ± 6.7) and Kumasi, Ghana (30.58 ± 9.1). Most of the participants in the study revealed a high level of education up to Tertiary level in both countries of residence (HG 79%, KG 91%). The study revealed a statistically significant association between the educational status and self-reported knowledge on both breast cancer and screening practices. Mann-U Whitney HG ($U=4327$, $P=.008$) KG (5000 , $P=.008$). There was no statistical association between the religious status and knowledge on breast cancer and screening practices (HG ($U=4999$, $P=.997$) KG (5000 , $P=1.000$)). There was a statistically significant association between the age and self-reported knowledge on breast cancer and screening practices HG ($U=9602$, $P=.018$) KG (9130 , $P=.028$). A large proportion of the participants usually get their source of information from the media and medical practitioners in both countries of residence. Media (HG55%, KG 56%) Medical practitioners (HG32%, KG30%).

Conclusion: The study revealed that the level of knowledge, awareness and perception about breast cancer and screening practices among Ghanaian women in both countries of residence is very high, and the participants proved good level of screening practices. More research should be conducted on the prevalence of the breast cancer in Ghana.

CHAPTER ONE

1.0. INTRODUCTION

1.0.1 Background

Breast cancer is the most common cancer in both developing and developed countries and is the leading cause of cancer mortality in women. The global estimate of cancer burden in the year 2000 is approximately 10 million new cancer cases and is responsible for 6 million cancer deaths. Breast cancer is the most recurrent and about 1 in 10 cancers affecting women (1). The World Health Organization in 2018 reported about 627,000 women died of breast cancer which is approximately 15% of all cancer deaths in women (2).

In Ghana and other developing countries, women have a low participation rate of breast cancer screening services which leads to late presentation, diagnosis, and results in poor outcomes with a high mortality rate among women (3,4,5).

A scientific study conducted in Ghana and other communities in sub-Saharan Africa revealed that breast cancer in indigenous black African populations is often severe with negative prognostic features (6,7). Some prognostic features reported in the study include young age at presentation of breast cancer, advanced stage of diagnosis, large tumor size, high-grade histologic sub-types, and low rate of hormone receptor positivity (7,8,9,10,11). Scientific evidence concluded that women's perceptions and attitudes towards breast cancer treatment and screening are influenced by both economic and socio-cultural factors; policymakers need to consider the factor when planning public health initiatives (12).

Today, there is statistical evidence that nearly 40,000 people with a Ghanaian migration background live in Germany (13). A report from a scientific population-based registry in Germany by Robert Koch reported 117.4 incidence rates of breast cancer in women and 1.1 incidence rate in men in 2012 with a mortality rate of 23.9 in women (14).

1.0.2. Problem Statement

Breast cancer in women is considered a huge public health problem in Ghana with a critical effect on healthcare systems and medical expenditure (15). The incidence rates of breast cancer in women have increased due to late presentation with poor outcome of treatment in most developing countries like Ghana. The five-year survival rate of breast cancer is less than 25% in Ghana (16).

Ghana as a developing country lacks comprehensive data on cancers, most of the data found are hospital-based. According to the International Agency for Cancer Research (IARC) in 2012, reported the incidence of breast cancer in women which ranges from 27 per 100,000 in central Africa (17). The same study reported the low incidence rate of breast cancer in sub-Saharan Africa

with a high mortality rate (18,19). Late presentation and advanced stages of diagnosis of breast cancer in women are highly prevalent in the region (20). Poor survival rate observed in sub-Saharan Africa was due to the late presentation of the disease, poor health care infrastructure, and lack of adequate funding (18).

1.0.3. Justification

Numerous studies revealed that lack of basic knowledge and an effective information delivery system for breast cancer further threatens the life and well-being of women. Breast cancer is a silent killer among women who have no knowledge and are ignorant about breast cancer and breast diagnostic screening methods for early detection (21).

1.0.4. Significance of the study

This study will help to determine if a Ghanaian woman living in Hamburg and compatriots living in Ghana are likely to have more information and knowledge about breast cancer and screening practices to improve on early detection to reduce breast cancer cases.

1.0.5. Research Gaps

- There is gaps in research on the late presentation of breast cancer cases among African women.
- Little is known about the risk factors for breast cancer among African women.
- There are less information and large gap on attitude and behavior about breast cancer screening and treatment.

1.1. AIMS AND OBJECTIVES

The main purpose of this study is to investigate on the knowledge, attitudes, belief and perception on breast cancer and screening practices among Ghanaian immigrants living in Germany and compatriots living in Ghana.

1.1.1. Objectives

- To assess the educational background and religion belief on women's knowledge about breast cancer and screening practices.
- To explore how age, affect breast cancer screening practices.
- To determine the geographical differences of participants knowledge and breast cancer screening.

1.2. RESEARCH QUESTIONS

- What is the effect of educational background and religion belief on women's knowledge about breast cancer?
- Does age affect breast cancer screening practices among women?
- What are the geographical differences of participants knowledge and breast cancer screening?

CHAPTER TWO

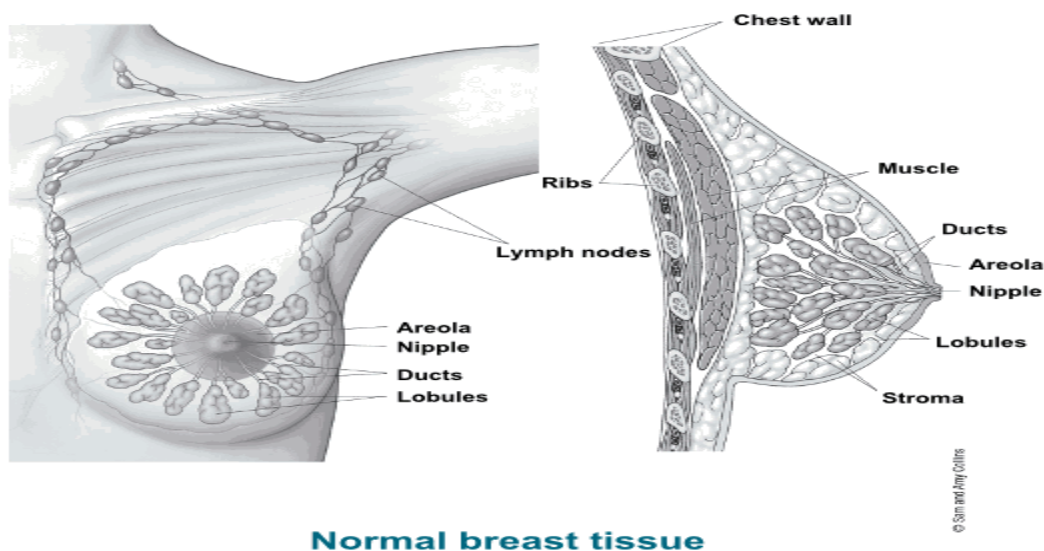
2.0. LITERATURE REVIEW

2.0.1. BREAST CANCER

Breast cancer begins when cells in the breast grow out of control. The cells in breast typically form a tumor that can only be seen on an x-ray or felt as a lump. The tumor is malignant (cancer) if the cells can grow into (invade) surrounding tissues or spread (metastasize) to distant areas of the body. Breast cancer mostly occurs in women and can also be seen in men (22).

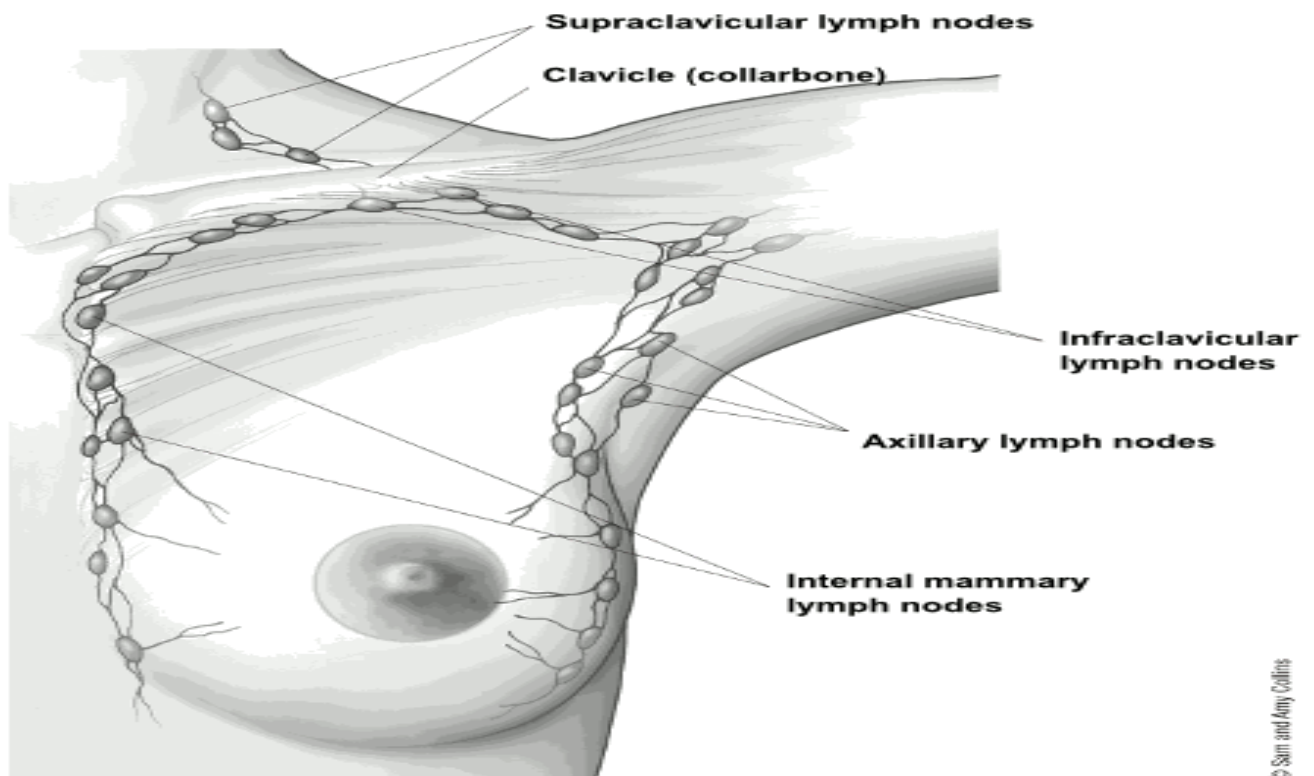
Breast cancers begins in various part of the breast. Mostly breast cancers commence in the ducts that carry milk to the nipple (ductal cancers) (22). Several breast cancers begin in the glands that produce breast milk (lobular cancers). Some types of breast cancer are less common. Sarcomas and Lymphomas are small number of cancers that start in other tissues in the breast. Even though numerous types of breast cancer can result in a lump in the breast, not all breast cancer causes lumps in the breast. Most breast lumps are benign and not cancer (malignant). Non-cancerous breast tumors are abnormal growths but do not spread outside of the breast and they are not life threatening. But some benign breast lumps can increase a woman's risk of developing breast cancer (22).

Figure 1: Illustration of a Normal Breast Tissue



Breast cancer can circulate when the cancer cells get into the blood or lymph system and are transported to other parts of the body. The lymph system is a network of lymph (or lymphatic) vessels found throughout the body that connects lymph nodes (small bean-shaped collections of immune system cells). The transparent fluid inside lymph vessels called lymph contains tissue byproducts and waste material as well as immune system cells. The lymph vessels help to take lymph fluid away from the breast. In the case of breast cancer, cancer cells can enter these lymph vessels and start to grow in lymph nodes. Most lymph vessels in the breast drain into the lymph nodes under the arm (axillary nodes), the lymph nodes around the collar bone (supraclavicular [above the collar bone] and infraclavicular [below the collar bone] lymph nodes) and the lymph nodes inside the chest near the breast bone (internal mammary lymph nodes) (22).

Figure 2: Illustration of Lymph Nodes in Relation to the Breast



Lymph nodes in relation to the breast

2.1.1. Risk Factors and Causes of Breast Cancer

Studies have shown that women's risk for breast cancer is due to a combination of factors. The major factors that increase the risk of breast cancer are being a woman and getting older. Breast cancers are mostly found in women who are 50 years old or older. Research suggests that other factors such as smoking, being exposed to chemicals that can cause cancer, and changes in other hormones due to night shift working, genetic mutation, reproductive history, dense breasts, personal history of breast cancer or non-cancerous breast cancer diseases, family history of breast cancer, previous treatment using radiation therapy, overweight or obesity after menopause, taking hormone replacement therapy and drinking alcohol may also increase breast cancer risk (23).

2.1.2. Types of Breast Cancer

The most common types of breast cancer include

- Invasive ductal carcinoma. Cancer cells grow outside the ducts into other parts of breast tissue. Invasive cancer cells can also spread or metastasize to other parts of the body (24,25).
- Invasive lobular carcinoma. Cancer cells spread from lobules to nearby breast tissues. These invasive cancer cells can also spread to other parts of the body (24,25).
- Paget breast disease (also known as Paget nipple disease and mammary Paget disease) is a rare type of cancer involving the skin of the nipple. Often, the darker circle of skin around it is called the areola. Most people with Paget breast disease also have one or more tumors inside the same breast. These breast tumors are either ductal carcinoma in situ or invasive breast cancer (25, 26).
- Inflammatory breast cancer. In inflammatory breast cancer, the cancer has spread to the skin of the breast. The breast looks red and swollen and feels warm. Redness and warmth occur because cancer cells block lymph vessels in the skin. The skin of the breast may also show a dimpled appearance called peau orange (like the skin of an orange). Some breast lumps may not be felt in the breast. Inflammatory breast cancer may be Stage IIIB, Stage IIIC, or Stage IV (23).

Figure 3: Inflammatory breast cancer of the left breast showing peau d'orange and inverted nipple.



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2.1.3. Diagnosis and staging of Breast Cancer (23)

The stage of a breast cancer is determined by the cancer's characteristics such as how large it is and whether it has hormone receptors. The stages of breast cancer help to figure out the prognosis, the likely outcome of the disease, decide on the best treatment options and to determine if certain clinical trials may be a good option for the treatment.

Breast cancer stage is generally expressed as a number on a scale of 0 through IV — with stage 0 describing non-invasive cancers that remain within their original location and the stage IV of breast cancer illustrate invasive cancers that spreads outside the breast and to the other parts of the body.

A pathology report usually includes information that is used to calculate the stage of the breast cancer whether it is limited to one area in the breast, or it has circulated to healthful tissues inside the breast or to other parts of the body. The breast cancer staging system called the TNM system, is overseen by the American Joint Committee on Cancer (AJCC). In the past, stage number was calculated based on just three clinical characteristics such as T, N, and M.

- the size of the cancer tumor or it has grown into near tissue (T)
- or whether the cancer is in the lymph nodes (N)
- or if the cancer has spread to other parts of the body outside the breast (M)

The American Joint Committee on Cancer (AJCC) in 2018, reorganized the breast cancer staging standards to add additional cancer characteristics to the T, N, M system to determine a cancer's stage:

- tumor grade: describes a measurement of how significantly the cancer cells look like normal cells
- estrogen and progesterone receptor status: means if the cancer cells have receptors for the hormone's estrogen and progesterone?
- HER2 status: means the cancer cells is making too much of the HER2 protein.
- Oncotype DX score, implies if the cancer is estrogen-receptor-positive, HER2-negative and there is no cancer in the lymph nodes.

The updated AJCC breast cancer staging standards have determined the stage of a cancer in a more complicated but accurate method. The characteristics of each stage below are generalized.

Stage 0 illustrates the non-invasive breast cancers such as DCIS (ductal carcinoma in situ). In stage 0, there is no proof of cancer cells or non-cancerous abnormal cells break out of the part of the breast in which they started or getting through to or entering the near normal tissue.

Stage I explains an invasive breast cancer (which means cancer cells are breaking through to or invading the normal nearby breast tissue) Stage I is apportioned into smaller group known as IA and IB. In general, stage IA explains an invasive breast cancer in which the tumor measures up to 2 centimeters (cm) and the cancer has not spread outside the breast, there are no lymph nodes involved while the stage IB defines an invasive breast cancer in which there is no tumor in the breast as a replacement for small groups of cancer cells which is larger than 0.2 millimeter (mm) but not larger than 2 mm are found in the lymph nodes or there is a tumor in the breast that is no larger than 2 cm and there are small groups of cancer

cells larger than 0.2 mm but not larger than 2 mm in the lymph nodes. When the cancer is either estrogen-receptor-positive or progesterone-receptor-positive, it is most likely to be classified as stage IA. A microscopic invasion is possible in stage I breast cancer. In microscopic invasion, the cancer cells have just started to invade the tissue outside the lining of the duct or lobule, but the invading cancer cells cannot measure more than 1 mm.

The stage II of breast cancer is apportioned into smaller group known as IIA and IIB. Stage IIA defines invasive breast cancer in which no tumor can be found in the breast, but cancer (larger than 2 millimeters [mm] is found in 1 to 3 axillary lymph nodes (the lymph nodes under the arm) or in the lymph nodes near the breast bone (found during a sentinel node biopsy) or the tumor measures 2 centimeters (cm) or smaller and has spread to the axillary lymph nodes or when the tumor is larger than 2 cm but not larger than 5 cm and has not yet spread to the axillary lymph nodes. If the cancer tumor measures between 2cm and 5 cm and has not yet spread to the lymph nodes or parts of the body away from the breast is HER2-negative it is expected to be categorized as stage I.

Similarly, if the cancer tumor measures between 2 and 5 cm and has not spread to the lymph nodes means HER2-negative, is estrogen-receptor-positive, is progesterone-receptor-negative, has an Oncotype DX Recurrence Score of 9, it is believed to be classified as stage IA.

Although stage IIB describes invasive breast cancer in which the tumor is larger than 2 cm but no larger than 5 centimeters, small groups of breast cancer cells larger than 0.2 mm but not larger than 2 mm are found in the lymph nodes or the tumor is larger than 2 cm but no larger than 5 cm, cancer has spread to 1 to 3 axillary lymph nodes or to lymph nodes near the breastbone (found during a sentinel node biopsy) or the tumor is larger than 5 cm but has not spread to the axillary lymph nodes. Then if the cancer tumor measures between 2cm and 5 cm and cancer is found in 1 to 3 axillary lymph nodes, is HER2-positive, estrogen-receptor-positive, progesterone-receptor-positive, it is expected to be classified as stage I.

The stage III is split into subgroups known as IIIA, IIIB, and IIIC. Stage IIIA defines an invasive breast cancer in which either no tumor is found in the breast or the tumor may be any size; cancer is found in 4 to 9 axillary lymph nodes or in the lymph nodes close to the breastbone (it is detected during imaging tests or a physical exam) or when the tumor is larger than 5 centimeters (cm); small groups of breast cancer cells (larger than 0.2 millimeter [mm] but not larger than 2 mm) are found in the lymph nodes or the tumor is larger than 5 cm; cancer has spread to 1 to 3 axillary lymph nodes or to the lymph nodes close to the breastbone (found during a sentinel lymph node biopsy), when the cancer tumor measures more than 5 cm

across and is known as grade 2, the cancer is found in 4 to 9 axillary lymph nodes, is estrogen-receptor-positive, is progesterone-receptor-positive, is HER2-positive and is expected to be classified as stage IB.

In general stage IIIB explains invasive breast cancer in which the tumor may be of any size and has spread to the chest wall and or to the skin of the breast and caused swelling or an ulcer which may spread up to 9 axillary lymph nodes or may have spread to lymph nodes close to the breastbone. If the cancer tumor measures more than 5 cm around and is grade 3, cancer is found in 4 to 9 axillary lymph nodes, is estrogen-receptor-positive, is progesterone-receptor-positive, is HER2-positive. It is expected to be classified as stage IIA.

The inflammatory breast cancer is recognized at least stage IIIB. The normal features of the inflammatory breast cancer include redness of a large part of the breast skin, swollen breast, the breast feels warm, cancer cells have spread to the lymph nodes and may be found in the skin.

General, Stage IIIC describes invasive breast cancer in which there may be no sign of cancer in the breast or if there is presence of tumor, it may be any size and may have spread to the chest wall or the skin of the breast and the cancer has spread to 10 or more axillary lymph nodes or the cancer has spread to lymph nodes above or below the collarbone or the cancer has spread to axillary lymph nodes or to lymph nodes near the breastbone. If the above-mentioned cancer tumor measures any size and is grade 2, is estrogen-receptor-positive, is progesterone-receptor-positive, is HER2-positive or negative. It is likely to be classified as stage IIIA, Stage IV

Stage IV describes invasive breast cancer that has spread beyond the breast and close to the lymph nodes and to other organs of the body (the lungs, distant lymph nodes, skin, bones, liver, or brain).

TNM staging system; The T (size) category describes the original (primary) tumor:

- TX implies the tumor cannot be assessed.
- T0 implies there is not any evidence of the primary tumor.
- Tis implies the cancer is "in situ" (the tumor has not started growing into healthy breast tissue).
- T1, T2, T3, T4, are established on the size of the tumor and the extent to which it has grown into nearby breast tissue. The higher the T number, the larger the tumor or the more it may have grown into the breast tissue.

The N (lymph node contribution) classification describes whether the cancer has reached nearby lymph nodes:

- NX implies that the nearby lymph nodes cannot be assessed, for instance, if they have been removed previously.
- N0 implies nearby lymph nodes do not contain cancer.
- N1, N2, N3, these are based on the number of lymph nodes involved and how considerable cancer is found in them. The higher the N number, the greater the extent of the lymph node involvement.

The M (metastasis) category reveals if there is proof that the cancer has traveled to other parts of the body:

- MX implies metastasis that cannot be assessed.
- M0 implies there is no distant metastasis.
- M1 implies that distant metastasis is present

2.2. GLOBAL INCIDENCE OF BREAST CANCER

Breast cancer in women is a major health problem globally. The incidence rates of breast cancer have increased in past years in most countries due to changes in lifestyles features. The increase in burden of breast cancer is mostly observed in developing countries where the risk of breast cancer has historically been low comparative to western countries. The increase is broadly linked to the “westernization” of lifestyles, an ill-defined surrogate for changes in factors such as childbearing, anthropometric attributes, and lifestyle characteristics (27). Breast cancer has been the main cause of death from cancer among women globally. More than 1.1 million cases are diagnosed, and more than 410,000 patients die of it worldwide (28). Approximately 55% of the global burden is currently observed in developed countries, but the incidence rates are rapidly rising in developing countries (27,28).

Overall, the incidence of breast cancer is high (larger than 80 per 100,000) in developed areas of the world and low (fewer than 30 per 100,000) in developing areas; the range of mortality rates is much less (approximately 6–23 per 100,000) because of the more favorable survival of breast cancer in (high-incidence) developed areas (27,28).

In 2018, there were an estimated 626,679 deaths from breast cancer worldwide (15.1% of the total number of cancer deaths in women (29)

The highest incidence rates of breast cancer are observed in northern and western Europe, North America, Australia, New Zealand and in southern countries of South America, notably Uruguay and Argentina (28).

In 2018, GLOBOCAN estimated that new cases of breast cancer are around 2,088,849 globally, accounting for 25.4% of all cancers in women apart from non-melanoma skin cancers). Breast cancer is the most common cancer among women in Europe with a new case of 522,513 accounting for 28.2% of all cancers in women apart from non-melanoma skin cancers) (29).

In Europe, the most common causes of death among women with breast cancer accounted for 137,707 which is approximately 16.2% of the total number of cancer deaths in women. The 5-year prevalence of breast cancer in 2018 was estimated at 6,875,099 worldwide (181.8 breast cancer survivors per 100,000 women) and 2,054,887 in Europe (534.7 breast cancer survivors per 100,000 women). In 2018, the cumulative risk of breast cancer in women aged under 75 was 5.03% worldwide and 8.06% in Europe (29).

In Europe, the highest incidence is recorded in Switzerland with 72.2 cases per 100,000 populations, 62.4 in France, 59.7 in Southern Ireland, 59.6 in Italy and 56.1 in England and Wales (30, 31).

2.2.1. Breast Cancer Incidence in Africa

According to the GLOBOCAN database (32) an estimated 94 378 new cases of breast cancer are diagnosed in sub-Saharan Africa annually. Incidence rates vary considerably between African countries—e.g., 38 new cases per 100 000 women per year in Kenya compared with 28 cases per 100 000 women per year in Uganda. An average increase in incidence rate of 3.7 cases per 100 000 women per year was seen in the past 20 years in Uganda (33)

A substantial variation in breast cancer incidence and mortality rates among regions within the continent of Africa have been observed (34,35). The estimation of age-standardized incidence rates (per 100,000 women) are 20.2 in eastern Africa, 13.5 in middle Africa, 24.8 in western Africa, and 31.8 in southern Africa (35).

In Nigeria, breast cancer among women is recognized as a major cause of morbidity and mortality with incidence rate ranging from 36.3 to 50.2/100,000 live birth (36). A retrospective study carried out in a 400-bed public tertiary hospital in Abuja, Nigeria among 2292 breast sample revealed that 35.3% (n = 810) are malignant and out of 10.6% (n = 86) died. In the study, the incidence of breast cancer increased from 29 in 2005 to 141 by 2013 while mortality declined from 11 to 9 over the same period. A crude fatality rate of

3.7% were observed. The study revealed the ages of the deceased which ranges from 20 to 90 years with a mean of 43.5 years, Infiltrative ductal carcinoma accounts for the largest mortality with 87.4% (36).

In Europe and United States, triple -negative disease are frequently diagnosed at the late stage. In a case control study conducted among 1,136 Nigerian women with invasive breast cancer in Ibadan, the study evaluated the contribution of an inherited predisposition to breast cancer in this population, which revealed that one in eight cases of invasive breast cancer is as a result of inherited mutations in BRCA1, BRCA2, PALB2, or TP53 and breast cancer risks were also significantly associated with PALB2 (11 cases, zero controls; $P = .002$) and TP53 (five cases, zero controls; $P = .036$). Compared with other patients, BRCA1 mutation carriers were younger ($P < .001$) and more likely to have triple-negative breast cancer ($P = .028$) (36).

Breast cancer is also a huge public health problem and the most common type of cancer among women in terms of mortality and incidence (37). The incidence of breast cancer is growing in Ghana since data derived from the Korle Bu Teaching Hospital Cancer Register from 1972 through 1975 shows that breast cancer accounted for 7.5% of all cancers in Ghana and is the fourth most common cancer after liver carcinoma, cervix cancer, and Burkitt lymphoma (38,39,40). In 1996, breast cancer accounted for about 12.8% of all malignant neoplasm's admissions at the Korle Bu Teaching Hospital (41,42). Another evidence from Clegg-Lampsey et al. in 2009 stated that breast cancer now accounts for about 16% of all cancers, being the commonest female cancer in Ghana (43). A cross-sectional study from five regions in Ghana : Greater Accra, Volta, Ashanti, Western, and Brong Ahafo reported a breast cancer cases of 6.46%(194) participants, 0.76% (23) participants were diagnosed with clinically palpable breast lumps; 17 participants out of these 23 (0.56%) was premenopausal (<46.6 years) with 7 (0.23%) being below 35 years. With an overall breast cancer incidence of 0.76% in this study, their observation was that about 30% of these cancer cases were below 35 years and may indicate a relative possible shift of cancer burden to women in their early thirties in Ghana compared to Western countries (44).

Regardless of the challenges and burden of breast cancer among African women, it has been characterized with lower lifetime risk of developing breast cancer relatively and it likely occur in premenopausal women (45,46) with peak incidences and about 10 years earlier than the Western counterparts (45,46). Additional scientific evidence indicate that breast cancers are typically presented late at treatment centers (48,49) which results in significantly larger tumors (50) that are difficult to treat. A cross-sectional descriptive study was carried out in Accra and Sunyani Ghana in 2007. The study reported that the respondents presented a knowledge deficit about both breast cancer and breast cancer screening which was obvious from the poor

appreciation of the risk factors and high level of misunderstandings and misrepresentation. About 8.2% and 1.7% stated that increasing age and early menarche respectively were considered as risk factors. A weak correlation was found between the levels of education and the self-reported knowledge about the disease with higher levels of education being associated with higher levels of appreciation about the disease ($r=0.316$, $N=465$, $p < 0.001$) (51).

A study carried out by Odunsanya O et al., 2001 among schoolteachers, revealed that only 53% had knowledge about the presence of lump(s) in the breast, which is an important symptom of breast cancer while 85% of the participants had a knowledge about breast cancer as a serious disease (52). In another study conducted to determine the knowledge level of women on breast cancer, respondents' perceptions about breast cancer and the attitude of the people toward breast cancer in the Sekyere East District-Ghana among 97 women. The study recognized that the respondents proved their knowledge level of breast cancer, breast cancer practices and their source of information of breast cancer. The major source of breast cancer information and knowledge was from the hospital which is about 41.1% and media 30.9% (53).

2.2.2. Breast cancer in Germany

Breast cancer is the most common cancer in Germany which has a high public health impact. Each year 57,000 cases of breast cancer are diagnosed. Breast cancer occurs mostly in younger women and the median diagnosis is usually 57 years of age (54). Germany as a western nation reported age standardized breast cancer incidence to be 120 per 1000 women and mortality rate to be 24 per 1000 women between 2009-2010 (55). Breast cancer causes almost 2 billion Euros per year which is about 0.8% of the total health cost (56). The incidence and mortality rate in the former East Germany remain lower than in West Germany (57) due to the early detection of breast cancer which was improved by different activities such as quality assured mammography introduced in 2001 in the Federal state of Schleswig-Holstein (58). A mammography screening pilot study which started in 2014 (59) and treatment therapy has significantly increased patients' chances of survival and has brought about a reduction in mortality rate (59,60).

2.3. BREAST CANCER SITUATIONS IN GERMANY AND GHANA

2.3.1. Breast cancer situation in Germany

Germany as a developed country has a complex and good health structure for breast cancer care with enough resources. For example, in Germany, the cost of treatment is covered by statutory health insurance. Letters from the regional mammography center are sent to women between the ages of 50 to 69 years inviting them to have mammography screening after two years and women within the age range are encouraged to make

appointment for the screening. After the mammogram examination, the results are usually sent within seven working days (61).

Recently, Germany developed a new test that can accurately detect cancer in the blood to improve early detection of breast cancer, a report from medical researcher at the Heidelberg in southern Germany noted that blood test can reliably detect whether a patient has breast cancer before it became visible Hei-screen. Patients who get timely treatment have 95% chances of full recovery. The Hei-screen test is designed to complement the existing mammography, ultra-sound, MR high scan method to reduce the burden on women because it is painless, costless and without exposure to radiation (62).

The risk of breast cancer has been reduced using High screening measure and effective treatment. Many clinical trials have revealed that chemotherapy and radiotherapy are associated with risk of suffering from disease because of the breast cancer treatment (62).

2.3.2. Breast cancer situation in Ghana

Ghana is facing a quite high mortality to incidence ratio and it is expected that the incidence will increase in Ghana in the years to come (63,64). Inequity in health care availability has been one of the problems to gain access to the health care in Ghana (65). The current population in Ghana is around 30 million people in 2019 (66).

Presently, Ghana lacks a wide-ranging breast cancer control policy. There are no breast cancer treatment guidelines in Ghana and the radiotherapy treatment is the only available treatment method in Ghana's two largest cities, which create an important geographical barrier to access. Financial barriers also occur even though breast cancer diagnosis and treatment are covered by Ghana's National Health Insurance Scheme (NHIS), only 34% of the Ghanaian population had active NHIS membership in 2010 (National Health Insurance Authority) (67).

More than 90% of women with breast cancer in Ghana present the disease at the advanced stage of the cancer and 10% in the high-income countries. The early presentation of the disease in high income countries is because of quality and affordability of treatment compared to the low-income countries such as Ghana. The late presentation of the disease in Ghana among women includes the fear of mastectomy and death, lack of routine screening, ignorance of symptoms and treatment option, absence of pains, cost, survival silence, lack of access to healthcare, appeal of traditional healers over doctors and stigma (68).

2.4. INFLUENCE OF BREASTFEEDING AND BREAST CANCER RISK

The risk factors related with breast cancer in women include age of menarche, number of pregnancies, age at first birth, lifetime duration of breastfeeding, age at menopause and use of menopausal hormone therapy. A scientific evidence indicates that these risk factors are differentially linked with each breast cancer subtype (69). Breastfeeding is of specific interest for breast cancer prevention because it is an adjustable risk factor. Breastfeeding reduces breast cancer risk and confers other health benefits to the mother including reduced risk for endometrial and ovarian cancer (70) and reduced risk for chronic conditions that are also risk factors for cancer, such as hypertension and diabetes (71,72).

There is growing evidence on breastfeeding and risk of breast cancer. A landmark study in 2002 pooled out approximately 50,000 breast cancer cases from 47 epidemiologic studies in 30 countries and revealed that relative risk for breast cancer in parous women is reduced by 4.3% for every 12 months a woman breastfeeds and is reduced by 7% for each birth independently (73). A 2013 review study of 32 studies revealed that the risk of having breast cancer was 14% lower among parous women who had ever breastfed compared with parous women who never breastfed. The protective effect of breastfeeding continued irrespective of the number of births and was even greater for women who had cumulatively breastfed for 12 months or longer; they had a 28% lower risk of breast cancer (74). In a study carried out by Victoria et al., 2016 (75) estimated that existing global breastfeeding rates prevent almost 20,000 annual deaths from breast cancer and suggested that extra 20,000 could be prevented by increasing breastfeeding duration to 12 months per child in high-income countries and recommended 2 years per child in low- and middle-income countries.

A study conducted by Lindsey Wohlford, a wellness dietitian noted that during pregnancy and breastfeeding, women shred breast tissue and the shredding helps to remove cells with potential DNA damage which helps to reduce the risk of developing breast cancer. Also, mothers who breastfeed has a lower risk of pre and post-menopausal breast cancer and a woman who breastfeed longer than the recommended six months gets additional protection because most women who breastfeed experience hormonal changes during lactation that delays their menstrual period which reduces women's life time exposure to hormone like estrogen which can promote breast cancer cell growth (76).

About 140 million women worldwide use hormonal contraceptive. There are four major types of oral contraceptives (77,78).

- Combination pills was the first oral contraceptive approved in the US and the most popular pills been used which contains fixed amount of estrogen and progestin which acts by suppressing ovulation.
- Sequential pills contain estrogen alone which is given for the first two weeks followed by the estrogen-progestin combination during the last six days. This is no longer used in the market.
- Mini pills or Progestin only pills; It contains no estrogen and lower amount of progestin; they do not affect ovulation but inhibit ovum transport and implantation by thickening the cervical mucus.
- Phasic oral contraceptive: It contains estrogen along progestin dose that varies in a month throughout the month.

In a Danish study, contraceptive that uses hormones such as birth control pills and intra uterine devices shows a slightly increased risk of breast cancer. The increment level of risk of each woman depends on factors such as age, general health, personal risk of breast cancer, smoking, alcohol and overweight (79). There is a strong evidence that suggest that older forms of hormonal birth control that contains higher doses of hormones were associated with higher risk of breast cancer while the newer form of contraceptive that contains lower doses of hormones were safe.

A study conducted by the collaborative Groups on hormonal factors on breast cancer among 150,000 women who participated in 54 epidemiologic studies revealed that, women who had always used oral contraceptives had a minor increase of 7% in the relative risk of breast cancer compared with women who does not use oral contraceptives. Women who were currently using oral contraceptives had a 24% increase in risk that did not increase with the duration of use. Risk decreased after use of oral contraceptives stopped and no increased risk was evident years after contraceptive use cessation (80).

In another study carried out in 2010 by the Nurses' Health Study, which follows more than 116,000 female nurses who were between the age of 24 to 43 years old when they enrolled in the study in 1989, participants who used oral contraceptives had a slight increase in breast cancer risk (81,82). In a retrospective study carried out in New York University Langone Medical center among 7007 participants, with a median age of 57 years in 2008, participants in the study were screened using the mammography. An inverse association was found between patient, age, and mammography breast density. 70% of patients between 40-49 had a dense breast (83).

2.5. EFFECT OF AGE ON BREAST CANCER SCREENING PRACTICES

Age is a risk factor for breast cancer, the rates of breast cancer are low in women below 40 years. Less than 5% of women below 40 years were diagnosed with breast cancer (84).

The benefit of screening women between the age of 40 to 49 years old cannot be overlooked. A mortality reduction benefit from screening has been found across multiple studies. One such study was the Pan-Canadian Study of Mammography Screening and Mortality from Breast Cancer (85) in which data were collected on screening participants and non-participants to judge the mortality benefit of mammographic screening. The results of the study which were published in 2014, showed a 40% mortality reduction benefit among the screening participants, a benefit that was also seen for the 40 to 49-year age group. Overall, there was not a large difference in mortality reduction benefit among the various age groups. According to Hendrick and Helvie (86), beginning screening of women in their 40s and continuing annually beyond that would save 99,829 more lives than USPSTF recommendations of only biennial screening of women 50–74 years old. Hendrick and Helvie also stated that with a current 65% rate of adherence to annual mammography, 64,889 more lives would be saved. In addition to this and the pan-Canadian study, the randomized controlled trials in Malmö (87) and Gothenburg (88) in Sweden showed mortality reductions of 45% (Malmö) and 36% (Gothenburg).

2.6. EFFECTIVENESS OF BREAST EXAMINATION ON BREAST CANCER RISK

2.6.1. Mammography, Digital Mammography and Digital Breast Tomosynthesis

Numerous studies have shown that mammographic screening is effective compared to all other screening regimen. Annual mammography screening beginning at age 40 has the largest mortality reduction benefit in terms of life years gained (88). In both observational cohort and case control studies in 1989-2014, the study invited women for mammography breast examination screening and the results of the study revealed that women between the ages of 50-69 years who were invited for the mammography screening had about 23% reduction in the risk of breast cancer (89).

In a Randomized Control Trial and many observational studies population-based screenings showed a pooled mortality reduction of 25% (relative risk of 0.75% ;95% confidence level (90). In a Pan Canadian observational study in 2014 which examined the effect of mammography screening and breast cancer mortality. The study revealed a substantial association between mammography screening and breast cancer mortality for women between the ages of 40-74 (91). The relative breast cancer mortality reduction with the screening was 44%.

Digital mammography is also known as full-field digital mammography (FFDM). This can be used for both diagnostics and screening mammography (92) due to its technical advantages. The importance of digital mammography includes the processes of image acquisition, display and storage are decoupled and each of these processes is performed independently allowing them to be optimized. The digital process improves logistics and allows radiologists to view the images on a monitor and alter the contrast of the image.

Researchers in experimental studies have shown digital mammographic images to be of better and have more consistent quality than screen-film mammographic images (93).

In a retrospective analysis of prospectively collected annual screening data from 2009/2010 to 2015/2016 for the 80 facilities of the English National Health Service Breast Cancer Screening Program, the influence of changing from screen-film mammography to digital mammography (DM) in a large organized national screening program was noted. The study reported that the overall cancer detection rate was 14% greater with digital mammography with no change in recall rates and without confounding by changes in other factors. There was a substantially higher detection of grade 1 and grade 2 invasive cancers including both ductal and lobular cancers, but no change in the detection of grade 3 invasive cancers (94).

Another was a study conducted to compare the effect of the introduction of digital mammography on the recall rate, detection rate, false-positive rate and rates of invasive procedures performed in the first and consecutive rounds of a population-based breast cancer screening program with double reading in Barcelona, Spain. The study reported that Digital mammography may reduce the adverse effects of screening programs if this technique is confirmed to have the same diagnostic accuracy as screen-film mammography (95).

2.6.2. Digital Breast Tomosynthesis

Breast tomosynthesis also termed as three-dimensional (3-D) mammography and digital breast tomosynthesis (DBT) is a progressive form of breast mammography that uses a low-dose x-ray system and computer reconstructions to create three-dimensional images of the breasts. In a retrospective analysis of prospective cohort data from 3 research centers in the Population-based Research Optimizing Screening Through Personalized Regimens (PROSPR) consortium included data of women aged 40 to 74 years who underwent screening examinations using DM and DBT from January 1, 2011, through September 30, 2014, to determine whether screening examinations using DBT detect breast cancers that are related with a better diagnosis and to compare the detection rates by patient age and breast density. The study revealed that Breast cancer screening examinations using digital breast tomosynthesis (DBT) has been shown to be associated with decreased false-positive test results and increased breast cancer detection compared with digital mammography (DM). Little is known regarding the size and stage of breast cancer types detected and their association with age and breast density (96).

2.6.3. Positron Emission Mammography

Positron emission mammography (PEM) is a new imaging modality that has higher resolution than PET-CT (Positron Emission Tomography and Computed Tomography) and can be performed on patients unable

to have an MRI scan. PEM involves a pair of dedicated gamma radiation detectors which is placed above and below the breast and mild breast compression to detect coincident gamma rays after administration of fluorine-18 fluorodeoxyglucose (^{18}F -FDG), the positron-emitting radionuclide used in whole-body PET studies for the detection of metastatic disease (97).

PEM's can detect small hypermetabolic lesions. PEM can detect lesions measuring <2 cm due of its higher spatial resolution of up to 2.4 mm even in very small tumors measuring <1 cm, the imaging sensitivity of PEM is between 60% to 70% (98). When PEM has been directly compared with PET and MRI, the reported sensitivity of PEM was 93% for known index lesions and 85% for unsuspected additional lesions. The sensitivity was comparable to that of MRI and significantly higher than that of PET particularly in small tumors (99). In a study which compares PEM and MRI were both revealed to have index lesion sensitivity of 92.8%. Whole-body PET demonstrated a sensitivity of only 67.9% (100). PEM are more specific, and it can be concluded in patients in whom MRI maybe contradicted. PEM can play an important role in the detection of additional foci of malignancy (101,102).

2.6.4. Breast Specific Gamma Imaging and Magnetic Resonance Imaging

MRI and BSGI are both physiologic methods to detect breast cancer. The breast-specific gamma imaging (BSGI) is used for breast imaging like MRI, uses a physiologic approach to identify lesions in the breast. BSGI has the benefit of being more comfortable, more cost-effective, and less time-consuming for the physician to interpret, albeit using a radioactive tracer which is not possible with MRI (103). BSGI has shown sensitivity of 96.4% similar with MRI (104) and specificity of 93.3% greater than MRI (105). Studies have revealed BSGI to be useful in detecting small lesions (106) and occult cancers not found with other imaging modalities (107,108). BSGI uses a breast-specific, high-resolution, small FOV gamma camera (Dilon 6800, Dilon Technologies). Once in a seated position, patients receive an injection of 15–30 mCi of $^{99\text{m}}\text{Tc}$ -sestamibi (555–1110 MBq) through an antecubital vein (108).

In a study carried out by RV Tadwalkar et al .,2012 on the sensitivity of breast specific gamma imaging BSGI for detecting invasive breast cancers and to characterize the sensitivity of BSGI based on tumor size and pathological grade .The study involved 139 females with invasive carcinoma who underwent BSGI .The study revealed that BSGI has a high sensitivity (98%) for detecting all invasive breast cancer pathological grade 2 and higher irrespective of the size and all cancers which measured $\geq 7\text{mm}$ irrespective of the grade (109).

Magnetic resonance imaging (MRI) of the breast has mainly been used as an additional device for breast screening with mammography or ultrasound. A breast MRI is mostly used for women who have already been diagnosed with breast cancer to help measure the size of the cancer, search for other tumors in the

breast and to check for tumors in the opposite breast. A screening MRI is recommended along with a yearly mammogram for some women at high risk for breast cancer. MRI is known to give some false positive results which means more test and/or biopsies for the patient should be done. Although breast MRI is useful for women at high risk, it is barely recommended as a screening test for women at average risk of breast cancer. Breast MRI does not show calcium deposits known as micro-calcifications which can be a sign of breast cancer (110). MRI is also said to define the size and extent of the tumor better for planning surgery. While this is expected to reduce re-excision rates along with a decrease in the local recurrence rates and overall survival rates, this has not borne out. It however leads to increase in additional biopsies, patient anxiety, cost, delay the onset of treatment and possibly increase in mastectomy rates (110).

2.6.5. Magnetic Resonance Imaging (MRI)

In a Randomized Control Trial study which was conducted in twelve hospitals in the Netherlands among women between the ages of 30-55years who had a lifetime risk of breast cancer. The study revealed that tumors were detected earlier with the MRI than mammography. Thus 48% of 25 in the MRI group and 7% of 15 in the mammography group (111).

2.6.6. Ultrasound

Ultrasound imaging is an important imaging technique used in detecting and diagnosing Breast cancer. It also assesses the monopoly, internal structure and imaging of lesion, orientation from multiple planes with high resolution in both predominantly fatty breasts and dense, granular structures (112).

In a study conducted by Stavros et al;1995, reported that ultrasound can be used to classify benign, solid lesions with negative predictive value of 99.5% (113).

In a multi-center randomized control trial conducted in 14 Breast cancer centers compares Ultrasound vs. mammography in the screening of Breast cancer in high risk among Chinese women. The study demonstrated that ultrasound examination is very sensitive, specific, and less costly screening modality in detecting Breast cancer in a high risk. Chinese women with high sensitivity of 100%, specificity of 99.9% and diagnostic accuracy of 0.999 and Positive Predictive value of 70.7%.The study shows that ultrasound are more effective and superior than mammography because the ultrasound group shows a higher cancer yield than the mammography group (114).

2.6.7. Breast Self-Examination

Clinical breast examination is an important means of reducing Breast cancer deaths among women. It is inexpensive, noninvasive procedure that empowers and is universally available. Breast Self-Examination has no direct impact on breast cancer mortality and cannot alone be recommended for breast cancer

screening. A large randomized study conducted in St Petersburg, Russia, and Shanghai China among (122471,266,064 women) respectively. Both studies did not show any reduction in breast cancer mortality in the number of stages of cancer detected during 9-11 years of follow up and nearly two folds increase in false positive results (115). Breast self-examination has been identified as the only realistic approach in the early detection of breast cancer in developing countries but a large knowledge application gap has been observed worldwide between the knowledge and the main practice of breast self-examination. Numerous factors are associated for the poor uptake of breast self-examination such as cultural belief and lack of accessibility to health care services (116).

CHAPTER THREE

3.0. METHODOLOGY

3.1. STUDY DESIGN

A descriptive cross-sectional study was carried out between October 2019 to July 2020, to assess the breast cancer and screening practices among Ghanaian immigrants living in Germany and compatriots living in Ghana. A mixed method research approach was used which involves using both quantitative and qualitative research approach in which both quantitative and qualitative data are collected and analyzed to understand and answer the research problem.

3.1.1 Mixed Method Research

Mixed Methods research is a methodology approach use in conducting research which involves combining or integrating both quantitative (e.g. experiments, surveys) and qualitative (e.g. interviews, focus group) research approach (117).

Quantitative research methods encompass the process of collecting, analyzing, interpreting, and writing the results of a study. The method in collecting a quantitative data includes non-experimental designs (such as online surveys, paper surveys, face to face interview, telephone interviews etc. which provides a quantitative or numeric description, attitudes, or opinions of a population by studying a sample of the population. Quantitative data includes cross sectional and longitudinal studies, using a close ended questions or structured interview and experimental designs (seeks to determine if a specific treatment influences an outcome (117).

Qualitative research method is mainly exploratory research. It is an approach for exploring and understanding the underlying reasons and opinions of individuals or groups assigned to a social or human problem and help to provide develop hypotheses or idea for potential quantitative research. A qualitative approaches data collection involves analysis, interpretation and report writing which differ from the traditional quantitative approaches. Qualitative data collection methods differ using unstructured or semi structured techniques (open-ended). The common methods used includes focus groups i.e. group discussion, personal interview, observations. Qualitative sample size is usually small (117). Qualitative research consists of five different designs such as narrative research, phenomenology, grounded theory, ethnographies, and case study (117).

3.2 STUDY LOCATION

The study was carried out through an online survey among Ghanaians in Hamburg, Germany and Ghanaians living in Kumasi, Ghana.

3.2.1. Brief Description of Ghana

Ghana is formerly known as the Gold coast, a West Africa which covers an area of 238,533 square kilometers (92,098square miles) just below the size of Germany about 357,114 kilometers north of the equator on the Gulf of Guinea between the latitudes of 4° - 11'5° north. The climate is tropical characterized most of the year by moderate temperatures generally 21° C- 32°C (70° -90° F), with constant breeze and sunshine (119).

Ghana gained independence on the sixth of March 1957. Ghana was the first place in sub-Sahara Africa where Europeans came for Gold trading and later in slaves. The population of Ghana is approximately 28,200,000. The literacy rate in 2018 is 76.6%. Ghana is very rich in mineral resources and endowed with good education system and efficient civil service before they fell victim to corruption and mismanagement after the independence. Ghana is world's second largest cocoa producer and biggest cocoa miner with the fastest growing economy. The country is also the first sub-Sahara Africa to achieve the millennium goals one which target poverty reduction. The country has recently become a middle-income country due to the discovery of major offshore oil announced in June 2007 which has a great impact on the country economy (119).

3.2.2. Vital Statistics for Ghana (120)

The Age structures	0-14 years: 38.01% (male 5,253,430/female 5,198,892)
	15-24 years: 18.63% (male 2,548,661/female 2,575,160)
	25-54 years: 34.14% (male 4,554,972/female 4,834,765)
	55-64 years: 4.97% (male 664,866/female 701,277)
	65 years and over: 4.25% (male 538,790/female 629,111) (2017 est.)

Median age	total: 21.1 years male: 20.6 years female: 21.6 years (2017 est.)
Population growth rate	2.17%
Birth rate	30.52 births/1,000 population
Death rate	7 deaths/1,000 population
Life expectancy at birth	total population: 67 years male: 64.5 years female: 69.6 years (2017 est.)
Maternal mortality rate	319 deaths/100,000 live births (2015)
Health expenditure	3.6% of GDP

3.2.3. Health System in Ghana

In Ghana there are two main types of practitioners of medicine, the traditional and the scientific (conventional) medical practitioners. The traditional and scientific medical institutions is a common practice in the developing countries like Ghana (121). The traditional concept is used to determine the cause and treatment method to initiate in the treatment of the diseases (122). In the developed world, diseases are most often seen as natural phenomena and therefore subject to investigation and study by scientific methods. Consequently, beliefs about the causes of various diseases require scientific proof to substantiate them. In Ghanaian traditional setting and some developing countries view disease manifestations as supernatural powers, therefore causal clarifications in these settings are sought in the spiritual or traditional aspect (123; 124).

Ghana has a four-tier health care delivery system. The medical institution in Ghana is based in the capital (Accra) and Kumasi (center of the country) which are the two largest cities in Ghana, which provide tertiary medical care, teaching and research including Radiotherapy centers for management of cancer patients (125). The radiotherapy center in Accra was established in 1997 in collaboration with the International Atomic Energy Agency (IAEA) to provide care for Ghanaian cancer patients. It has proven to be a center for cancer patients from Togo, Benin, Côte d'Ivoire, Burkina Faso, Liberia, and Sierra Leone and even Nigeria on occasion. Previously, Ghanaian patients with cancer travel to India, the Americans and Europe to seek medical care and patients who could not afford this were managed with palliative intent as surgery

and chemotherapy were the only forms of treatment available for solid tumors. The center in Kumasi was established in 2004 in collaboration with the IAEA, whilst the Swedish Ghana Medical center in Accra, a private venture was established in 2013. All three facilities in the country have capabilities for 3-Dimensional treatment planning (126).

The two governmental bodies that oversees the health care infrastructure and delivery in Ghana are Ministry of Health and the Ghana Health Services. In 1996, the Ministry of Health (oversaw)the direct provision of health service in Ghana. Presently in Ghana, the health service delivery is provided by the Ghana Health Services. The goals of Ministry of Health in Ghana are to improve the health status of all the population living in the country through an effective and efficient policy formulation, resource mobilization, monitoring and delivery of health care through different health agencies, resource allocation for health service and regulation of food and drugs. The Ministry of Health in Ghana is responsible for providing all the integrated health services in the country. The constraints under which health care is provided in Ghana have two major consequences for the designing and implementation of health services (125). Inadequate health facilities and insufficient numbers of health professionals due to limitations in resources, leads to inequalities in access to health care delivery. Patients pay at the point of service for medical care since there is no system of health benefits; the National Health Insurance Scheme in Ghana is operational with limited usage. These situations have a negative impact on the health seeking behavior of many Ghanaians due to the costs of treatment. Ghana Health Service is an executive agency which is responsible for national implementation of national policies, provide health care services and manage resources for health care delivery, promote healthy living and habits among habitants under the control of the Ministry of Health through its governing council. Ghana Health Service is a public sector which receives public funds from the government (125, 126).

3.3. STUDY POPULATION

The study involves Ghanaian women living in Hamburg Germany and their compatriots living in Ghana between the ages 20 to 60 years were invited via emails and social media such as Facebook and WhatsApp messenger to participate from different disciplines.

The inclusion criteria for selecting a participant included being between the age of 20 to 60 years, Ghanaian Women, living in Hamburg for at least one year. The exclusion criteria are women from other countries, below the age of 20 years.

3.4. SAMPLING PROCEDURE

An unidentified self-completed online survey was used to assess the women living in Hamburg and compatriot living in Ghana by questionnaire. Both open and close ended questions were used to collect data. The links to the questionnaire were directly sent with an invitation letter to Ghanaian women both in Ghana and Hamburg. Participation to the study was voluntary and incentives like money to buy internet data were provided to some participants in Ghana. The questionnaire took 10 -15 minutes to complete. Participants gave informed consent by clicking online questionnaire link. The data collected during the survey was stored anonymously and strictly confidential.

A convenience sample (which is non-probability-based method) was used to enroll participants in the survey. All participants who showed interest and met the inclusion criteria were considered.

3.5. CONVENIENCE SAMPLING METHOD

A Convenience sampling also known as non-probability sampling method that depend on data collection from population who are conveniently available to participate in a study. Convenience sampling method involves getting participants wherever is convenient. A convenience sampling is a kind of sampling method where the first available primary data source is used for research without additional requirements. All subjects have an equal chance being selected to participate. An example of convenience sampling includes Facebook polls or questions (118).

3.6. MEASUREMENTS

Questionnaire was the main measure used in the study. The questionnaire was developed and well validated questions. The questionnaire consisted of different sections in assessing the demographic information, reproductive history, knowledge, beliefs and attitudes and screening practices.

3.6.1. DEMOGRAPHIC INFORMATION

The demographic information section involves the participants to answer questions about their sex, age, religion, educational level attained, country of residence.

3.7. VALIDITY AND RELIABILITY OF THE STUDY

In the present study, the validity and reliability illustrated and stated that all the sources used were relevant and reliable to the research topic. All the information used in the study were collected from scientific papers and other scientific reports from CDA, WHO etc.

The reliability of study was achieved among the target groups and is well represented in the population. The questionnaires used to obtain information from the participants were written in a clear and understandable manner and it relate with the aim and objectives of the research study.

3.8. STATISTICAL ANALYSIS

A descriptive and inferential statistical test was used to analyze and present the results in the study. The data collected was arranged, coded, and analyzed on SPSS. A descriptive statistic was used to summarize the results in the study such as percentage distribution tables; sampling mean, bar chart was used to display continuous data for educational level and source of information. Pie chart distribution is used to display religion and belief of the study participants.

For the inferential statistics, Student t-test was applied to examine significant mean age differences on breast cancer among women living in Kumasi, Ghana and women living in Hamburg, Germany. Man U-Whitney test analysis was used to determine the effect of educational level, religion belief and women's knowledge about breast cancer and effects of age on breast cancer screening practices.

CHAPTER FOUR

4.0. RESULTS

4.1. Demographic Characteristics

The descriptive statistics results of demographic characteristics of participants are presented in Table 1. The overall study sample of participants who completed the online survey questionnaire was (n =200: Germany n=100, Ghana n= 100). The mean age of women from Hamburg, Germany and Kumasi, Ghana who participated in the study are 30.44, 30.58, respectively.

Most participants who took part in the study living in Hamburg, Germany and Kumasi, Ghana reported to be Christian about 97%, 96% respectively. Only 2% of the women living in Hamburg, Germany are Muslims while 3% of women living in Kumasi, Ghana are Muslims. A large percentage (79%, 91%) of the participants from Hamburg, Germany and Kumasi, Ghana attained a Tertiary education level respectively ,20% of Ghanaian women living in Hamburg, Germany attained secondary educational level while only 6 % of participants living in Kumasi, Ghana had Secondary education.

Table 1: Demographic Characteristics of Participants

Variables	Participants living in Germany (n=100)	Participants living in Ghana (n=100)
Age(years)	Mean age 30.44±, SD 6.76	Mean 30.58±, SD 9.13
Religion		
Christian	97 %	96%
Muslim	2 %	3%
Traditionalist	1 %	0%
Hindu	0 %	1%
Total	100%	100%
Educational level		
Primary	1 %	1%
Middle	0 %	1%
Secondary	20 %	6%
Tertiary	79 %	91%
None	-	1%
Total	100%	100%

*General characteristics of the participants (%).

Figure 4: PIE CHART DISTRIBUTION FOR GHANAIAI PARTICIPANTS IN HAMBURG, GERMANY.

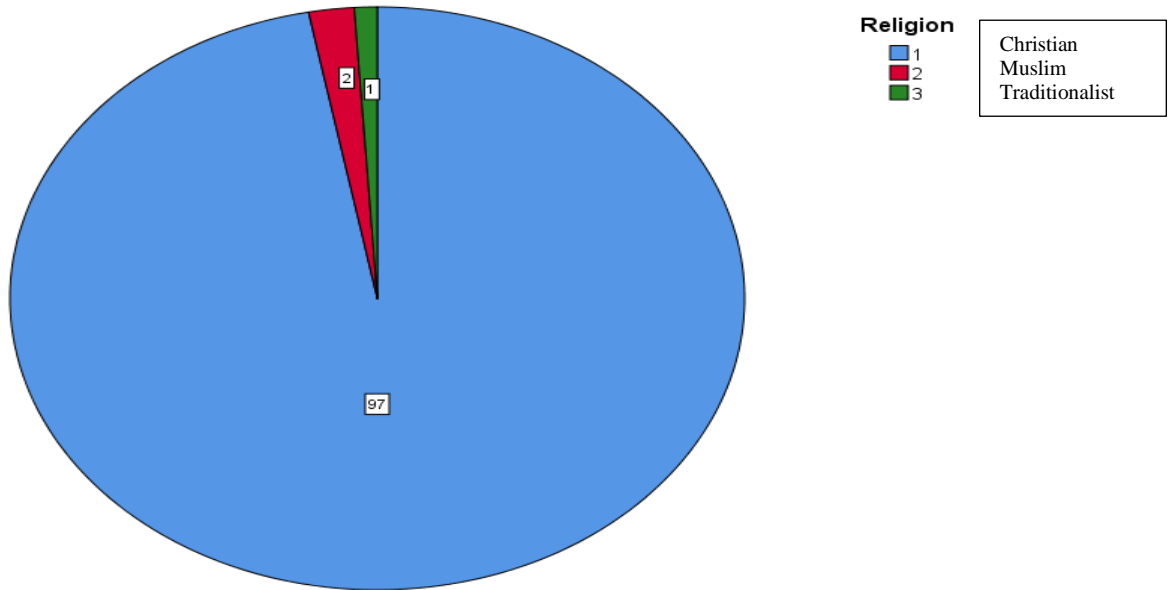


Figure 5: PIE CHART DISTRIBUTION FOR GHANAIAI PARTICIPANTS IN GHANA.

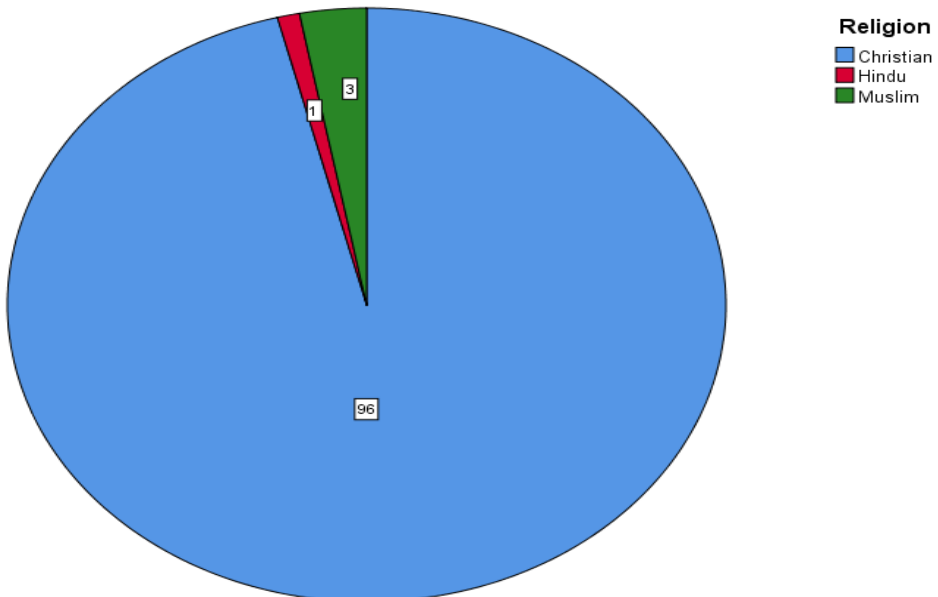
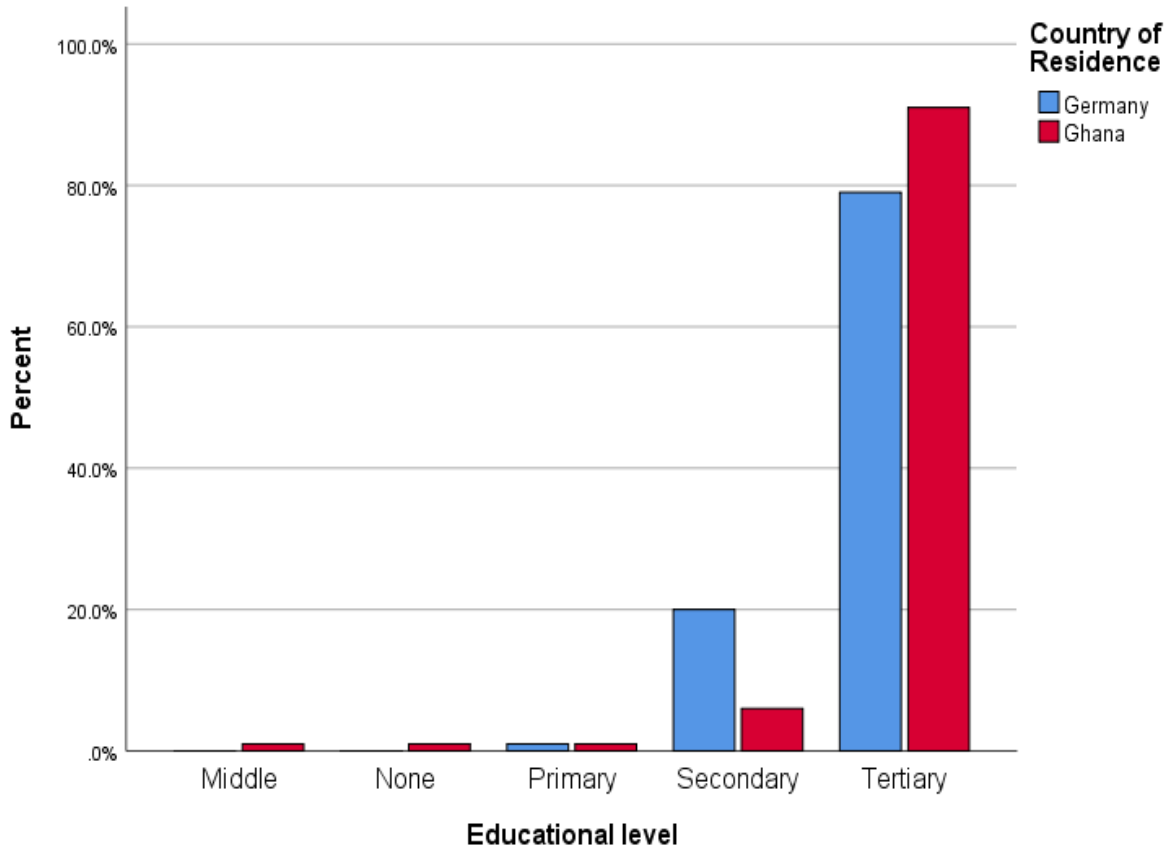


Figure 6: HISTOGRAM CHART FOR EDUCATIONAL LEVEL OF PARTICIPANTS ON BREASTCANCER AND SCREENING PRACTICES.



The bar chart indicates that participants living in Hamburg, Germany and Kumasi, Ghana have a high level of education, 91% of participants living in Kumasi, Ghana attained tertiary level of education and 79% of Ghanaians living in Hamburg, Germany attained tertiary level of education. While 6%, 20% of participants living in Kumasi, Ghana and Hamburg, Germany had a secondary educational level attainment, respectively.

4.2. REPRODUCTIVE HISTORY OF PARTICIPANTS

Table 2: Reproductive History of Participants in both Study Locations

Reproductive History	Hamburg, Germany (%)	Kumasi, Ghana (%)
Age at menarche (years)	Mean 13.55 ± SD 1.88	Mean 13.57±SD 1.75
Do you have a child?		
Yes	63%	55%
No	37%	45%
TOTAL	100%	100%
What is your age when you had your first child?	Mean 16.29 ±SD11.8	Mean 24.38 ±SD5.21
Do you breastfeed?		
Yes	61%	54%
No	39%	46%
TOTAL	100%	100%
How long do you breastfeed?	Mean 12.73±SD6.26	Mean 13.85 ±SD5.63
Do you use contraceptive pills during breastfeeding?		
Yes	20%	13%
No	79%	87%
Valid	1%	0%
TOTAL	100%	100%

*Reproductive history of the participants (%).

The reproductive history of participants is presented in Table 2 above. The results from the reproductive data revealed that majority of participants in both countries of residence have given birth (Hamburg, Germany 63%, Kumasi, Ghana 55% while only 37%, 45% have not given birth in Hamburg, Germany and Kumasi, Ghana.

The present study reviewed that 61% of participants in Hamburg, Germany breastfeed their child, 54% participants living in Kumasi, Ghana breastfeed their child. 39%, 46% of participants in Hamburg, Germany, Kumasi, Ghana respectively do not breastfeed their child.

20% of the participants living in Hamburg, Germany used contraceptives pills while breastfeeding and only 13% from Kumasi, Ghana used contraceptive pills while breastfeeding their child. 79% ,87% of participants in the study do not use contraceptive pills during breastfeeding in both countries of residence respectively.

4.3. : KNOWLEDGE, BELIEF AND ATTITUDE OF PARTICIPANTS

Table 3: Knowledge, Belief and Attitude of Participants on Breast Cancer and Breast Cancer Screening

Knowledge, Belief and Attitude	Germany, Hamburg (%)	Ghana, Kumasi (%)
Information about Breast cancer		
Medical Practitioners	32%	30%
Media	55%	56%
Women's group	4%	3%
Internet	-	2%
Family and Friends	4%	3%
Church	2%	3%
Hospital	1%	-
Facebook	2%	-
Reading on the internet	-	2%
School	-	2%
TOTAL	100%	100%
Breast cancer awareness?		
Yes	99%	99%
No	-	-
Maybe	1%	1%
TOTAL	100%	100%

Breast cancer death awareness?		
Yes	51%	59%
No	14%	18%
Maybe	35%	23%
TOTAL	100%	100%
Do you know of anyone who has died of Breast cancer?		
Yes	56%	59%
No	44%	41%
TOTAL	100%	100%
How common is breast cancer in your country of residence?		
Do not know	20%	9%
Not common at all	6%	10%
Somewhat common	53%	52%
Very common	21%	29%
TOTAL	100%	100%
Are you aware of the services in your community for breast cancer screening?		
Yes	96%	100%
No	3%	0%
Maybe	1%	0%
TOTAL	100%	100%
Do you know the activities involved in Breast cancer screening?		
Yes	85%	89%
No	12%	8%
Maybe	2%	2%
Valid	1%	1%
TOTAL	100%	100%

Would you like to be screened for breast cancer?		
Valid	1%	0%
Yes	85%	92%
No	12%	4%
Maybe	2%	4%
TOTAL	100%	100%
Have you ever been invited to participate in breast cancer screening?		
Yes	39%	55%
No	61%	45%
TOTAL	100%	100%

This study noted that most of the participants in both countries of residence usually gets their information from the media (Hamburg, Germany 55%, Kumasi, Ghana 56% respectively). 32% of participants in Hamburg, Germany breast cancer source of information is from the Medical practitioners while 30% of the participants in Kumasi, Ghana breast cancer source of information is from Medical practitioners. A small percentage of participants in both countries gets their breast cancer information from Women group (4% ,3%) , Internet (0% , 2 %), Family and Friends (4% ,3%), Church(2% ,3%), Hospital (1% ,0%) ,Facebook (2% , 0%) , School (0% , 2%) from participants living in Hamburg, Germany and Kumasi, Ghana respectively.

Regarding the self-reported knowledge about breast cancer, The findings from this study stated that participants knowledge and awareness about breast cancer in both countries of residence was high, 99% of participants from each country shows high level of breast cancer awareness ,51% of the participants living in Hamburg, Germany and 59% participants living in Kumasi, Ghana are aware of breast cancer death. Only 24% of the participants living in Hamburg, Germany and 18% of participants living in Kumasi, Ghana are not aware of the death caused by breast cancer. About 56% of participants living in Hamburg, Germany revealed that they know of someone who died of breast cancer while 59% of the participants living in Kumasi, Ghana know of someone who had died of breast cancer. 44%, 41% of participants living in Hamburg, Germany do not know of anyone who died of breast cancer, respectively. The study participants had a good knowledge of the burden of breast cancer among Ghanaian women because high percentage of participants 21 % , 29% of the participants living in Hamburg, Germany and Kumasi, Ghana agreed that

breast cancer is very prevalent health issue in their countries of residence and about 53%, 52% of participants living in Hamburg, Germany and Kumasi ,Ghana accepted that breast cancer is somewhat common in their countries of residence respectively. Out of the study population, 20% of the participants living in Hamburg, Germany stated that they do not know how common breast cancer incidence case in their countries of residence and 9% from Kumasi, Ghana.

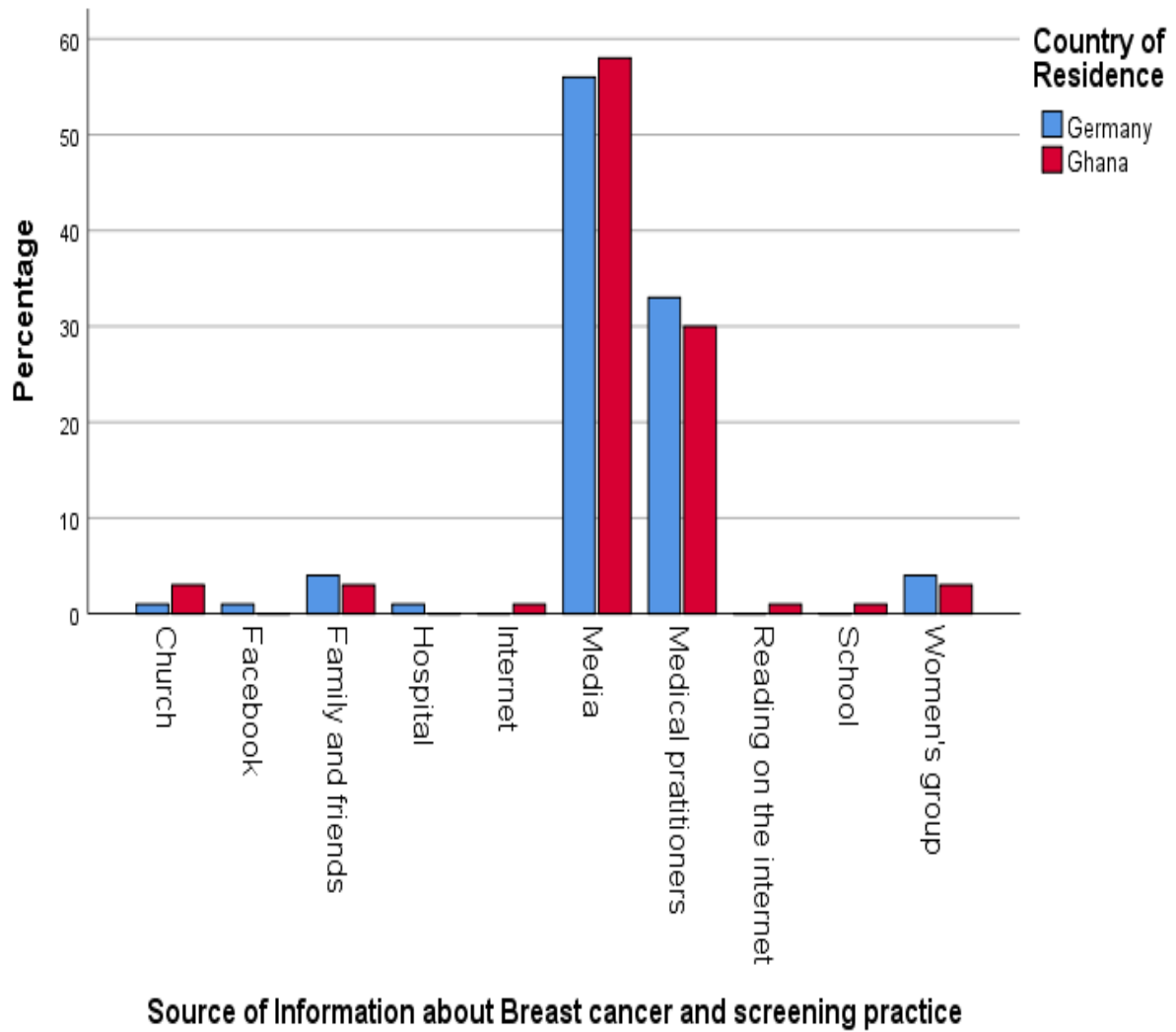
The Majority of participants (96%) living in Hamburg, Germany, 100 % of participants living in Kumasi, Ghana are highly aware of breast cancer services in the community of their countries of residence.

A high percentage of the participants (85%,89%) living in Hamburg, Germany and Kumasi, Ghana respectively had a good knowledge of the activities involved in breast cancer screening. Only (12%, 8%) of participants living in Hamburg, Germany and Kumasi, Ghana are deficit in knowledge of the activities involved. Most of the participants in the study are fully aware of the activities involved in breast cancer services,85% of participants living in Hamburg, Germany and 89% of participants in Kumasi, Ghana.

The findings of this study revealed a high level of willingness and readiness to be screened for breast cancer Hamburg, Germany (85%) and (92%) of participants living in Kumasi, Ghana.

39% and 55% of participants living in Hamburg, Germany and Kumasi, Ghana respectively stated they have been invited to participate in breast cancer screening.

FIGURE 7: BAR CHART ILLUSTRATION ON PARTICIPANTS SOURCES OF INFORMATION



4.4. BREAST CANCER SCREENING PRACTICES OF PARTICIPANTS

Table 4: Breast Cancer Screening Practices of Participants in both Study Locations.

Practice	Hamburg, Germany (%)	Kumasi, Ghana (%)
What examinations were done for you?		
None	2%	1%
Self- Examination.	18%	18%
Clinical Breast Examination.	8%	12%
Self-Breast Examination and Clinical Examination.	20%	27%
Mammography	2%	1%
Mammography, Breast Self-Examination.	4%	2%
Clinical Breast Examination, Mammography, Breast Self-Examination.	36%	31%
I said I cannot tell	0	1%
Valid	10%	7%
TOTAL	100%	100%
Have you ever practiced breast self-examination?		
Yes	83%	85%
No	17%	12%
Maybe	-	3%
TOTAL	100%	100%
If yes, at what age did you start the breast self-examination?	Mean age 22.69± SD5.46	Mean age 24.26 ±SD7.15

If yes, how often do you perform the examination?		
Everyday	1%	1%
Annually	2%	4%
Half-Annually	4%	8%
Monthly	23%	14%
Never	14%	11%
Occasionally	49%	51%
Quarterly	7%	10%
Bi -monthly	0%	1%
TOTAL	100	100
Do you normally go for Clinical Breast examination?		
Yes	16%	11%
No	75%	82%
Maybe	9%	7%
TOTAL	100%	100%
If you go, how often?		
Valid	54%	49%
Annually	8%	11%
Half yearly	1%	3%
No	5%	13%
Occasionally	28%	24%
Quarterly	4%	0%
TOTAL	100%	100%

When was the last time you had the examination?		
No	21%	21%
1990	-	1%
1999	3%	1%
2000	1%	-
2005	2%	4%
2007	1%	-
2008	3%	1%
2010	-	1%
2012	-	1%
2013	1%	1%
2014	-	2%
2015	14%	11%
2016	-	5%
2017	4%	4%
2018	7%	6%
2019	30%	41%
2020	14%	-
TOTAL	100%	100%

From the study population, about 18% of the participants living in Hamburg, Germany had breast self-examination only, 8% had clinical breast examination, 20% had both breast self-examination and clinical breast examination, 2% had mammography and 2% of the participants do not have any examination while 18% of the participants living in Kumasi ,Ghana had Breast self-examination, 12% had only clinical breast examination , 27% had both self-breast examination and clinical breast examination , 1% mammography and 31% had clinical breast examination ,mammography and breast self-examination.

In the present study, it was observed that majority of the participants living in Hamburg, Germany practice breast examination occasionally, monthly , half annually , quarterly , annually and everyday (49% , 23% , 4% , 7% , 2% ,1%) respectively while participants living in Kumasi, Ghana also practice breast examination occasionally , monthly , half annually , quarterly , annually and everyday (51% , 14% , 8% , 10% ,4 % and

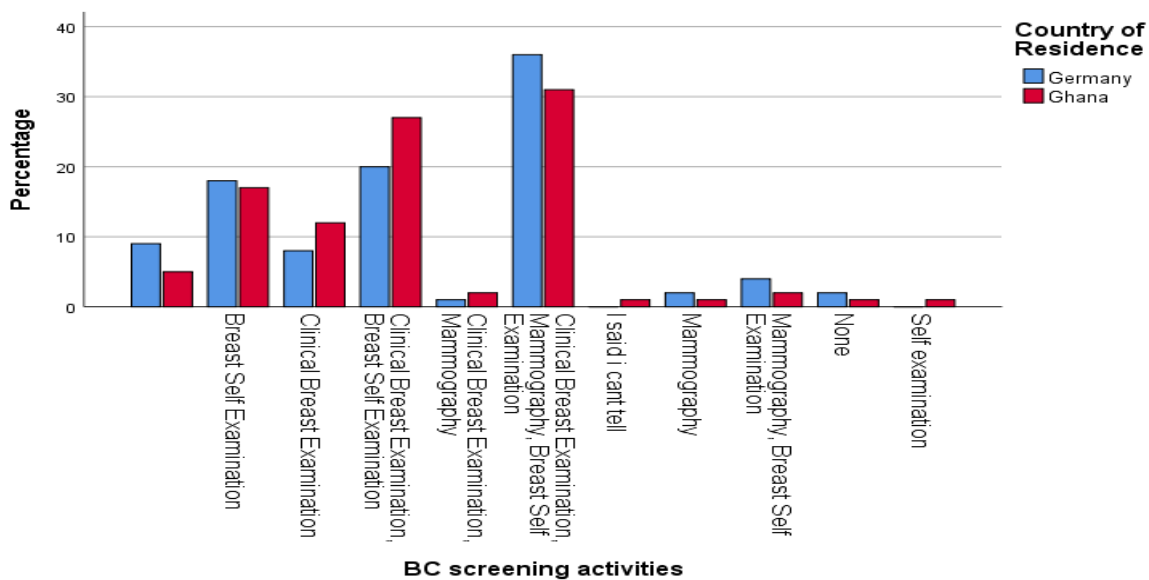
1%) respectively .Of the participants living in Hamburg, Germany and Kumasi,Ghana,14% and 11% respectively practice a breast examination.

In the study, most of the participants living in Hamburg, Germany and Kumasi, Ghana (85% ,82%) respectively do not practice a clinical breast examination while only (16%, 11 %) of the participants living in Hamburg, Germany and Kumasi, Ghana practice clinical breast examination respectively.

The study revealed that high percentage of participants living in Hamburg, Germany practice clinical breast examination , 28% occasionally , 8% annually , 5% quarterly and only 5% among the participants do not practice clinical breast examination whiles participants living in Kumasi, Ghana practice clinical breast examination, 24% occasionally , 11% annually and 13% of the participants living in Kumasi, Ghana do not practice clinical breast examination at all.

The findings from the present study on the last time the participants had a breast examination done in both countries of residence. The participants living in both countries of residence reported the last time they had a breast examination between 1990-2020. In 2015, 2018, 2019, 2020 about 14% ,7% 30% and 14% of the participants living in Hamburg, Germany had their breast checked while among the participants in Kumasi, Ghana about 11%, 6% and 41% had their breast checked on 2015, 2018 ,2019 respectively.

Figure 8: Bar- Chart illustrating the Participants Breast cancer screening practices in both countries of residence.



4.5. MEAN DIFFERENCE OF PARTICIPANTS ON AGE(YEARS) AND MENARCHE.

Table 5: The Differences in the Mean Age, Age at Menarche, Age at First Child, and Breastfeeding Time.

	Group Statistics				
	Country of Residence	N	Mean	Std. Deviation	Std. Error Mean
Age (Years)	Hamburg, Germany	100	30.44	6.765	.676
	Kumasi, Ghana	100	30.61	9.173	.917
Age at menarche (years)	Hamburg, Germany	100	13.55	1.888	.189
	Kumasi, Ghana	100	13.54	1.737	.174
Age at first childbirth(years)	Hamburg, Germany	100	15.55	12.310	1.231
	Kumasi, Ghana	100	13.86	12.308	1.231
Breastfeeding time (months)	Hamburg, Germany	10	26.78	18.566	1.857
	Kumasi, Ghana	100	31.58	18.590	1.859

The table above revealed that there are no mean differences between the age of participants(years) and age at menarche(years) within participants living in Hamburg, Germany and Kumasi, Ghana. There is a mean difference in the age at birth (years) and breastfeeding time (months) among the study participants living in Hamburg, Germany and Kumasi, Ghana.

Table 6: Significance Differences Among Study Participants

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Age (Years)	Equal variances assumed	1.870	.173	-.149	198	.882	-.170	1.140	-2.418	2.078
	Equal variances not assumed			-.149	182.108	.882	-.170	1.140	-2.419	2.079
Age at menarche (years)	Equal variances assumed	.489	.485	.039	198	.969	.010	.257	-.496	.516
	Equal variances not assumed			.039	196.654	.969	.010	.257	-.496	.516
Age at first childbirth (years)	Equal variances assumed	.003	.954	.971	198	.333	1.690	1.741	-1.743	5.123
	Equal variances not assumed			.971	198.000	.333	1.690	1.741	-1.743	5.123
Breastfeeding time (months)	Equal variances assumed	1.067	.303	-1.827	198	.069	-4.800	2.627	-9.981	.381
	Equal variances not assumed			-1.827	198.000	.069	-4.800	2.627	-9.981	.381

*T-test is significant at the 0.05 level

The table above suggest that there is no significant difference in the mean age of participants, age at menarche, age at first birth and breastfeeding time(months) within the study participants living in Hamburg, Germany and Kumasi, Ghana.

4.6. EDUCATIONAL LEVEL AND KNOWLEDGE OF PARTICIPANTS ON BREAST CANCER

TABLE 7: Ranks Table for the Educational Level and Knowledge on Breast Cancer

	Countries of Residence	N	Mean Rank	Sum of Ranks
Educational level	Hamburg, Germany	100	93.77	9377.00
	Kumasi, Ghana	100	107.23	10723.00
	Total	200
Self-reported of Breast cancer	Hamburg, Germany	100	100.50	10050.00
	Kumasi, Ghana	100	100.50	10050.00
	Total	200

The table indicates a little difference in the mean rank on the educational level of participants living in Hamburg, Germany and Kumasi, Ghana. (mean difference 93.77,107.23)respectively, while there is no mean rank difference on the knowledge; self-reported of breast cancer among the participants living in both countries of residence.(mean rank;100.50,100.50) respectively.

Table 8: Test Statistics of Participants on Educational Level and Knowledge of Breast Cancer

	Educational level	Self-reported knowledge of breast cancer
Mann-Whitney U	4327.000	5000.000
Mann-Whitney W	9377.000	10050.000
Wilcoxon Z	-2.655	.000
Asymp. Sig. (2-tailed)	.008	.008

a. Grouping Variable: Country of Residence

Table 8 Present the participants educational level and self-reported knowledge on Breast cancer. There was a statistically significant association between the educational level of participants living in Hamburg, Germany and Kumasi, Ghana and self-reported knowledge of Breast cancer as demonstrated by Mann-U Whitney HG (U=4327, P=.008) KG (5000, P=.008).

4.7. RELIGIOUS BACKGROUND AND KNOWLEDGE ON BREAST CANCER

TABLE 9: Rank Table on Participants Religion Background and Knowledge on Breast Cancer.

	Countries of Residence	N	Mean Rank	Sums of Rank
Religious	Hamburg, Germany	100	100.50	10049.50
	Kumasi, Ghana	100	100.50	100
	Total	200		
Awareness of Breast cancer	Hamburg, Germany	100	100.50	10050.00
	Kumasi, Ghana	100	100.50	100.50
	Total	200		

The table 9 indicates that there are no differences in the mean rank on the religion background and self-reported knowledge of participants living in Hamburg, Germany and Kumasi, Ghana (mean difference 100.50,105.50) respectively.

Table 10: Test Statistics of Participants on Religious and Knowledge of Breast Cancer.

	Religion	Self-reported knowledge of breast cancer
Mann-Whitney U	4999.000	5000.000
Mann-Whitney W	10049.500	10050.000
Wilcoxon Z	-.004	.000
Asymp. Sig. (2-tailed)	.997	1.000

a. Grouping Variable: Country of Residence

Table 10 present the participants religion background and self-reported knowledge on Breast cancer. There was no statistically significant association between the religious background and self-reported knowledge of breast cancer of participants living in Hamburg, Germany and Kumasi, Ghana Breast cancer as demonstrated by Mann-U Whitney HG (U=4999, P=.997) KG (5000, P=1.000).

4.8. PARTICIPANTS AGE AND BREAST CANCER SCREENING PRACTICES

Table 11: Rank Table for Participants age and Breast Cancer Screening Practices.

Ranks	Country of Residence	N	Mean Rank	Sums of Ra
Age	Hamburg, Germany	100	104.98	10497.50
	Kumasi, Ghana	100	96.03	9602.50
	Total	200		
Participation in Breast cancer screening	Hamburg, Germany	100	107.70	10769.50
	Kumasi, Ghana	99	92.23	9130.50
	Total	199		

The table indicates a little differences in the mean rank on the age of participants living in Hamburg, Germany and Kumasi, Ghana (mean difference 104.98,96.03) respectively, and also a mean differences were observed on breast cancer screening participation among the study participants in both countries of residence (mean rank;107.70,92.23) respectively.

Table 12: Age and Participants Involvement on Breast Cancer Screening Practices.

	Age	Breast cancer screening practices
Mann-Whitney U	4552.500	4180.500
Mann-Whitney W	9602.500	9130.500
Wilcoxon Z	-1.977	-2.192
Asymp. Sig. (2-tailed)	.018	.028

a. Grouping Variable: Country of Residence

Table 12 present the participants age and Breast cancer screening practices. There was a statistically significant association between the age of participants living in Hamburg, Germany and Kumasi, Ghana and breast cancer screening practices of participants as proved by Mann-U Whitney HG (U=9602, P=.018) KG (9130, P=.028).

4.9. GEOGRAPHICAL DISTRIBUTION OF PARTICIPANTS ON THE KNOWLEDGE ON BREAST CANCER SCREENING.

Table 13: Geographical Distribution of Participants.

	Knowledge of Breast screening	Breast cancer screening practices
Mann-Whitney U	5000.000	4107.000
Mann-Whitney W	10050.000	8667.000
Wilcoxon Z	.000	-609
Asymp. Sig. (2-tailed)	1.000	.542

The above table 13 indicates that there are no statistical differences in the knowledge and Breast screening practices between the participants in the two countries of residence.

4.10. DISCUSSION OF THE STUDY

The study was conducted to investigate on the Knowledge, Perception and Beliefs on Breast cancer and Breast cancer screening practices among Ghanaian women living in Hamburg, Germany and compatriots living in Kumasi, Ghana. The study also finds the difference in the Geographical location on Breast cancer screening practices among the study participants.

The mean age distribution of the participants in Hamburg, Germany is 30.44, ± 6.76 and in Kumasi, Ghana is 30.58, ± 9.13 years using student t test to determine the mean difference of participants in years, menarche, age at first child and breastfeeding time. The study indicates that there is no mean difference between the age of participants living in both countries of residence. The study finds no significant difference in the mean age of participants; age at menarche, age at first childbirth and breastfeeding time(months) within the study participants in both countries of residence.

Most of the participants in the study are Christians. There was no statistical association between the religious background and self-reported knowledge on breast cancer among the study participants living in both countries of residence as indicated by the Mann U Whitney test, Hamburg, Germany (U=4999, P=.997) and Kumasi, Ghana is (U=5000, P=1.000) respectively.

The present study reviewed that the participants are largely aware of breast cancer, breast cancer death and screening practices in both countries of residence. The participants' major sources of information on breast cancer and their overall health are the medical practitioners and media (Table 3), others are women's group, Internet, Family and Friends, Church, Hospital, Facebook and School were very low and less effective in both countries of residence. The present study is related to a cross-sectional study carried out in Accra and Sunyani Ghana among 474 women which reported the major health information source to be mass media (65.4%) (51). In another study carried out by Dufie et al.,2017 in Sekyere Ghana among 97 women which investigated the knowledge level of women on breast cancer, respondents' perceptions about breast cancer and the attitude of the people toward breast cancer. The study recognized that the respondents proved their knowledge level of breast cancer through breast cancer practices and their source of information on breast cancer. The major source of breast cancer Information and knowledge was from the hospital which is about 41.1% and media 30.9% (53).

The existing found a statistically significant association between educational level and knowledge about breast cancer among Ghanaian women in both countries of residence. Based on the high level of education among the study participants, Ghanaian women displayed a high knowledge about both breast cancer and breast cancer screening. The participants were fully informed about breast cancer screening practices. The

existing study indicated a statistically significant association between educational level and knowledge of breast cancer screening practices. The present study also reported that virtually all the participants in both countries of residence is fully aware of the services and activities involved in breast cancer screening. Most of the participants showed a high level of readiness and willingness to be screened for breast cancer. The study carried out by Opoku et al.,2012 reported a knowledge deficit in both breast cancer and breast cancer screening among the participants (51). A weak correlation was found between the level of education and self-reported knowledge about the disease (51). This does not go in line with the present study, which found out a statistically significant association between breast cancer and breast screening practices among the study participants due to a high level of education among the participants in both countries of residence. Another study carried out in Sekyere by Dr. Frances Dufie et al.,2017 found that a high proportion of the respondents in the study had knowledge about breast cancer screening which goes in line with the present study on the knowledge of breast cancer and breast cancer screening (53).

The participant's perception of the incidence and prevalence of breast cancer in both countries of the residence revealed that almost all the participants in the study recognized that the incidence and prevalence of breast cancer disease are very common in both countries of residence. However, this present study is closely related to the study carried out by Samuel Yaw Opoku et al.; 2012 in Ghana which reported that about 35.7% of the participants described the disease as very common, 24.5% thought it was common and 12.8% described it as uncommon, 27% have no knowledge of its prevalence (51).

The findings from the present study revealed that about 20% of the participants living in Hamburg, Germany had both breast self-examination and clinical breast examination. In Kumasi Ghana, 27% had both self-breast examination and clinical breast examination, 31% had clinical breast examination, mammography, and breast self-examination. From the present study, most of the women were involved in both breast self-examination and clinical breast examination in both countries of residence due to the high level of education and awareness about the disease.

The findings in the present study on the age and breast cancer screening practices shows a statistically significant association between the age of participants and breast cancer screening practices among Ghanaian women in both countries of residence as indicated by Mann U Whitney test, Hamburg, Germany (U=9602, P=.018), Kumasi, Ghana (9130, P=.028).

The study further investigates the geographic distribution of participants' knowledge and breast cancer screening practices. As reported earlier, most of the participants in the study had adequate knowledge of breast cancer and screening practices from the two study locations. However, there were no statistical differences in the knowledge and Breast screening practices between the participants in the two countries

of residence. Despite the quality health care infrastructure and high level of education reported by the participants, one is expecting a significant difference in the screening practices among participants in Hamburg, Germany more than participants in Kumasi, Ghana.

CHAPTER FIVE

5.0. CONCLUSION, RECOMMENDATION AND LIMITATIONS

5.1 Conclusion

In conclusion, the study revealed that the level of awareness about breast cancer and screening practices among Ghanaian women in both countries of residence is very high, and the participants proved good level of screening practices.

5.2. Recommendations

- The Government of Ghana should provide adequate treatment facilities for patients with the signs and symptoms of breast cancer.
- Good early detection program of breast self-examination to help detect signs and symptoms of breast cancer.
- Health professionals should schedule an annual clinical breast examination for Ghanaian women as their age advances.
- Adequate training should be given to health professionals in all levels to perform clinical breast examination as overall clinical assessment.
- The cost of mammography should be affordable to enable Ghanaian women who are at risk to go for the examination freely.
- More cancer centers should be built in all regions in Ghana.
- I therefore recommend continuous educational interventions for Ghanaian women and step by step practice of the Breast Self-Examination which is an essential tool to detect breast cancer and reduce mortality from breast cancer in both countries of residence for sustainability.

5.3. Limitations

- Absence of reliable literature studies which makes it difficult to make a comparison.
- The study is limited only to investigate the knowledge and perception of breast cancer.
- Self-reported which could lead to reporting bias.

APPENDIX

QUESTIONNAIRE

Dear Participants,

I am studying Master of Public Health at HAW Hamburg. I am currently carrying out my master’s thesis on Knowledge, Attitude, Belief and Perception on Breast Cancer and Screening Practices among Ghanaian immigrants Living in Germany and Compatriots in Ghana.

I humbly request for your assistance in participating in this survey. This survey is about breast cancer and screening practices among women between the age of 20 to 60 years. The survey will take 10 minutes to fill the questionnaire. The research study is voluntary and your information provided will be strictly confidential and use solely for the purpose of the study.

Thank you for sparing your time.

Best Regards,

Mandy Opoku-Amankwah

SECTION A: DEMOGRAPHIC INFORMATION

1. Country of Residence
2. Age (Years)
3. Religion: Christian () Muslim () Traditionalist () Others Specify
4. Educational Level attained? Primary () Middle () Secondary () Tertiary () None ()

SECTION B: REPRODUCTIVE HISTORY

5. What was your age at menarche (first time of menstruating)?
6. Do you have children? Yes () No ()
7. If yes, at what age did you have your first child?
8. Do/ did you breastfeed your children? Yes () No ()
9. If yes, for how long?
10. Do/ did you take a contraceptive pill during breastfeeding? Yes () No ()

SECTION C: KNOWLEDGE, BELIEFS & ATTITUDE

- 11. Have you ever heard about breast cancer? Yes No Not sure
- 12. Where do you get most of the information about breast cancer? Medical practitioners Media
Women's Group Family and Friends Church Others Specify
- 13. Do you think many women die from breast cancer in your country of residence? (If yes answered yes, go to) Yes No Not sure .
- 14. Do you know of anyone who has died of Breast cancer? Yes No Not Sure
- 15. How common is breast cancer in your country of residence? Very common Somewhat common.
 Not common at all Don't know .
- 16. Have you heard about breast cancer screening? Yes No Not sure
- 17. If yes, from whom /where? (Tick as many as appropriate) Medical practitioners Media Family
and Friends Women's Group Church Others Specify
- 18. Can you tell me the activities involved in the breast cancer screening? Yes No Not sure .
- 19. If yes, indicate them. Breast self-examination Clinical Breast Examination Mammography
Others Specify
- 20. Are you aware of the services in your community for breast cancer screening? Yes No Not
sure Would you like to be screened for breast cancer? Yes No Not sure .
- 21. Have you ever been invited to participate in breast cancer screening? Yes No . If yes, by whom?
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SECTION D: PRACTICES

- 22. What examinations were done for you?
- 23. Have you ever practiced breast self-examination? Yes No .
- 24. If yes, at what age did you start the breast self-examination?
- 25. If yes, how often do you perform the examination? Monthly Bi-monthly Quarterly Half-
Yearly Annually Occasionally
- 26. Do you normally go for Clinical Breast examination? Yes No .
- 27. If you go, how often? Quarterly Half yearly Annually Occasionally .
- 28. When was the last time you had the examination?

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