ASSESSMENT OF HISTOPATHOLOGY PATTERNS OF BREAST CANCER MANAGED AT ALEXANDRIA CANCER CENTER AND PALLIATIVE CARE HOSPITAL, ELDORET, UASIN GISHU COUNTY, KENYA

BY

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RESEARCH THESIS REPORT IS SUBMITTED TO THE DEPARTMENT OF EPIDEMIOLOGY AND MEDICAL STATISTICS IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF PUBLIC HEALTH AT MOI UNIVERSITY

DECLARATION

This Thesis report is my original work and has not been presented to any other University/Institution for any academic award.

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Declaration by supervisors

This thesis report has been submitted to Moi University with our approval as University supervisors.

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DEFINITION OF TERMS

Cancer: It's a group of diseases characterized by uncontrolled growth of the cells in the human body and the ability of these cells to migrate from the original site and spread to distant sites.

Breast cancer: It is a disease in which cells in the breast grow out of control

Histopathology: It's the microscopic examination of biological tissues to observe the appearance of diseased cells and tissues in very fine detail

ACRONYMS

ACC	Adenoid Cystic Carcinoma
BRCA	Breast Cancer
CDC	Center for Disease Control and Prevention
DCIS	Ductal Carcinoma In-situ
ER	Estrogen Receptor
HER-2	Human Epidermal Growth Factor Receptor Type 2
IDC	Invasive Ductal Carcinoma
ILC	Invasive Lobular Carcinoma
MBC	Metaplastic Breast Carcinoma
MIPC	Micropillary Carcinoma
PR	Progesterone Receptor
SEER	Surveillance, Epidemiology, and End Results
TC	Tubular Carcinoma

ABSTRACT

Background: Globally approximately 2.3 million cases of breast cancer were reported in 2022. These cases were distributed among different histopathological sub-types. In sub-Saharan Africa 186,598 cancer cases were diagnosed in 2022 and 85,787 deaths occurred annually. In Kenya of the 5985 new cases reported breast cancer contributed 12.5% of all cancer cases. Detailed data on patient characteristics, survival rates, and factors influencing mortality among breast cancer patients at the Alexandria Cancer Center and Palliative Care Hospital (ACCPH) is lacking, hindering effective management and treatment strategies.

Objective: To determine the characteristics of patients with breast cancer, proportion of different histopathological sub-types of breast cancer and survival.

Methods: The study was conducted at ACCPH using a cross-sectional study design. Census of all patients who met the inclusion criteria and managed between 2016 and 2019 at ACCPH were included. Data was collected from records using a data abstraction tool. Mean and standard deviation were employed to summarize continuous variables while proportions and frequencies were used for categorical variables. Kaplan-Meier (K-M) survival estimates procedure was used to analyze the 2-year survival time. Cox regression model was fitted to assess predictors of survival time, significance evaluated at p-value <0.05.

Results: Fifty four cases were studied, 52 females and 2 males. Females contributed the highest number and 40 to 49 years (33.3% of the total) was the peak age. Invasive ductal carcinoma accounted for 88.7%, 2-year survival rate was 64.8%. Metastases at diagnosis and disease progression were factors associated with risk of death with a p-value < 0.001. Gender, age and metastasis were also significantly associated with survival time.

Conclusion: The most affected age group was 40 to 49 years, invasive ductal carcinoma was the commonest histological sub-type, a significant number of cases presented with metastasis an indicator of late presentation. Majority of the cases were alive 2 years post diagnosis. Those who had metastasis had a higher likelihood of dying.

Recommendations: Breast cancer screening among the females above 40 years old. Reduction of risk of metastasis by creating awareness for early diagnosis to further improve the 2-year survival rate.

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CHAPTER ONE: INTRODUCTION

This chapter describes a preview of the concept and assessments of histopathological patterns of breast cancer diagnosed. In this section, the background, problem statement, study objectives, and the limitation were described.

1.1 Background

Globally there were 20 million new cases of cancer and 9.7 million deaths from the disease in 2022. The bulk of these instances occurred in countries with low and moderate incomes (Globocan, 2022). A key cause for concern on a global scale is the increasing cancer burden. Cancer is a disease that is characterized by the proliferation of abnormal cells in the affected area of the body, the ability to grow beyond their usual boundaries, and the tendency to invade the surrounding tissues and spread to secondary organs or tissues as metastases (WHO, 2012). Cancer is a disease that occurs when abnormal cells grow in an uncoordinated manner without regard to the normal rules of cell division (Hejmadi, 2013). Within the context of this growth and development continuum, cancer can be prevented or diagnosed at an earlier stage provided the appropriate procedures are followed. Cancer is typically caused by the transformation of normal cells, which occurs over the course of a multistage process.

The incidence and mortality rates of cancer continue to rise. Over the next two decades, it was anticipated that the number of newly diagnosed cases of cancer would increase by approximately 70 percent, and the global economic expenditures associated with cancer prevention and treatment were estimated to reach over 1.16 trillion dollars in 2010 (WHO, 2017).

According to Siu (2016), breast cancer is a disease that poses a significant risk to the lives of both men and women. According to Laishram and Singh (2015), it is a disease that is believed to be complicated and heterogeneous in terms of histology, cellular origin, mutations, metastatic potential, progression, therapeutic response, and clinical outcome. It accounts for sixteen percent of all cancers (Taheri et al., 2019) and one-quarter of all female cancers worldwide (Bray et al., 2018); (Makki, 2015). It is the most common form of cancer, with 2.2 million cases, and it is a substantial cause of cancer fatalities, with 626,679 deaths in females worldwide (Bray et al., 2018).

In industrialized countries, the incidence of breast cancer is significantly higher than in developing countries; yet, according to Ahmedin Jemal (2011), around sixty percent of breast cancer deaths and fifty percent of new cases of occur in developing countries. According to Jemal, Centre, DeSantis, and Ward (2010), the greater rates in developing nations are a result of disparities in reproductive and hormonal factors, as well as the availability of early diagnosis services in industrialized countries.

As of the year 2020, the World Health Organization (WHO) reported that cancer was the greatest cause of illness and mortality across the globe. According to the report, around 18.1 million new instances of cancer were reported as having occurred over the world in 2018. According to the World Health Organization's (WHO) estimation models of the evolution of cancer, the number of deaths caused by cancer is expected to increase by forty-five percent by the year 2030. It was estimated in the paper that the increase in the burden of the disease could be five times bigger in nations with intermediate to low income in comparison to those with developed income countries. The projection also indicated that the economic burden of the disease would increase, with the cost of cancer prevention and treatment estimated to be $1.6 trillion as of

2018. This would pose a threat to the budgets of individuals with varying levels of income, and it would cause individuals who have developed cancers and their families to experience unimaginable suffering and financial distress (WHO, 2020).

Cancer accounts for 7% of overall mortality in Kenya, with 42,116 new cases and 27,092 deaths in 2020 (GLOBOCAN, 2020). In Kenya, infectious and cardiovascular diseases are the primary causes of death, but cancer is the third highest. The majority of cancers are identified at advanced stage, which is a time when the prognosis is not favourable and there are few therapeutic choices available that can cure the disease.

In contrast to many developing countries, where the number of newly diagnosed cases of breast cancer has rapidly increased over the past few decades (Nematolahi & Ayatollahi, 2017), the number of new cases of breast cancer has slowed down in developed countries. This is probably due to the rise in life expectancy, the expansion of urban areas, and the acceptance of the western way of lifestyle (Tazhibi & Feizi, 2014). More than two hundred and fifty thousand new cases of breast cancer were reported in the United States of America (USA) in the year 2017. It is estimated that twelve percent of all women in the United States will be diagnosed with it at some point in their lives (Waks & Winer, 2019).

When compared to other types of cancer, breast cancer has the greatest incidence rate, with over 2.2 million cases being reported worldwide in the year 2020. On the other hand, it is extremely uncommon in males, accounting for fewer than one percent of all occurrences of breast cancer. In high income countries, breast cancer is common among postmenopausal women compared to those from LMICs where it is common in postmenopausal. Countries with low and moderate incomes are the ones that experience the majority of breast cancer incidences and fatalities. According to the American Cancer Society (2018), breast cancer is one of the most common cancers

that affect women and is responsible for the majority of cancer fatalities that occur among women of all races when compared to other malignancies. Furthermore, according to the American Cancer Society, each year in the United States, there are approximately 200,000 women who are diagnosed with breast cancer, and at least 40,000 women pass away as a result of the same condition. In LMICs, metastasis and lack of access to timely quality management are the leading causes of morbidity and mortality. When it came to women in the United States, cervical cancer was also one of the major causes of mortality.

One of the most significant contributors to death and morbidity in the region is cancer, as is the case in other nations in the sub-Saharan region. It was estimated that the proportion of cancer burden would increase by more than 85 percent by the year 2030 over the entirety of sub-Saharan Africa alone (Bello et al., 2013). Additionally, it was projected that there would be a significant global increase of 19.3 million new cancer cases per year by the year 2025 (Globocan, 2012). Breast cancer was responsible for 28% of all cancers and 20% of all cancer deaths among women in Africa in 2012 (Clegg-Lamptey, 2016). Among both sexes, it accounted for 16% of all cases and 11% of total fatalities. Breast cancer was specifically responsible for the deaths of women. According to the American Cancer Association (2018), it was placed second next to cervical cancer among women in East Africa in terms of the number of deaths and the prevalence of the disease.

According to the Globocan report for 2018, the International Agency for Research on Cancer (IARC) estimated that there were 47,887 new instances of cancer diagnosed per year in Kenya, with 32,987 deaths resulting from the disease. According to the information provided by the Kenya National Cancer Control Strategy 2017-2022, around 37,000 new infections were reported in the year 2012. According to the

Ministry of Health (2017), during the same period, a total of 28,500 people lost their lives due to cancer. There were 47,887 new cases of cancer diagnosed in 2018, according to the National Cancer Institute's most recent figures, and 32,987 people lost their lives to the disease. It is the most prevalent form of cancer in Kenya, with 6,799 new cases expected to take place in the year 2020 and an age-standardized prevalence of 41 per 100,000 people. It has been determined using preliminary data from the Kenya National Cancer Registry 2014-2019 (KNCR) that seven out of ten cases of cancer are identified at late stages, specifically stage III and stage IV. Kenya tends to experience it at a relatively younger age (35-50 years), in contrast to western countries, where it typically occurs between the ages of 50 to 55. In the United States of America, around 90 percent of breast cancer cases are random, whereas only 5 to 10 percent may be related to a genetic predisposition. The invasive ductal carcinoma (IDC), is the most prevalent histological form of breast cancer that is identified, accounting for up to 75% of all breast cancers. One of the most significant obstacles in the fight against breast cancer is the restricted availability of prevention, diagnostic, treatment, and rehabilitation services for cancer patients.

Breast and cervical cancer screening rates in the country continue to be low, a fact that may be related to a lack of understanding regarding these malignancies as well as inadequate and rare access to sexual reproductive healthcare services (KNBS & Macro, 2014). The low uptake of these screening services necessitates the implementation of novel approaches to improve information about these diseases and as a result to encourage screening, which ultimately results in the early diagnosis of these cancers.

1.2 Problem Statement

In 2022, breast cancer remained the most common cancer among women globally, with estimated 2.3 million new cases and 666,000 deaths. In sub-Saharan Africa, most patients present with advanced disease due to delayed diagnosis. The patients diagnosed with breast cancer have different histologic sub-types and characteristics which influence morbidity and mortality. General statistics compiled by the Alexandria Cancer Centre and Palliative Care Hospital, breast cancer was the most prevalent form of cancer in the years 2016 and 2019, accounting for 13.5% and 12.7% of all malignancies, respectively. This illustrates that breast cancer is a significant burden on the government's health system. According to the Eldoret Cancer Population Based Registry, which is based at Moi Teaching and Referral Hospital, the results of cancer in general and breast cancer in particular, continue to be dismal in the western region of Kenya. Patients who come with advanced disease have diseases that has spread to numerous organs, including the brain, bones, lung, and regional lymph nodes. A very unfavourable prognosis is associated with breast tumours that are in stages 3 and 4. The various genetic compositions shed light on the behaviour of the histological patterns and molecular characterization of breast cancer, both of which have the potential to influence the aggressiveness of the disease progression. Cancer and patient characteristics, such as age, gender, histological sub-type, molecular characterizations, and so on, are diverse and present a significant challenge in terms of the physical, social, financial, and emotional costs that are associated with living with the disease.

1.3 Justification

The purpose of this study is to provide information on the histopathological sub-types of breast cancer, clinical assessment and breast cancer treatment.

The findings and conclusions of the study may be used in clinical practice, public health and to guide policy in order to guarantee that interventions carried out by government and non-government organizations are tailored to prevent, reduce morbidity and mortality, and, in general, save resources on physical, emotional, social, and financial costs. There is a possibility that the prognosis may improve when we provide individualized treatment. The treatment will be tailored to the individual patient after considering the characteristics of the tumour and the patient, including histopathological and molecular analysis. As an illustration, the research on the expense of treating breast cancer that is triple negative is distinct from breast cancer that is hormone receptor positive and breast cancer that is Her-2 positive.

1.4 Research Questions

1. What is the proportion of various sub-types of breast cancer managed at the ACC&PCH?
2. Which characteristics are associated with patients with breast cancer managed ACC&PCH?
3. What is the relationship between the characteristics and survival of patients managed at the ACC&PCH?
4. What is the two-year survival rate of breast cancer patients managed at the ACC&PCH?

1.5 Objectives

1.5.1 General Objective

To assess characteristics, histopathological sub-types, and survival of breast cancer treated at Alexandria Cancer Center and Palliative Care Hospital

1.5.2 Specific objectives

1) To determine characteristics of breast cancer sub-types among patients being managed for breast cancer at ACC&PCH
2) To evaluate the percentage of different sub-types of breast cancer among patients being managed for breast cancer at ACC&PCH
3) To determine the relationship between histopathological sub-types and metastasis among patients being managed for breast cancer at ACC&PCH
4) To determine the two-year survival rate of different histopathological sub-types among patients being managed for breast cancer at ACC&PCH

CHAPTER TWO :LITERATURE REVIEW

2.0 Introduction

In this chapter, reviewed literature related to the objectives of the study together with basic concepts were defined. The reviewed literature highlighted the key study objectives empirically and that the researcher will be guided to understand the research problems.

2.1 Characteristics of patients with breast cancer

2.1.1 Gender

While breast cancer is commonly found in women, it is possible for men to develop the disease (American Cancer Society, 2016a). There were over 2.1 million newly diagnosed instances of breast cancer in females in 2018, accounting for almost one in four occurrences of cancer (Bray et al., 2018). Breast cancer is the most frequent type of malignancy worldwide and the main cause of cancer-related deaths among women (Hu et al., 2019). Breast cancer is diagnosed in men as well. The annual incidence of invasive breast cancer in males were estimated to be slightly less than 2,500 cases in 2017, which was equivalent to one case for every 1,000 men over the course of their lives. The incidence of invasive breast cancer in women in the United States was approximately 253,000, which is equivalent to one in eight women throughout the course of their lifetime. This is approximately one hundred times greater than the incidence of breast cancer in men (Kufel-Grabowska, 2011).

There were approximately 2,670 new cases of invasive breast cancer in men that were diagnosed in the United States in 2019, and it is anticipated that approximately 500 men will pass away as a result of breast cancer (American Cancer Society, 2016a). A

mere 0.7% of all breast cancer diagnoses are made in males, making male breast cancer an uncommon occurrence. According to Ravi, Bang, Karsif, and Nori (2012), there were approximately 1,970 new instances of breast cancer diagnosed in males in the United States in the year 2010. Additionally, it is anticipated that 390 men will pass away as a result of the disease each year. According to Anderson, Jatoi, Tse, and Rosenberg (2010) and B. Cutuli et al. (2010), male breast cancer accounts for less than one percent of all malignancies that affect males and less than one percent of all breast cancers that occur in western countries. The American Cancer Society (2016a) reports that ductal carcinoma in situ, invasive ductal carcinoma, and invasive lobular carcinoma are the three kinds of breast cancer that are most prevalent in males experiencing breast cancer.

2.1.2 Age

According to Sripan et al. (2017), breast cancer is a disease that is associated with ageing. The process of ageing is associated with a number of physical changes, including changes in hormone levels, which has a significant role in both the incidence of breast cancer and the effectiveness of treatment. Age is the most significant risk factor for breast cancer in women. The incidence of breast cancer rises sharply with increasing age among per-menopausal women (those who are younger than or equal to 50 years old), while the incidence reduces among postmenopausal women (those who are older than 50 years old) until the age of 80 years old (Ma & Jemal, 2012). Depending on tumour biology, which is assumed to differ between the two groups or regions due to genetic and environmental risk factors (Hemminki, Mousavi, Sundquist, & Brandt, 2011), age-specific incidence rates for breast cancer in low-risk and high-risk ethnic populations differ by age at which the maximum

incidence is reached. In low-risk populations, the age at which the maximum incidence occurs is approximately fifty years, while in high-risk populations, it is over sixty years.

During the year 2008, it was anticipated that 33 percent of women who were diagnosed with breast cancer were under the age of 50. This figure contrasts with the 42 percent of women who were diagnosed with the disease in the Asia-Pacific area and the 47 percent of women who were diagnosed in the sub-region of South-Eastern Asia. According to Youlden, Cramb, Yip, and Baade (2014), the percentage of breast cancers diagnosed in women under the age of 50 ranged from 21% in Australia to 55% in South Korea and Laos and 58% in Vanuatu and Papua New Guinea. In Australia, the percentage of breast cancer diagnosed was in the range of 21%. By the year 2013, Rao, Shetty, and Kishan Prasad reported that sixty-seven percent of patients in India were younger than fifty years of age. In Sweden, the incidence of breast cancer in males reaches its highest around the age of 70, whereas in females, it reaches its peak bi-modally between the ages of 50 and 70. According to Nilsson et al. (2011), the onset of breast cancer in men often occurs between five and ten years after the onset of breast cancer in women. In women aged 40 to 49 years, the incidence of ductal carcinoma in situ is 0.6 per 1000 screening examinations, whereas in women aged 70 to 84 years, the incidence is 1.3 per 1000 screening examinations (Kanumuri & Chagpar, 2015). This indicates that the incidence of this type of cancer rises with age.

2.1.3 Socio-economic, cultural, and demographic characteristics

Several studies have shown that socio-economic and demographic characteristics, such as financial status (Bouchardy et al., 2006) and economic disadvantage (Alice et al., 2008), may have an effect on the number of people who get screened for breast cancer. It has been demonstrated that socioeconomic position is a significant factor in the participation in breast cancer screening (Moser et al., 2009). Furthermore, it is of utmost importance to note that deprived populations appear to have a later stage presentation in breast cancer in London (Cuthbertson et al., 2009). In a study of the association between uptake of breast screening and socio-economic deprivation, travel distance, urban-rural status, location and type of screening unit, the strongest association of breast screening uptake was with socioeconomic deprivation especially with significantly lower uptake from deprived areas (Maheswarab et al., 2006). Very little research has been done especially in developing countries like Kenya to establish the influence of socio-economic deprivation and income status on the uptake of clinical breast examination and mammography.

The role of culture and beliefs on breast cancer and its implications on preventative health behaviour is not well understood. Nevertheless, Gulshan et al. (2007) showed that cultural beliefs have an effect on how people perceive cancer and how they behave in terms of their health. For example, among Asian women in London, the subject of cancer is considered a taboo, there is a stigma associated with it, and there are misunderstandings about the cause of cancer. In Africa, the most significant barrier to breast cancer screening is the prevalence of cultural beliefs, and a significant number of women are reluctant to openly discuss the breast cancer (WHO, 2006). Women would rather contact gods or pray in order to find out why and who is

responsible for the diseases, which would result in a delay in the presentation for screening and treatment (Ibid, 2006). Cultural beliefs and practices exacerbate the challenges that are associated with comprehending breast cancer and screening (Moller, 2008).

Furthermore, culture defines temporal norms for behaviour and directs members to respond emotionally, cognitively, and socially to the condition (Gulshan et al., 2007). Even while culture influences both the risk factors for cancer and the meaning of the disease, it also influences the relationship between the two. The attitude that women have towards breast self examination (BSE) is influenced by culture (Ibid, 2007). A study conducted by Sarah and colleagues in 2007 found that the most significant determinants of breast screening attendance and non-attendance were cultural attitudes on breast screening as well as the perceived personal relevance of breast screening. There are some societies in which women believe that cancer is an illness that only affects white people, while others believe that breast cancer is a curse from God or that it is caused by the devil. Therefore, if a lump in the breast is not found and treated earlier, it will recede and never grow into a malignant tumour (ibid, 2007). This is because other women assume that it is not necessary to explore situations that are unknown to them. Deshpande et al. (2009) noted in some studies that, religiosity has been found to be negatively linked with breast health enhancing behaviour, whilst in other studies, spirituality has been found to be positively connected with such health behaviour.

Consequently, cancer control efforts that are aimed at women need to incorporate messages that are in line with their beliefs, attitudes, and experiences (Baron et al., 2008). According to Cullati et al. (2009), the belief in invulnerability to breast cancer,

in which women attribute the occurrence of breast cancer to unfortunate circumstances, does not only delay the reporting of breast cancer but also the adoption of screening. Some people feel that breast cancer is not a serious sickness, while others believe that exposure to breast cancer is the will of God. This belief has the potential to reduce the impact of the perceived severity of the disease on the practice of breast self-examination and the number of people who undergo screening. Others are of the opinion that discussing the disease may lead to its start, which will consequently postpone the reporting of the disease and the uptake of screening (ibid, 2009). According to the findings of Bulaporn and Clark (2008), the cost of screening and the distance to screening facilities are two of the most important factors that come into play when deciding the number of Thai women who utilize breast cancer screening services.

A significant barrier that prevents women from making use of services like mammography and clinical breast examinations is the high expense of these procedures, particularly in underdeveloped countries (World Health Organization, 2006). According to the findings of Maheswarab et al. (2006), the number of women who went through breast screening reduced dramatically as the distance from their home to the screening facility increased. Barter and Taket (2007), on the other hand, discovered that there was no correlation between the proximity of their sample to the screening site and attendance. They reported that access was a concern due to the fact that appointments were declined due to the inconvenience they caused. According to Chan et al. (2008), a lower education level among women is a significant variable that is associated with low breast screening uptake. Furthermore, according to Weller et al. (2009), age was a significant predictor of screening mammograms in 57% of the

studies that were conducted among Latin American women in the United States. On the other hand, Lee et al. (2010) discovered that there is an inverse relationship between the fact that women participate in breast screening and their age.

2.1.4 Psychosocial characteristics

In Iranian women, the dread of discovering anything wrong and the idea that it is better not to know have been described as barriers to breast cancer screening (Lamyian et al., 2007). Both of these feelings come from the belief that it is better not to know. Hay et al. (2006) discovered that there is a positive correlation between women's screening behaviour and their level of concern over breast cancer. As another factor that may discourage Latinas from undergoing preventative procedures, Schueler et al. (2008) found that Latinas are concerned about the pain and discomfort that are connected with these operations. According to research conducted by Magai et al. (2007), women who engage in repression and denial tend to preemptively block the knowledge of the cancer threat from their consciousness, which in turn leads to avoidance behaviour when it comes to breast cancer screening. There are a number of factors that have been identified as obstacles to the use of breast cancer screening among Asian American women (Tzu –Yin Wu et al., 2008).

These factors include feelings of shyness, humiliation, and discomfort in the event that the mammography is performed by a male or a doctor who is unfamiliar with the patient. Magai et al. (2007) discovered that when other factors, such as age, socioeconomic position, physician recommendation, and anxiety, were adjusted for, higher levels of embarrassment were found to be a predictor of inferior screening. Furthermore, they discovered that women with high embarrassment ratings were 29% less likely to undergo a screening test. It is Aygul and Ayse. (2011) found that among

older Turkish women, neglect and deferral of breast screening due to a lack of physical indications and a feeling of well-being were hurdles to the process. The fact that many women in Ol-kalou, Nyandarua County Kenya, did not identify breast cancer screening with any direct benefits was the most common reason that influenced their decision to decide whether or not to undergo the screening. Given that breast cancer is not prominent in the region, many women could not see the rationale for doing breast cancer screening (Muchiri, 2006). Additionally, the significance of such psychosocial variables in breast screening decisions among women in Africa has been explored the least in the research that is currently being conducted.

2.1.5 Institutional characteristics

Schueler et al. (2008) reported that there is a negative correlation between living in rural area and the use of mammography as a screening procedure (adjusted odds ratio of 0.75, 95% confidence interval of 0.63–0.90). However, according to the study that Guessous et al. (2010) conducted in 2010, only thirty percent of the research (three out of ten) concluded that living in a rural area was a significant barrier to the uptake of colorectal cancer screening. They have pointed out that transportation issues, such as considerable distances between women's residences and health facilities and the absence of public transit networks, may also create challenges to regular breast screening in rural locations. Ackerson and Grete-beck (2007) have made this observation. According to the findings of Maheswarab et al. (2006), the number of women who went through with breast screening reduced dramatically as the distance from their home to the screening facility increased. A study was conducted to determine the impact of out-of-pocket charges on the utilization of mammograms.

The findings revealed that women who were required to pay for mammograms out of their own pocket were less likely to have screenings compared to those who had health insurance coverage that covered the expenses (ibid, 2006).

Cohen (2010) found that nurses not only have a favourable impact on patient compliance with breast screening, but they also educate women on how to recognize changes in their breasts and assist them in making decisions regarding what to do in the event that a change is detected. According to the findings of Meissner and colleagues (2007), the intervention of a nurse is more likely than any other element to act as an incentive for breast screening; this is the case. However, a significant percentage of healthcare facilities in Kenya do not have enough nurses, and the workload that they are expected to do is quite excessive. Many medical facilities do not have mammography facilities or breast health protocols that pertain to the detection of tumours in the breast (Musimbi, 2008). Additionally, some hospitals do not follow breast health guidelines. The parts of breast cancer screening that are discussed in MCH clinics are limited, and there is little evaluation done to investigate the level of compliance that women meet, particularly with regard to BSE.

In addition, in comparison to other elements of health, breast health is not given a significant amount of attention in most medical care clinics (ibid, 2008). It was demonstrated by Nevin et al. (2007) that the accuracy of the BSE of the women improved after they received schooling. In addition, both their attitude and behaviour towards BSE changed, which led to the conclusion that the primary reasons why the women were not practicing BSE prior to schooling were a lack of knowledge and a lack of motivation. According to Sarah et al. (2009), it has been demonstrated that teaching in social situations can improve one's understanding of breast cancer and

screening screenings. It is possible to increase the number of women who undergo breast cancer screening if a qualified nurse is present in a clinic. This nurse would be able to deliver intensive educational interventions, as well as information about the advantages of breast screening and breast screening (WHO, 2006). For the objective of making improvements, it is necessary to investigate whether or if the utilization of clinical breast examination and mammography in Mosocho may be connected with hospital characteristics that are equivalent to those found in other developing nations.

It is known that cancer is a multifaceted disease that might include many sub-types. According to Das et al. 2019, early cancer identification and prognosis have become increasingly important in the field of cancer research. This is due to the fact that they can assist with the subsequent clinical care of patients. Considering the significance of classifying cancer patients into high-risk and low-risk categories, a great number of research teams in the disciplines of bio-medicine and bio-informatics have investigated the application of machine learning (ML) techniques (Davi & Acioli-Santos, 2019). In accordance with the World Health Organization (WHO), cancer is the second most common cause of death. Any part of the body might be affected by this condition, which is distinguished by the rapid progression of abnormal cells. Cancer is a category of diseases that can manifest itself in a wide range of different ways and symptoms.

The development of cancer can be attributed to a variety of factors, including unhealthy lifestyle choices and genetic mutations. When an amino acid in the DNA undergoes a mutation, the structure of the DNA sequence is altered or shifted, which results in the production of mutant cells with a new sequence order. This is an example of a genetic mutation. There are a lot of steps involved in the process of

evaluating possible cancer patients, some of which include blood work testing and physical examinations (Johnson, Ben-Zion, Meng, and Vernon, 2020). White blood cells (WBC) and the immune system are the two primary organs that are impacted through the presence of malignancy. Neutrophils, lymphocytes, monocytes, eosinophils, and basophils are the five primary types of white blood cells. Also known as white blood cells. When a body is affected by cancer, the only changes that occur are in the amounts of the first four types of cells. The white blood cell (WBC) test is intended to be carried out in an automated fashion, with the counting of white blood cells and the subsequent comparison of the results to a reference table that may display different values depending on the region. The presence of decreased neutrophil and lymphocyte counts is indicative of the fact that the immune system of the body is engaged in a fight against a virus and that the body is not producing sufficient antibodies. Consequently, the purpose of employing these approaches is to simulate the progression of malignant circumstances and the management of those conditions.

In addition, the significance of machine learning approaches is proved by the fact that they are able to extract significant features from complex datasets (Tresp & Yu, 2016). Although it is obvious that the application of machine learning techniques can assist us in gaining a better understanding of the progression of cancer, these techniques need to be verified to a sufficient degree before they can be utilized in routine clinical settings. Cancer of the breast affects a significant number of people in today's society. This disease can be caused by a wide variety of factors, many of which are difficult to name. Additionally, in order to determine if the cancer is benign or malignant, doctors and physicians are required to put in a significant amount of effort during the

diagnosing phase. Even for those who are trained in the medical field, it may be difficult to ascertain the ultimate result when numerous tests are utilized in the process of diagnosing breast cancer. These tests may include clump thickness, uniformity of cell size, uniformity of cell shape, and other similar procedures. Over the course of the past few years, there has been a rise in the utilization of diagnostic tools that are based on artificial intelligence in general and machine learning in particular. According to the findings of epidemiological research (Otieno, 2008), there are variations occurring all around the world in the prevalence and distribution of breast diseases. Once the local patterns of breast disease distribution have been identified, it is possible to establish generalizations about diagnosis and treatment that are pretty certain.

Furthermore, planning and resource allocation are both able to be managed with greater skill. This is especially true in countries with limited resources, where a sizeable portion of the population may possibly be unable to afford all of the diagnostic modalities that are now accessible. The incidence rate of breast diseases in males normally ranges from 0 to 5.8%, although the likelihood of breast diseases occurring in women is significantly higher than in men. When it comes to benign breast disorders that affect men, gynaecomastia has the highest ranking. There is a significant amount of variation in the distribution of pathology in females based on age and geographical location. A mean age of 28.5 years is associated with the development of benign lesions, which account for 48.9% to 57% of cases across all age groups. In adults under the age of 30, the prevalence of benign lesions can reach a staggering 99%. Fibro-adenoma is the most common breast lesion, with prevalence rates ranging from 34.7 to 67% of all breast lesions. Its highest mean age incidence

occurs between the ages of 16 and 25 years old. Inflammation and malignancy are the two most common types of lesions, with fibro-adenoma being the most common. Therefore, benign diseases are responsible for the majority of cases that are seen in any breast clinic. Despite the fact that some studies suggest that malignant disorders are more prevalent, other studies have discovered that inflammatory lesions are the most prevalent disease entity. The alteration of cellular and molecular structures is what leads to the development of cancer. The growth and multiplication of the organism are intricately connected to the accumulation of mutations. Particularly noteworthy is the fact that a considerable proportion of identified mutations are responsible for the cellular alterations that lead to cancer. Only a very small fraction of mutations are responsible for the development of cancer, while the vast majority of mutations are harmless and neutral (passenger) in nature. There is a possibility that oncogenes, tumor-suppressor genes, and stability genes could all be responsible for the development of tumours as a consequence of the accumulation of genetic changes (Vogelstein and Kinzler 2004; Vogelstein et al., 2013; Feinberg et al. 2006).

Furthermore, despite the fact that sexual reproduction and recombination play a significant part in the process of genetic diversity, mutation continues to be the primary source of genetic variation. Genetic variety is the term used to describe the mutations that occur in the DNA sequence of the genome. These mutations are responsible for the distinctive features that individuals possess. According to Carleo et al.'s 2019 research, it is brought on by minute mutations in the DNA. There is the potential for variation in both germ cells and somatic cells. The one and only variability that can be discovered in germ cells has the capacity to be transmitted from one individual to another, which can have an effect on the dynamics of the population

and ultimately lead to changes in the course of evolution. Any errors that occur during the process of DNA replication and are not corrected by DNA repair enzymes will result in the formation of new mutations. In spite of the fact that the vast majority of somatic mutations are detectable, such alterations might occasionally interfere with essential cellular activities. On the other hand, early somatic mutations might cause developmental issues, and persistent accumulation of mutations may lead to cancer. When human cells are born, they already possess a number of protective mechanisms that protect them from the potentially lethal effects of mutations that can lead to cancer. It can be concluded that the proliferation of cancer is due to the presence of defective genes (Yeang et al., 2008; Li et al., 2016). The identification of the mutations that are responsible for cancer is still a challenging problem. According to Torkamani et al. (2009), there are a variety of computational methods that may be utilized to discover driver genes and prioritize mutations based on their impact on the risk of developing cancer. Brown et al. (2019) found that as a consequence of this, a significant number of driver genes are not considered to have a connection to disease.

At the moment, the recurrence of a mutation in patients is one of the most precise markers of the state of the mutation driver. However, due to differences in the rates of background mutations that are caused by the many different DNA replication and repair mechanisms, certain mutations are more likely to occur than others (Brown et al., 2019). The findings of a study that was conducted in 2019 by Brown and colleagues revealed that mutations that had not yet been found in a tumour had relatively low mutability. This finding suggests that background mutability may be responsible for preventing mutations from taking place. The methodologies for circulating miRNA profiling are explicitly discussed in these papers. This class of

miRNA has been demonstrated to be a potential class for the diagnosis and detection of cancer. The sensitivity of these methods, on the other hand, is low when it comes to early screening, and they have difficulty distinguishing between benign and malignant tumours. (Zairis, 2018) addresses a variety of concerns that are associated with the utilization of gene expression profiles for the purpose of forecasting the progression of cancer. These articles provide an overview of the benefits and drawbacks associated with the utilization of microarrays for monitoring the progression of cancer. However, despite the fact that gene signatures have the potential to significantly improve our ability to forecast the prognosis of cancer patients, there has not been much success in implementing them in clinical settings.

2.2 Histological sub-types of breast cancer

Breast cancer is a diverse illness that can be classified into a variety of subgroups based on its morphology and biomarkers. Despite the fact that the morphological categorization continues to serve as the basis for histopathological diagnosis, a variety of molecular classification systems have been developed in appreciation of personalized medicine. The four stages of breast cancer are determined by a number of distinct risk factors, including the size of the tumour, whether the cancer is invasive or non-invasive, whether lymph nodes are involved, and whether the disease has spread beyond the breast. Other risk factors include the presence of lymph nodes. The purpose of the staging system is to help organize the different factors and some of the features of the cancer into categories, in order to best understand a patient's prognosis (the most likely outcome of the disease), guide treatment decisions (together with other parts of the pathology report), and provide a common way to describe the extent

of breast cancer for doctors and nurses all over the world, so that treatment results can be compared and understood consistently worldwide (Breastcancer.org Online 2009).

It is the least advanced stage of the disease, and the five-year survival rate, which refers to the percentage of patients who are still alive after five years, is approximately ninety percent. On the opposite end of the spectrum comes the most advanced stage, which is stage IV, where the survival rate after five years is approximately thirty percent. There are a number of prognostic indicators that are investigated in order to classify the disease into distinct stages. The overall distribution of these prognostic factors is what determines which stage of the disease is present. The TNM staging system is the one that is used the most frequently.

From the perspective of three tumour morphological characteristics, the TNM method provides a description of the extent of the malignancy. These characteristics are the size or extent of the main tumour (T), the involvement of lymph nodes in the region (N), and the presence or absence of distant metastases (M) (Olivotto et al. 1996). When referring to the initial (original) tumour, the T (size) category is used to characterize it. TX indicates that the tumour cannot be measured or located. T0 indicates that there is no sign of the primary tumour within the body. In this case, cancer is considered to be in situ, which means that the tumour has not yet begun to expand into the breast tissue. These values, T1 - T4, provide a description of the size of the malignancy and/or the extent to which it has spread into the breast tissue. When the T number is higher, it indicates that the tumour is larger and/or that it has grown deeper into the breast tissue that it is affecting. The number N0-N3 indicates the size, location, and/or the number of lymph nodes that are involved. The N category, which stands for "node involvement," indicates whether or not the cancer has spread to

lymph nodes in the surrounding area. Increasing the N number indicates that the lymph nodes are involved to a greater extent. As an illustration, a breast cancer that is classified as T1, N0, and M0 indicates that the original breast tumour is less than 2 centimetres in diameter (T1), that there is no involvement of lymph nodes (N0), and that the cancer has not migrated to other different regions of the body (M0).

Breast cancer accounts for around 23 percent of all cancers that occur in females. According to Veronesi et al. (2005) and Bray et al. (2013), more than a million new instances of breast cancer are diagnosed each year around the globe, accounting for more than 400,000 deaths caused by the disease. According to the World Health Organization (2010), it is the most prevalent form of cancer among females. Approximately one percent of the population is comprised of men, and this phenomenon occurs only occasionally. It has been demonstrated that approximately twenty to thirty percent of breast cancer cases have an overexpression of HER2/neu, which is a prognostic marker that is utilized in the selection of patients for HER2 therapy (Blackwell et al. 2010). According to Slomon et al. (1987) and Yokota et al. (1986), an overexpression of HER2 is associated with a more aggressive progression of the disease as well as a worse prognosis. According to Hamond et al. (2010), the presence of steroid hormone receptors for progesterone receptor (PR) and oestrogen receptor (ER) serves as both a prognostic and predictive sign for the response to hormonal therapy. For an extremely extended period of time, the clinical-pathological characteristics of breast cancer patients have been used to identify the therapy care that must be provided to them.

Due to the fact that studies have demonstrated that breast cancer that is positive for HER-2, ER, and PR is difficult to treat (Strasser et al 2005), it is believed that

rigorous molecular classification that makes use of these biomarkers will improve outcomes of therapy. Since the beginning of time, tissue biopsy blocks have been the sample of choice for assessing the status of HER2, ER, and PR. However, the processing of biopsies attracts a very high cost in developing countries. It is possible that obtaining a surgical excision for HER2, ER, and PR tests will not always be possible. This is especially true for patients who are having neoadjuvant therapy or who have metastases that cannot be cured. When this occurs, fine-needle aspiration cytology, also known as FNAC, should be utilized in order to determine the status of HER2, ER, and PR (Wolf et al. 2014). For the purpose of diagnosing breast cancer, the triple evaluation, which consists of clinical assessment, imaging, and either a FNA or a biopsy, is utilized (Senkus et al 2013). In accordance with the findings of immunochemistry, breast tumours can be classified into four distinct subtypes: luminal A (ER+, PR+, HER2-), luminal B (ER+, PR+, HER2+), HER2 over-expression (ER-, PR-, HER2+), and the triple negative type. These subtypes are divided according to the presence or absence of HER2 and hormone receptors. In investigations carried out in Kenya, formalin-fixed paraffin embedded tissues (FFPE) have been utilized rather frequently, despite the fact that they have certain disadvantages when it comes to preoperative treatment (Bird et al 2008). In particular, the classification of breast cancer subtypes based on ER/PR and HER2 expression patterns has not been sufficiently examined when it comes to the evaluation of HER2, ER, and PR expression patterns using FNAC. This is especially true when it comes to the evaluation of their expression patterns. The detection of these biomarkers on FNAC samples of breast cancer is clinically significant in countries that are not yet developed and have limited resources. When compared to core needle biopsies (CNB), it has been demonstrated that FNAC is less invasive, safer, more expedient, and more

cost-effective. A fast characterization of ER, PR, and HER-2/neu status is also possible with this method, which has uses in both diagnostic and prognostic medicine. As stated by Nizzoli et al. (2000), FNAC is well acknowledged all over the world for its utilization in breast cancer screening and diagnosis. When ER and PR state are evaluated with immunocytochemistry on cell blocks obtained by FNAC, research suggests that there is a substantial association between the outcomes of tissue blocks and biochemistry (Chang et al 2001). This correlation is based on the fact that there is this strong correlation. The purpose of this research was to determine whether or not fine needle aspiration cytology (FNAC) is more informative than core needle biopsies (CNB) when it comes to determining the patterns of HER2, ER, and PR expression in breast cancer patients. Breast cancer is the most prevalent form of carcinoma in females, accounting for thirty-three percent of all malignancies that affect females around the world. There are roughly 400,000 deaths that are attributed to breast cancer each year, which results in the identification of more than a million new instances of the disease. Manral et al. (2016) state that breast cancer is the second most common cause of morbidity and mortality that affects women. This information comes from the authors' research. According to Dumitrescu and Cotarla (2005), it is responsible for around one to three percent of mortality in developing countries and three to five percent of deaths in industrialized countries. A total of 13.7% of women in Kenya are diagnosed with breast cancer. The consequence of this is that it makes a considerable contribution to both morbidity and mortality. According to the World Health Organization (2010), it is the most prevalent form of cancer among females. Many factors, such as age, gender, exposure to ionizing radiation, alcohol, genetic predisposition, parity, history of atypical hyperplasia, nulliparity, advanced age at first childbirth, use of oral contraceptives, obesity, lack of physical activity, consumption

of alcohol and tobacco, high body mass index, and endocrine factors (both endogenous and exogenous) are known to play a role in the development of breast cancer (Ali and Coobes 2002, McTiernan 2003, Abdulkareem 2013). Both of these variables contribute to the fact that the aetiology of breast cancer is not well known. A person's age and gender are the two most significant risk factors. Breast cancer is uncommon in people under the age of 20, and the incidence of the disease progressively increases with increasing age. 2010 Ferlat and colleagues etc. According to Asegaonkar et al. (2015), the molecular characteristics of breast cancer can be precisely characterized by determining whether or not proteins HER2, ER, and PR are present.

It is important to note that the basic goals of cancer diagnosis and detection are not the same as those of cancer prognosis and prediction. There are three predictive factors that are involved in the process of predicting and assessing the prognosis of cancer: These includes the prediction of cancer susceptibility (risk assessment), the prediction of cancer recurrence, and the prediction of cancer survival.

One is seeking to make a prediction about the progression of the disease (including life expectancy, survival, and the sensitivity of the tumour to drugs) after the diagnosis has been made. The last two scenarios make it abundantly clear that the accuracy or success of the diagnosis plays a role in the success of the prognostic prediction. However, a prognosis for a disease can only be formed after a medical diagnosis has been made, and a prognostic prediction must take into consideration more than just the diagnosis alone. Determination of prognosis may involve multiple medical practitioners from different specialties using different subsets of biomarkers and multiple clinical factors. These factors include the patient's age and general health,

the location and type of cancer, as well as the grade and size of the tumour. The type of cancer is an important factor because it is used to determine the prognosis of cancer.

2.2.1 Characteristics and survival

It has been determined that there are a number of factors that have a significant impact on the prognosis of breast cancer. It is essential to conduct research on these aspects in order to arrive at a diagnosis and to choose the appropriate course of treatment. When dealing with cancer that has a poor prognosis, it is possible that more aggressive treatment regimens will be selected, and the patient may be willing to suffer more damaging side effects. The following is a list of some of the most frequently seen clinical factors.

In general, breast cancers that arise in women under the age of 40 tend to be more aggressive than those that occur more frequently in women over the age of 50. However, although age does have a role, it is not a significant factor in determining the severity of any particular breast cancer case. The radiological examination is used to determine the size of the tumour, and the results are then classified into four distinct groups. There are other factors to consider besides size. It is possible for tiny cancer to expand extremely quickly. A more advanced kind of cancer can be a gentle giant. Involvement of the lymph nodes Lymph nodes are filters that are located along the lymph fluid pathways. Before cancer cells can spread to other areas of the body, they make an effort to capture and contain them.

The lymph nodes are considered to be positive if they include any cancer cells. This is connected with a higher risk of the disease spreading, and it also guides the differentiation of a newly found progenitor population in the lymph nodes. According to Asselin-Labat et al. (2007), the mature gland is located along the luminal-cell

bloodline. When compared with patients whose tumours had high GATA3 levels, it was hypothesized that patients whose tumours showed low levels of GATA3 had considerably shorter overall and disease-free life times (Mehra et al. 2005). Another finding revealed that the expression of GATA3 in breast cancer had a substantial connection with the oestrogen receptor, but that it did not have any independent significance as a prognostic factor (Voduc et al. 2008).

Her1, also known as the epidermal growth factor receptor 1, is one of the four receptor members that belong to the family of tyrosine kinases that comprises the epidermal growth factor. The other three members of this family are Her216 to Her4. There is a structural similarity among all receptors, which includes an extracellular portion that binds ligands, a trans-membrane domain, and an intra-cellular tyrosine kinase domain. In contrast to the exhaustive analysis that was conducted for Her2, the potential function that Her1, Her3, and Her4 play in breast cancer need additional clarification. They are intriguing due to the fact that they are able to form heterodimers with Her2, and theoretically, given that Her2 does not have any recognized ligand, it is possible that Her1 activation could lead to an increase in the expression of Her2 (Olsen et al. 2009). In a study conducted by Nielsen et al. (2004), it was discovered that a significant number of basal-like tumours express Her1, which indicates that prospective medications should be evaluated in these patients.

Her2, also known as human epidermal growth factor receptor 2, is a protein that is associated with increased aggressiveness in malignant breast tumours. This particular gene plays a role in regulating the processes by which cells grow, divide, and repair themselves. When compared to a healthy breast cell, which only contains two copies of the Her2 gene, approximately one out of every four breast tumours has an

abnormally high number of copies of the Her2 gene. In cancer cells, the Her2 gene is responsible for directing the development of specialized proteins that are referred to as Her2 receptors. Cancers that have an excessive number of copies of the Her2 gene or an excessive number of Her2 receptors have a tendency to proliferate rapidly. According to the Breastcancer.org report from 2009, they are also linked to an increased chance of disease spreading.

It is likely that one of the most promising applications of Her2 is to assist in determining how a patient will react to various forms of treatment, such as chemotherapy or endocrine therapy (Muss et al. 1994; Cornez and Piccart 2000). Both the identification of women who are likely to benefit from trastuzumab (Herceptin) treatment and the monitoring of their response to herceptin therapy can be accomplished with the help of Her2 levels (Ross et al. 2004; Kostler et al. 2004). It is important to take note that Her2, along with ER and PR, has been incorporated into the normal pathology report that a hospital provides. IGFB, which stands for insulin-like growth factor binding protein, is a protein that acts as a carrier for insulin-like growth factor 1, a polypeptide protein hormone that is quite similar to insulin in terms of its molecular structure. Insulin-like growth factor 1 is a hormone that plays a significant role in the development of children and continues to have anabolic effects in adults (Hwa et al. 1999). Serum concentrations of IGFB were not shown to be associated with an increased risk of breast cancer, according to the findings. When it comes to breast pathology in post-menopausal women, however, insulin and insulin resistance may play a role (Schairer et al. 2007; Wolpin et al. 2009).

One of the nuclear antigens that can be identified in cells that are in the proliferative phase of the cell cycle is called Ki67. A significant association has been observed

between the percentage of cells that exhibit Ki67 staining and the nuclear grade, age, and mitotic rate (Sahin et al. 1991; Keshgegian and Cnaan 1995). This correlation has been observed to be quite high. Researchers Veronese et al. (1993) found that patients whose tumours overexpress Ki67 in more than fifty percent of the cells had a significantly increased likelihood of getting recurrent disease. A gene that inhibits the growth of tumours is known as P53 (protein 53). The regulation of cell proliferation, the induction of apoptosis, and the promotion of chromosomal stability are all functions that it may play. It has been suggested by Wang et al. (1993) that the disruption of these functions has a significant role in the development of cancer. According to Thor et al. (1992), Beenken et al. (2001), and Pharaoh et al. (1999), there is data that suggests that the overexpression of p53 is associated with the growth of breast cancer, which ultimately results in poor patient survival. According to the findings of other studies (Rakha et al. 2007), p53 may not have particularly significant clinical prognostic implications.

The progesterone receptor, also known as PR, is a type of intra-cellular steroid receptor that specifically binds to the active hormone progesterone. In spite of the fact that the tumour is described as being ER-negative, the presence of PR overexpression can be used as a functional test because it demonstrates that the ER pathway is not compromised (Esteva1 and Hortobagyi 2004). Because of this, PR has frequently been linked to ER as a predictive factor for hormone therapy (for examples, see Esteva1 and Hortobagyi 2004; Voorzanger-Rousselot and Garnero 2007; Ponzone et al. 2006), and it is also included in a standard pathology report. Research has also demonstrated that PR status can be used to define a subset of tumours that exhibit distinct clinical characteristics. This can also be used to assist in selecting patients

who will benefit the most from endocrine adjuvant treatment, particularly in the initial few years of follow-up (Ponzone et al. 2006).

By stimulating growth-promoting genes like Her2 and EGFR (epidermal growth factor receptor), YB1 (Y-box binding protein-1) is a transcription and translation factor that can enhance tumour growth and chemotherapy resistance (Wu et al. 2006). YB1 is also known as Y-box binding protein-1. It has been discovered that YB1 is a biomarker that very accurately predicts relapse and poor survival rates across all subtypes of breast cancer. According to Habibi et al. (2008), the expression of YB1 is a globally recognised indicator of patients who are at a high risk and who are in circumstances that may require more aggressive therapy.

2.2.2 Histological classifications of breast cancer

Breast cancer can broadly be categorized histologically into in-situ carcinoma and invasive (infiltrating) carcinoma. Breast carcinoma in-situ is further sub-classified as either ductal or lobular while invasive tumor types include infiltrating ductal, invasive lobular, ductal/lobular, mucinous (colloid), tubular, medullary and papillary carcinomas (Malhotra et al., 2010) as shown below.

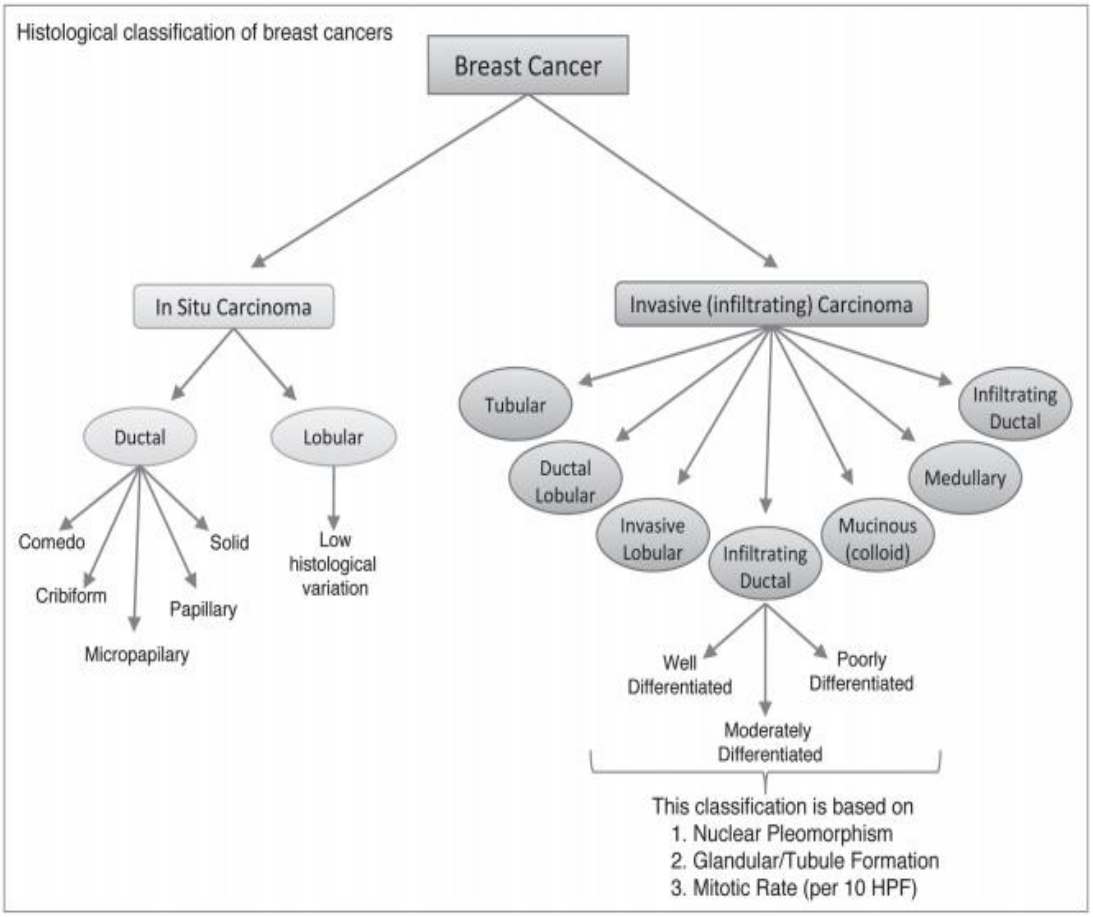

Figure 1: Histological classifications of breast cancer sub-types

2.2.1.1 Breast carcinoma in situ

According to the American Cancer Society (2015), in-situ breast carcinomas are aberrant epithelial cells that have not invaded neighbouring organs. However, when viewed via a microscope, these cells appear to be extremely similar to cells that are associated with invasive mammary carcinoma. According to Ward et al. (2015), the likelihood of a woman receiving a diagnosis of in situ breast cancer over her lifetime is one in thirty-three. According to C. DeSantis, Ma, Bryan, and Jemal (2014), there were approximately 64,640 new cases of in situ breast cancer diagnosed among women in the United States in the year 2013.

2.2.1.1.1 Ductal carcinoma of breast

Ductal carcinoma in situ of the breast is a type of breast cancer that is defined as stage 0 breast cancer (Stuart et al., 2005). It is characterized by malignant epithelial cells that are restricted to the ductal system of the breast and there is no evidence of invasion through the basement membrane into the surrounding stroma (Siziopikou, 2013). According to Barnes, Ooi, Yarnold, and Bundred (2012), ductal carcinoma in situ lesions have the potential to develop into invasive cancer over a period of time that could range from a few years to many decades. Such a transformation could take place.

The proliferation of malignant epithelial cells that are confined by the basement membrane of the breast ducts is the histological characteristic that distinguishes DCIS from other types of breast cancer (Gorringe & Fox, 2017); (Virnig, Shamliyan, Tuttle, Kane, & Wilt, 2009). Approximately twenty percent of all breast cancers are caused by ductal carcinoma in situ, according to Epstein, Lagios, and Silverstein (2017); Shrestha, Schneiders, and Ravichandran (2013); and the American Cancer Society (2017) reports that eighty-three percent of all in situ instances occurred between the years of 2010 and 2014.

Over the course of the last few decades, there has been a fast increase in the incidence of ductal carcinoma in situ, which is predicted to impact more than one million women in the United States by the year 2020 (Klimov et al., 2019). According to Gorringe and Fox (2017), this rise can be attributed to the widespread deployment of mammographic screening for breast tumours such as ductal carcinoma, which were formerly uncommon.

2.2.1.1.2 Lobular carcinoma in situ

Lobular carcinoma in situ is a type of breast cancer that develops in the region of the breast where milk is produced (the lobule and terminal ducts) (Ginter & D'Alfonso, 2017). It is sometimes discovered by accident during a biopsy that is performed to diagnose another breast disease or a suspicious lump (Wen & Brogi, 2018a). When it was first discovered, lobular carcinoma in situ was thought to be a pre-malignant lesion. However, it has since been identified as a marker of an elevated risk of breast cancer (Wen & Brogi, 2018b) and as a non-obligate precursor to invasive carcinoma (Ginter & D'Alfonso, 2017). According to the findings of a study that was carried out in France (Bruno Cutuli et al., 2015), lobular carcinomas in situ account for between one and two percent of all breast cancers. (Wen & Brogi, 2018a) Pre-menopausal women are the most likely to have this manifestation.

Breast carcinomas that are invasive, also known as infiltrating, Invasive breast cancer, also known as infiltrating breast cancer, is a type of breast cancer that has already penetrated the ductal or glandular walls, which is where the disease first began, and has moved into the breast tissue that is surrounding it. According to Bowker and Johnson (2014), the stage of the disease which is present at the time of diagnosis has a significant impact on the prognosis of invasive breast cancer. It is projected that there were 252,710 new instances of invasive breast cancer and 40,610 fatalities caused by breast cancer in the United States in 2017 (DeSantis, Ma, Goding Sauer, Newman, & Jemal, 2017). However, this number has climbed to an estimation of 268,600 new cases ("Breast Cancer Breast Cancer," 2016). According to the American Cancer Society (2016b), the two forms of invasive breast carcinomas that are most frequently encountered are invasive lobular carcinoma and invasive ductal carcinoma. The

majority of breast cancers were invasive breast cancer, accounting for 78.8 percent of the total cases, according to a study that was conducted in North Eastern Nigeria (Dauda, Misauno, & Ojo, 2011). The study was conducted over a period of seven years on 172 cases of malignant breast tumours that were documented during the study period.

2.2.2.1 Invasive ductal carcinoma

With invasive ductal carcinoma, the cancer begins in a milk duct, and by the time it is diagnosed, it has already spread through the wall of the duct into the breast tissue that is nearby. This makes it possible for cancer cells to travel through blood vessels or the lymph system to other parts of the body (Carcinoma, Situ, Carcinoma, Situ, & Carcinoma, 2016). According to Zangouri et al. (2018), of all the sub-types of breast carcinoma, invasive ductal carcinoma is the most prevalent and is responsible for a considerable portion of the mortality rate associated with breast cancer. According to Rampaul and Pillarisetti (2006), it accounts for around 70–80 percent of all breast cancers.

According to the findings of a study that was carried out in India (Urmiladevi et al., 2018), infiltrative duct cell carcinoma was the most prevalent kind of malignant breast carcinoma, accounting for 79.41% of all cases. In addition, Chen et al. observed even greater proportions of invasive ductal carcinoma, with 711,287 instances (89.3% of the total 796,335 patients that were assessed in a study that was conducted in the United States of America) (Chen et al., 2017).

2.2.2 Invasive lobular carcinoma

According to Mamtani and King (2018), invasive lobular carcinoma (ILC) is the second most frequent histologic form of breast cancer. It accounts for 10% to 15% of all invasive tumours and is seeing a growing prevalence in postmenopausal women (Carcoforo et al., 2012). Despite the fact that they are low grade and positive for oestrogen receptors, they are associated with a favourable prognosis; yet, the tumour may be extremely metastatic (Reed, Kutasovic, Lakhani, & Simpson, 2015). According to Tzou (2012), these tumours are typically aggressive and multi-centric, and they are frequently not visible from a mammographic perspective. According to Makki (2015), invasive lobular carcinoma tumour cells are often round, tiny, reasonably homogenous, and non-cohesive. Additionally, these tumour cells can be identified by their unique development pattern, which includes single-file infiltration of the stroma.

2.2.3 Breast cancer hormone receptors

Analysis of the oestrogen receptor (ER), the progesterone receptor (PR), and the Her-2/neu (Human Epidermal Growth Factor Receptor Type 2) have all been recognized as standard methods in the normal therapy of patients who have breast cancer. According to Nasrazadani, Thomas, Oesterreich, and Lee (2018), the combined expression of these three hormone receptors has become the most informative factor in the molecular classification of breast tumours, as well as in their clinical assessment for therapy and in predicting the prognosis for breast cancer patients. According to Kaul, Sharma, Minhas, and Mardi (2011), women who have ER and/or PR-negative disease have a higher risk of mortality after their diagnosis, whereas women who have oestrogen receptor that is positive and/or progesterone that is

positive have a lower risk of death.

According to Cetin and Topcul (2014), triple negative breast cancer (TNBC) is characterized immuno-histochemically by the absence of expression of the oestrogen receptor (ER), the progesterone receptor (PR), and the human epidermal growth factor receptor type 2 (HER2). The likelihood of it being identified on a mammogram is lower than that of some other types of breast cancer. Furthermore, it is believed to be an aggressive tumour in comparison to other types of breast cancer and has a tendency to grow more quickly (Ismail-Khan & Bui, 2010). It is also recognized for an early peak of recurrence between the first and third year following diagnosis, as well as more aggressive metastases, which are more likely to arise in viscera, notably in the lungs and brain, and less likely to migrate to the bone (Akshata Desai, 2012). Both of these characteristics are associated with the disease.

TNBC is treatable; however, because to the absence of targeted treatments and the fact that adjuvant chemotherapy is the only method available, it has the potential to return early (within five years) and spread to other regions of the body. On the other hand, the survival rates are comparable to those of positive tumours if the tumour do not recur (Laishram & Singh, 2015). According to Maeda et al. (2016), triple-negative breast cancer accounts for roughly 12–20 percent of all breast cancers diagnosed in the world, which is equivalent to almost 200,000 cases annually. According to Vanderpuye et al. (2017), African women have a tendency to have a higher incidence of triple-negative breast cancer, which results in poorer outcomes. Among all breast cancers, the proportion of triple-negative breast cancers is 23% in Tunisia (Corbex, Bouzbid, & Boffetta, 2014) and 28% in Egypt (Rais et al., 2012). This is an example of a country that has a higher incidence of breast cancer.

A number of various treatments are available, each of which has the potential to either totally or substantially prevent the development of breast cancer. Special medications (Nazarali et al., 2014), the excision of sections that develop "pre-cancerous changes," and the removal of the breast entirely are the three procedures that fall under this category. (NCI, 2013). On the other hand, this sort of preventive treatment is mostly suggested for women who have a high risk of developing breast cancer. These treatments should be avoided by women who have a conventional risk of having breast cancer, which is considered to be the average risk. Only after reaching a particular age is it recommended that they go through the process of frequent special preventive screening, which is mammograms. Beginning between the ages of 50 and 69, it is advised that women in Finland undergo mammography screening (2010 report from the Finnish Cancer Registry).

It is possible to discover breast cancer in its early stages with the use of preventive mammography, when the disease may not yet be exhibiting any symptoms but can still be safely treated. The likelihood of a successful therapy and a full recovery is significantly increased for women who have mammograms on a regular basis. To put it another way, having a mammography on a regular basis can help avoid the development of advanced cancer, which has a significantly more dismal prognosis for recovery than the earlier stages of the disease. According to Løberg et al. (2015) At the moment, mammography is the primary approach that is utilized for breast cancer screening purpose. All of the ladies who are urged to take this survey are able to do so because it is not only inexpensive but also pretty easy to complete, reasonably priced, and risk-free. (WHO, 2016). Mammography is a diagnostic procedure that involves taking many X-ray pictures of the breasts, which are the mammary glands. In a room

that is specifically designed for the purpose, a mammography machine is used to execute the procedure. We can think of it as a type of x-ray machine. It is necessary to remove all clothing from the waist up before to undergoing mammography. It is necessary to take individual photographs of each breast. It is possible that the process will take approximately twenty minutes. (NCI, 2014.) Mammography screening programs were initially implemented by the government of Finland in 1987, making it the first country to do so. Approximately ninety percent of the age range that was targeted is currently participating. The letter of invitation is being sent out through the mail to every woman in Finland who has reached the age of fifty. The screening occurs once every two years on average. 2010 report from the Finnish Cancer Registry The majority of women who receive screening mammography do not exhibit any alterations during the examination. Only five to ten percent of women who undergo additional preventive mammography of the breast are found to have some abnormalities that are difficult to differentiate from cancer.

Ultrasonography and biopsy are two more tests that are recommended by medical professionals in such circumstances. The poll was conducted on ninety percent of the women who were ordered a biopsy following a mammogram, and it did not reveal any potentially harmful changes. According to Yankaskas et al. (2010) The practice of undergoing preventative mammograms is not suggested for women who are younger than 40 years old and do not have a genetic predisposition to the development of breast cancer. When a woman is younger than 40 years old, the likelihood of developing breast cancer is low. On the other side, it is during this time period (up to this age) that women experience alterations in their mammary glands, such as fibrocystic breast disease, fibro-adenoma, and other similar conditions. (Cardoso and

colleagues, 2012) It is only with the use of non-hazardous mammography that these irregularities may be differentiated from "cancer." For obvious reasons, it is recommended to perform additional exams, such as biopsies or even surgical excision of the formation, in order to discover any changes that may constitute a "tumour." This is done in order to finally ensure that the formation is healthy and does not pose any risks. (Cardoso and colleagues, 2012). Consequently, if all women up to the age of 40 were to receive preventive mammograms on a regular basis, a significant percentage of them would have been compelled to participate in a variety of additional questionnaires, which are frequently painful and partially pointless, and which only serve to demonstrate that the formation of breast cancer is not a threat.Mammography is not suggested for women under the age of 40 for a number of reasons, one of which is that breast tissue is very dense before this age. As a result, the results of mammography do not include a great deal of information (if there are any changes, mammography might "miss" them) (Cardoso and colleagues, 2012).

The incidence of breast cancer has increased by more than twenty percent, while the mortality rate has climbed by fourteen percent worldwide, (Bray, Ren, Masuyer, and Ferlay, 2013). According to Hayana and Newman, who were referenced by Mutebi (2014), the greater incidence/mortality rate among women on the African continent is 1:2, but the rate among white Americans is 1:5. This difference can be related to late presentation and a lack of follow up. (Lafourcade et al., 2018) Research conducted by Lafaurcade and colleagues found that between 15 and 30 percent of all breast cancer cases manifest with distant metastases at the time of presentation. Only a small percentage of women who have been diagnosed with breast cancer eventually progress to Stage IV of the disease. On the other hand, approximately thirty percent of

women who are originally diagnosed with early-stage illness will eventually acquire metastatic lesions, many times months or even years after the initial diagnosis. According to Dig and Mcallister (2013), the most significant clinical problem in solid tumour oncology is the presence of metastatic disease, which refers to the spread of tumour cells throughout the body. This disease is responsible for the great majority of fatalities that occur among cancer patients.

In addition to having a high incidence and mortality rate, breast cancer is the leading cause of death among females all over the world (Bozorgi et al., 2016, Lindsey et al., 2016). Breast cancer is a significant health burden in the society. According to Azubuike (2018), breast cancer was responsible for approximately 25 percent of all newly diagnosed cases of cancer and 15 percent of all cancer mortality rates that were noted among females over the world. According to Lindsey et al. (2016), the United States of America has the highest mortality rates, which are most frequent among Black women. On the other hand, Korean women have the lowest mortality rates. Patterns in the incidence and mortality from breast cancer are contributed by a variety of controls including screening systems some of which were employed in several European countries as early as the late 1980s (Botha et al., 2013) Breast cancer ranks high among the common cancers affecting women with 571,000 deaths worldwide (Siegel et al., 2017).

The prevalence rates of breast cancer in women vary depending on the population and age of the individual, with the greatest rates being found in Western Europe and the United States, and the lowest rates percentages being encountered in Africa and Asia, with the exception of Israel, which has among the highest rates (Lindsey et al., 2016). It is predicted that there were 1,688,780 new instances of breast cancer and 600,920

deaths from cancer in the United States (US) by the end of 2017. The incidence rate of cancer in women is twenty percent greater than the incidence rate in males as of the same time period. According to Siegel et al. (2017), the number of new instances of breast cancer in females was predicted to be 252,710 in 2017, while the number of patients who suffered from the disease and ultimately passed away was estimated to be 40,610. According to Susan (2018), the death rates for women in the States of Washington, District of Columbia, Alabama, and California were predicted to be 29 per 100,000 women, 22 per 100,000 women, and 20 per 100,000 women respectively in 2018. In 2019, it is anticipated that there will be around 41,760 fatalities caused by breast cancer, with the state of California being forecast to have the greatest number of breast cancer deaths at 4,560 (Susan, 2019). The number of new cases of invasive female breast cancer among women in the United States is estimated to be 268,600.

According to the Ministry of Health in Kenya (2017), cancer is the third largest cause of death in the country, placing it behind infectious diseases and cardiovascular disorders. Each year, it is responsible for approximately seven percent of all deaths that occur in the country. According to statistics provided by the Ministry of Health, there are around 28,000 new cases of cancer diagnosed each year, and there are 22,000 fatalities that are attributed to cancer. A more than sixty percent of individuals affected are under the age of seventy, with a fourteen percent likelihood of having cancer before the age of seventy-five and an estimated twelve percent risk of passing away. According to the report from the national cancer registry (2014-2016) (MOH, 2017), the three most common cancers in women are breast, cervical, and oesophageal cancers. On the other hand, the three most common cancers in men are oesophageal cancer, prostate cancer, and Kaposi's sarcoma. The word "cancer" refers

to a broad spectrum of diseases that are marked by uncontrollable cell growth and proliferation in any area of the body, beginning from a monoclonal origin and growing beyond its bounds to infiltrate surrounding organs and/or other sections of the body (World Health Organization, 2017). Cancer can occur in any part of the body. According to the International Agency for Research on Cancer and Cancer Research UK (2014), it is the second most prevalent cause of death across the globe, with 14.1 million new cases being identified in 2012. In addition to accounting for nearly two-thirds of the deaths, Africa and other regions with low and moderate incomes were responsible for more than half of the cases. If the current worldwide trends continue, the burden of cancer would increase to 23.6 million new cases per year by the year 2030, according to a study that was conducted in 2014 by the International Agency for Research on Cancer and Cancer Research located in the United Kingdom.

The process of diagnosing and treating cancer is emotionally taxing and is associated with pain, death, and anguish (Powe & Finne, 2003). This can have a detrimental effect on mental health and lead to feelings of anxiety, fear, and hopelessness. Therefore, in order to provide patients with the appropriate assistance in coping with these challenges, it is essential to determine the psychosocial load that is present among people who are receiving cancer treatment. It is possible for patients to enhance their adherence to their medications by seeking assistance for psychosocial concerns, which should result in an improvement in their prognosis. According to Grassi et al. (2015), a cancer patient goes through a significant amount of psychological stress, which can, of course, be mediated by underlying factors that are related to their experiences and life history, such as their relationship with attachment figures. As stated by Sutherland (1956), which is cited by Grassi et al. (2015), there

are six clinical types of psychological issues that are frequently encountered over the course of cancer treatment after the diagnosis has been made. These clinical categories include, but are not limited to, anxiety, postoperative depression, dependency, obsessive-compulsive disorder, paranoid responses, and hypochondriac responses. The clinical components have a considerable impact on the care that is provided to patients and the families of those patients. For example, Mitchell et al. (2011) found that there is a significant association between the quality of life of cancer patients and their carers and the level of psychosocial distress that they feel. The International Psycho-Oncology Society (IPOS) unanimously recognized the concept of distress as the sixth vital sign in cancer settings in 2009. This was in addition to the fact that temperature, respiration, heart rate, blood pressure, and pain were already considered vital signs. The panel also arrived at the conclusion that the evaluation of a patient's level of distress is an essential component of their overall health and should be performed on a frequent basis when delivering care. The World Health Organization (WHO), several health ministries, the National Cancer Control Network (NCCN), and many charitable organisations in the United Kingdom, such as Macmillan Cancer Support, Breast Cancer Care, and the British Psychosocial Oncology Society, have all demonstrated their support and approval of the concept since its inception (Swash, 2015).

Every year, more than one million cases of cancer are recorded in African countries. Of those cases, between 88 and 95 percent of patients show late in the course of the disease, exhibiting substantial psychological distress at that point (MOH, 2013).

In order to improve the quality of life of these patients, which is the foundation of palliative care, it is essential to give early intervention a high priority in order to

address the problems that have been discovered and to undertake psychosocial distress screenings for these patients. According to the national palliative care guidelines for Kenya, patients who are receiving palliative care and their families or carers should be made aware of the psychosocial issues that palliative patients frequently face. These issues include depression, anxiety, advanced care plans, child care, finances, wills, support from the community, and family dynamics (MOH, 2013). The evaluation of each and every one of these psychological difficulties needs to be taken very seriously. The palliative care team, in conjunction with the patient and their family or carers, is responsible for a number of crucial activities, including giving priority to the acknowledged psychosocial requirements of the patient and their family and incorporating these need into the treatment plan. In order to determine the incidence of psychosocial distress and the variables that are associated with it in cancer patients, the goal of this research was to investigate.

Palliative care is an approach that, according to the definition provided by the World Health Organization in 2002, improves the quality of life for patients and their families who are dealing with a life-threatening illness. This is accomplished by preventing and relieving suffering through early detection, accurate assessment, and treatment of pain and other issues related to the body, mind, and spirit. Palliative care comprises end-of-life care, which is especially important during the years that a patient is in their final year of life. Having said that, it is frequently difficult to make any kind of accurate prediction regarding that schedule. Through the final stages of life and into the grief period, it makes it possible to identify and meet the requirements of both the patient and their family in terms of supportive and palliative care provision. According to the Kenya National Palliative Care Guidelines (2011),

end-of-life care is defined as "special time before death when the patient and family require holistic support." This type of care typically involves the treatment of pain and other symptoms, in addition to the provision of support on a physical, social, spiritual, and psychological level. It is important to note that the carers cannot be excluded from a conversation on end-of-life care. Constantly, there is involvement from the family.

According to Ferlay et al. (2018), the number of new cases of cancer in Europe in 2018 was predicted to be 3.9 million, while the number of deaths caused by cancer increased to 1.9 million. The most common cancer sites were found in the female breast (523,000 cases), followed by colon cancer (500,000 cases), lung cancer (470,000 cases), and prostate cancer (450,000 cases). The mortality rate for breast cancer was estimated to be 13.4 percent, according to Malvezzi et al. (2019), who predicted that the number of cancer deaths in Europe would be approximately 1,410 thousand in 2019. This would equate to age-standardized rates of 130.9 per 100,000 males (5.9%) and 82.9 per 100,000 women (3.6%). 2018 research by Ferlay et al. It was observed that there was a reduction in the mortality rate associated with breast cancer, with the greatest decrease in mortality being observed among women in the age bracket of (50–69) by 16.4%. This is the age range that was covered by screening, and it was also observed in the age bracket of (20–49) at 13.8%. In addition, Malvezzi et al. (2019) predicted that the mortality rate from cancer will continue to decrease in both men and women, with the rates of breast cancer likely to decrease steadily. This is mostly due to the utilization of hormone replacement therapy, as well as advancements in screening, early detection, and treatment. It is possible that the

number of deaths caused by breast cancer will not greatly decrease due to the fact that the population is getting older (Malvezzi et al., 2019).

Breast cancer incidence has been observed to increase with age, with the highest incidences documented among women in the age bracket of between 40 and 59 years (Salah et al., 2010). This finding also indicates that the risk of breast cancer incidence is growing with age. According to Shreshtha et al. (2018), breast cancer is the most prevalent kind of cancer that affects Indian women. The age-adjusted incidence rate for breast cancer is as high as 25.8 per 100,000 women, while the mortality rate for breast cancer is 12.7 per 100,000 women. In India, the incidence of breast cancer increased by 11.54% between the years 2008 and 2012, while the mortality rate owing to breast cancer increased by 13.82% over that same time period (Shreshtha et al., 2018). It is highly probable that this could be attributed to the absence of sufficient breast cancer screening facilities, the detection of the disease at an advanced stage, and the absence of suitable medical facilities. In India, the mortality-to-incidence ratio for breast cancer is as high as 66% in rural registries, while it is as low as 8% in urban registries. Furthermore, Malvia et al. (2018) found that young age is a significant risk factor for breast cancer in Indian women. According to Malvia et al. (2018), the breast cancer prediction for India by the year 2020 is as high as 1797900. As a result, there is an urgent need for established health awareness, accessibility of breast cancer screening systems, and breast cancer management facilities in order to work towards creating a positive and favourable clinical picture in the country.

According to McKenzie et al. (2016), breast cancer continues to be the most prevalent form of cancer that affects women in sub-Saharan Africa (SSA). In 2012, there were 94,000 new cases of breast cancer and 48,000 deaths that were attributed to breast

cancer-related causes. As a result of population growth and ageing, it was anticipated that this burden would increase by a factor of two between the years 2012 and 2030 (McKenzie et al., 2016). Azubuike (2018) and Cumber et al. (2017) made the observation that mortality statistics revealed that Africa has the highest age-standardized mortality rate connected with breast cancer in the entire world. In addition, Azubuike (2018) presented evidence that demonstrated that the incidence of breast cancer in Africa, which is relatively low, has been increasing over the years, with several cases going undetected. The southern African sub-region was found to have the highest incidence rates, and western Africa was discovered to have the highest burden of cancer when both the incidence and mortality rates were taken into consideration. According to the findings of Davies et al. (2018), the incidence of breast cancer in North Africa was found to be higher than in Sub-Saharan Africa (SSA), which was found to be at 22.4 per 100 thousand (95% CI 17.2-28.0). The North African incidence was found to be 29.3 per 100 thousand (95% CI 20.0- 38.7). After additional investigation, Davies et al. (2018) found that between the years 2000 and 2015, the incidence rates in registries located in both North Africa and sub-Saharan Africa had significantly increased.

Kenya has been reported to have the highest risk of breast cancer among the African countries, with breast cancer incidence and mortality rates growing dramatically since the 1980s (Sawe et al., 2016). Kenya is also the country with the highest rate of breast cancer deaths. Breast cancer is the most common form of cancer among women in Kenya, accounting for 23.3% of all registered cases of cancer (Ministry of Public Health and Sanitation & Ministry of Medical Services [MPHS & MMS], 2010). In Nairobi, Kenya, 51.7 out of every 100,000 women are diagnosed with breast cancer

each year (Korir et al., 2015). The high number is largely attributable to the growing trend of adopting a Western lifestyle, which includes alterations in the foods that are consumed, a delay in the birth of the first child, a lower parity, and shorter periods of breastfeeding. All of these factors contribute to a higher incidence of breast cancer in those regions (Franco & Rodriguez 2018).

Breast cancer remains the highest cause of death among females in developing countries with Kenya not being an exceptional (Torre et al., 2015).Patients present themselves for screening at late stages of the disease when little can be done since even the diagnosis and treatment amenities are limited (Kanyeria, 2017) Low awareness levels are greatly linked to the late presentation of cancer cases where curative treatment cannot reverse the situation (MPHS & MMS, 2010). Due to gender discrimination, stigma, cultural taboos, and well-founded concerns of abandonment, the expanding breast cancer problem has disturbingly serious implications for women (Ginsburg, 2013). These effects are in addition to the fact that the problem is growing. Ginsburg (2013) made the observation that the majority of breast cancer patients experience significant challenges when attempting to combat the cancer threat.

Breast cancer is the most prevalent cause of mortality in women in both developing and industrialized countries. It ranks fifth among the causes of death from all types of cancers and is the leading cause of death worldwide. Breast cancer is the leading cause of death worldwide. When it comes to the most common types of cancer found in Ethiopian women, breast cancer is the most common. The mortality rate and survival status of breast cancer patients in Ethiopia were not determined, despite the fact that the incidence of the disease was quite high (Areri et al., 2018). An age-standardized incidence case of breast cancer was estimated to have occurred in

Ethiopia 12,956 times, and the mortality rate was 25 cases per 100,000 women, as stated by the World Health Organization in 2017 (World Health Organization, 2017). Consequently, in order to alleviate this burden, the Ethiopian Federal Ministry of Health (EFMOH) has established a task group with the purpose of addressing the problem of non-communicable diseases, with a particular focus on cancer. According to Nuño et al. (2012), the primary objective of the strategic framework is to decrease the occurrence of cancer, decrease mortality rates, and enhance the quality of life of individuals who are afflicted with the disease. Keene et al. (2010), Mensah et al. (2016), and Parkin et al. (2014) found that survival data in African and Asian countries were extremely limited. This was the case despite the fact that there was sufficient information regarding the incidence and survival rates of breast cancer in western countries.

The findings of Shulman et al. (2010) indicate that underdeveloped countries are the locations where more than half of all breast cancer cases that arise are incidental. Inadequate facilities, a lack of awareness, and a lack of access to treatment are the primary factors that contribute to the late detection of a significant majority of these cases. In addition, the facilities that are necessary are quite pricey; hence, there is a scarcity of treatment alternatives that are both reasonable and of good quality in developing nations, which contributes to the worsening of the breast cancer burden in these countries. Nevertheless, these emerging countries are aware of the critical nature of the disease, and the majority of them have developed initiatives to assist in the prevention and control of the disease.

When a cancer diagnosis is made, monitoring immediately becomes an extremely important process. Treatment can begin with the patient depending on the stage, the

patient's health, and the patient's wishes. The most prevalent cancer treatment methods are surgery, which may involve cryosurgery, laser surgery, radiotherapy, chemotherapy, or a combination of these treatment choices (Types of Cancer Treatment, 2020). Other cancer treatment methods include chemotherapy, radiotherapy, and radiotherapy. In light of this, monitoring becomes an important aspect since it allows for the monitoring of the treatment response of the patients as well as the observation and management of any potential adverse effects. Additionally, the progression of the condition can be monitored, and treatment can be delivered in accordance with the findings. The most essential benefit of monitoring is that it helps to ensure the patients' quality of life or improve their health. In addition to the organs that are impacted, the severity of the symptoms, and the adverse effects of the treatment that is being delivered are the primary components that are monitored. To ensure that ethical considerations are taken into account during the treatment and monitoring of cancer, patients must be provided with options and given the opportunity to make decisions. Therefore, the methods of treatment and monitoring that are utilized vary contingent upon the individual patient. The monitoring of cancer can be accomplished using a variety of diverse approaches. There are both conventional and non-conventional approaches. The extent to which these procedures are utilized is a defining characteristic of them. Conventional methods have been utilized extensively and include techniques such as computed tomography (CT) scans and positron emission tomography (PET) scans.

On the other hand, non-conventional methods are relatively more recent approaches to the monitoring of cancer, such as liquid biopsy. Currently, there are cancer monitoring approaches that are considered to be standard and are well approved by

the medical research community. These procedures are also commonly employed. In order to monitor the progression of cancer to other organs, computed tomography (CT) scans make use of X-rays, which provide images that are extremely detailed. In the course of a computed tomography (CT) scan X-ray, the machines rotate around the complete body of the patient, collecting photographs at every single moment. In comparison to static X-rays, this provides a greater amount of information (Computerized Tomography (CT), 2020). CT scans can assist in determining if the cancer is expanding or contracting. There is a possibility that the tumours can be diagnosed even before the symptoms have become apparent in the body of the patient. It is possible to use PET scans in order to highlight the results that were obtained from the CT scan.

The positron emission tomography (PET/CT) scan is a type of nuclear medicine imaging that detects the metabolic activity of cells in organs of the body. When electrons and positrons in the body combine to produce energy, the scan measures the photons that are produced as a result of the annihilation that occurs as a result of this combination. It is therefore possible to build images of internal organs by using the information that was gathered. There are variations that can be observed that indicate the illness state of the patient. (Nuclear medicine, 2020) This serves as the foundation for the performance of progress monitoring. In addition to mammograms and ultrasounds, magnetic resonance imaging (MRI) is also utilized in the process of cancer monitoring.

The process of MRI examination is carried out with the assistance of a powerful magnetic field. Images that are detailed and three-dimensional are produced by it. It takes between forty-five and sixty minutes for each individual body component to

undergo the process (Magnetic Resonance Imaging (MRI), 2020). The magnets are open on both ends at this time, and the patient is supposed to remain still during the procedure. During the session, the radiologist has the ability to talk with the patient in order to provide instructions on any discomfort and other concerns relevant to the case. There are certain limits to these conventional imaging techniques, despite the fact that they have been successful. In the first place, they are unable to determine if the aberration that was discovered is a cancerous tumour or merely a normal scar-related tissue. First and foremost, they are centred on the clinical morphology metric, which involves the measurement of the size, shape, and colour of the tumour prior to, during, and after treatment. Thirdly, the size and form of the tumour are not adequate metrics for measuring the response of patients to therapy, due to the fact that the size and shape of the tumour are not adequate. In conclusion, the results of these methods are frequently achieved at a later stage in the therapy process.

Methods such as mobile symptom monitoring, diffusion-weighted magnetic resonance imaging, and biopsy are examples of non-traditional cancer monitoring techniques. A biopsy Cancer can be diagnosed and monitored through the use of a method called a biopsy. A lot of people believe that it is a definite means of determining the presence of cancer. However, this reasoning is not valid because the information gained from the biopsy is a snapshot of a tumour. As a result, it does not take into account the heterogeneity of tumours and can make it difficult to forecast the early recurrence of cancer (Crowley, Di Nicolantonio, Loupakis, & Bardelli, 2013).

This is the position of the tumour in the proc. In addition to its use in diagnosis, it has the potential to be utilized in the monitoring of the treatment response by means of studying genes that are associated with malignancies. Crowley et al. (2013) indicated

that a biopsy can be utilized in the process of determining the course of the disease as well as the patient's reaction to the treatment protocol. A number of difficulties are linked with the procedure of performing a biopsy. To begin, it is an invasive one. For the patient, the procedure is a terrible experience. In the second place, difficulties that arise after surgery increase the likelihood that the cancer may spread to other areas of the body. Because of these restrictions, its adoption has been considerably hampered, and as a consequence, other non-invasive approaches, such as liquid biopsy, have garnered a lot of attention from the medical community.

Liquid biopsy

Cancer can be detected and monitored by the use of a non-invasive method known as liquid biopsy. The process comprises the utilization of straightforward blood tests in order to identify cancerous agents in the bloodstream, such as circulating cell-free DNA (cfDNA) and circulating tumour cells. Furthermore, both the latter and the former have been demonstrated to have a direct association with the existence of cancer cells. According to Di Meo, Bartlett, Cheng, Pasic, and Yousef (2017), other variations of biological fluids that has the potential to be utilized include saliva, urine, plasma, cerebro-spinal plasma, and seminal plasma. On the other hand, liquid biopsy is a way for monitoring tumour markers, in contrast to standard imaging methods and biopsy, which are dependent on cell tissue and pictures, respectively. An examination of a blood sample can be used to ascertain the cause of an illness or cancer. The screening of biomarkers that are produced into the bloodstream by cancer cells is made possible by this procedure, which allows for the elimination of some of the restrictions that are associated with tissue-based biopsy. According to Crowley et al. (2018), liquid biopsy has the potential to offer the genetic landscape of all malignant

lesions, in addition to providing the possibility to closely monitor the progression of genomic information. Additionally, the assessment of the presence of residual disease, recurrence, relapse, and resistance can be accomplished through the tracking of tumor-associated genes through the use of blood.

The non-invasive nature of liquid biopsy makes it possible to perform continuous monitoring over periods of time that are far longer. In general, the process of liquid biopsy involves the collection of blood samples, the preparation of the samples, the detection of the samples using an imaging device, the processing of the data, and the interpretation of the results. This DNA-based liquid biopsy requires three millilitres of blood fluid in order to prepare the plasma. It is recommended that this be done within five to six hours following the last withdrawal. Through the use of tubes that have been cleaned with an anticoagulant, such as ethylenediaminetetraacetic acid, the collection is carried out. Following the successful formation of a blood clot, the cells are recovered by centrifugation, and then the plasma is removed. After that, the DNA that is associated with malignancies is extracted by utilizing the medical kits that are advised, such as the Maxwell RSC (MR), ccfDNA Plasma, Nucleic Acid Isolation, MagNA Pure Compact (MPC), and QIAamp Circulating Nucleic Acid (QCNA). In the present moment, there is no extraction method that has been agreed upon; nonetheless, each method has associated sensitivity and accuracy difficulties. According to Pérez-Barrios et al. (2016), the method of extraction of cfDNA might also have an effect on the amount of DNA that is obtained, and this factor ought to be taken into consideration throughout the analysis.

Use of cfDNA in the treatment and monitoring of cancer

In accordance with Sobhani et al. (2018), cell-free DNA is made up of DNA fragments that are released during the processes of cell death in both normal cells and cancer cells simultaneously. According to Zhang et al. (2018), tumour cells undergo several mechanisms that result in the release of DNA, which enables the identification of genetic changes linked with cancer. Patients with cancer, as a result, have a greater cell turnover than patients with normal conditions, and as a result, they have a larger concentration of cfDNA. According to Sobhani et al. (2018), the use of cfDNA acquired from plasma using liquid biopsy is a useful method for monitoring cancer since it solves the challenge of searching for tumour DNA mutations of targeted genes. Within the scope of Obonyo (2018), circulating tumour cells (CTC) acquired from liquid biopsies were the primary focus. However, this method has several limitations due to the fact that CTCs do not necessarily represent cells that are genetically malignant. According to Sobhani et al. (2018), the choice of cfDNA in this investigation was justified due to the fact that it is theoretically representative of all cancers and has the ability to discern between signals coming from non-cancerous cells and pre-cancerous cells. It was discovered by Sobhani et al. (2018) that there is a possibility of monitoring breast cancer by the use of cfDNA, as depicted in figure 1. This monitoring might be qualitatively accomplished by examining mutations, or quantitatively. On the other hand, both approaches have their own set of restrictions. Qualitative studies done of the mutations only represent approximately 40% of breast cancer patients while quantitative studies of cfDNa in breast cancer patients, cfDNA values can be impacted by viruses or infections which can increase the concentration of cfDNA in the patients. Nonetheless, cfDNA presents great advantages in the context of breast cancer monitoring.

Even after the initial cancer has been removed, the fact that it may be monitored frequently without requiring the patient to undergo an intrusive treatment can be helpful in predicting whether or not the tumour will return (Cheng et al., 2017). According to Crowley et al. (2018), monitoring of tumor-associated genetic abnormalities by cfDNA taken from blood can be utilized to detect the emergence of resistant cancer cells five to ten months before standard approaches reveal their presence. The process of ess involves the removal of actual body tissue for the purpose of examination, which is then followed by imaging with sophisticated medical equipment such as microscopes. First, a needle is used to remove the cells from the sample, and then the cells are analyzed to look for tumours. Procedures differ from patient to patient depending on the type of patient.

2.4 Overall survival rate of breast cancer patients

According to Lynne (2018), the term "survival rate" refers to the percentage of individuals who are able to endure a condition, such as cancer, for a predetermined period of time after receiving a diagnosis. The survival rate of breast cancer is particularly important since it enables medical professionals to provide patients with assistance on their prognosis (Lynne, 2018). Survival is dependent on mortality. Assuming that there are one hundred percent of the members in the group at the beginning, the survival rate is computed as illustrated by Susan (2018): one hundred percent minus the mortality rate means that the survival rate is one hundred percent. According to Bradburn et al. (2003), survival analysis is calculated by taking into account the amount of time that passes between a predetermined starting point (for example, the diagnosis of cancer) and a concluding event (for example, death). Survival analysis is dependent on the Survival Function S (t).

According to Allemani et al. (2015), survival statistics have been utilized as a significant instrument for the purpose of tracking progress achieved in the diagnosis and treatment of cancer. A reduced survival rate has been seen among patients diagnosed with breast cancer (Vanderpuye et al., 2017). This finding can be attributed to the constraints of inadequate nursing care and surgical procedures, limited access to radiation, and inadequate availability of both traditional and contemporary systemic therapies. For the purpose of defining early detection steps and improving treatment, it may be helpful to have an understanding of the elements that contribute to greater survival rates among women who have breast cancer (da Rosa & Radünz, 2012). Notable prognostic markers for breast cancer include clinico-pathological factors such as tumour stage, lymph node involvement, and tumour receptor status (Dong et al., 2014). These parameters are used to determine the likelihood of patient survival. The mortality rates of breast cancer in Africa are the greatest, despite the fact that the incidence rates of breast cancer in Africa are the lowest in the world (Joko-Fru et al., 2019). This is a reflection of the inferior survival results. In Ethiopia, the Kaplan-Meier survival estimation showed that the overall estimated survival rate two years after a diagnosis of breast cancer was 89.8% (Tadesse, Wondimeneh, Tefera, Yared, and Tadesse 2018). On the other hand, the overall survival rate for two years was a little bit higher in Iran, coming in at 96% (Page, Najafi, Mozaffari, & Sadeghi, 2017). According to Akpo et al. (2010) and Sant et al. (2004), survival rates in high-income countries like the United States of America and other regions have been favourable. Some researchers have cited a survival rate of 71% per five years, while others have cited an 89% survival rate per five years. This can be attributed to early detection through screening and to treatment that is both timely and effective (Weir et al. 2001). In contrast, survival rates are significantly lower in countries with low- to middle-

incomes. For example, survival rates in Ghana are less than 25 percent, and survival rates in Nigeria are just 10 percent (Akpo et al, 2010, Opuku et al and others 2012).

The rise in the number of people who have survived cancer is due to a number of different variables. One of these factors is the significant investment in cancer research, which has led to improved outcomes for cancer patients (Batawi et al., 2019). Another factor is the increase in cancer-related health education on the signs and symptoms of cancer, early diagnosis and treatment. Finally, there is an improvement in scientific knowledge and technology, which enables more effective cancer-related investigations and staging of cancer, which in turn leads to more effective cancer treatments (Lazenby et al., 2013). With the growing number of cancer survivors, the question of their quality of life (QoL) becomes more pressing. There are additional worries in the life sphere of the patient that are touched by the disease via virtue of the fact that the sickness is hazardous in nature. This is the case despite the fact that physical difficulties dominate the life of cancer patients. These issues were categorized by the World Health Organization (WHO) into four different categories of quality of life, which are the physical, psychological, social, and environmental domains (WHOQOL, 2020).

Depending on whether the distribution is known or unknown, survival data analysis can be regarded as an application of either parametric or semi-parametric statistical approaches (George et al., 2014). Parametric methods are more commonly used when the distribution is known. According to Georgousopoulou et al. (2015), the Cox proportional hazard regression model is the semi-parametric survival model that is utilized the most frequently in the field of health sciences. This is due to the fact that it relies on a smaller number of postulations in comparison to other parametric models.

The model proved to be useful in this investigation because it allowed for the elimination of variables that had a minimal or non-existent impact on the survival rate. As a result, the researchers were able to arrive at a survival rate model that included variables that had a significant impact on the survival rate of breast cancer patients (Smith, 2011). It is not known how many people in Kenya have survived cancer, despite the fact that there have been improvements in the therapy that is provided to cancer patients with the disease. Recent advancements in cancer treatment, supportive care, and early identification have led to an increase in the number of people who have survived the disease, and this trend has been observed both locally and globally. According to Bennett et al. (2016), there are more than 15.5 million cancer survivors in the United States.

An overwhelming majority of these individuals have completed their medical treatment. The average survival time for cancer patients in Wales and England is ten years or longer. According to Quaresma (2014), the survival rate has increased from 24% to 50% across the world to reflect this change. According to Batawi et al. (2019), the improvements that have been made in cancer treatment and biomedical research have made it possible to treat the majority of cancers that were previously considered to be incurable. As a result of a number of different factors, the number of people who have survived cancer has climbed. Large investments in cancer research, which improves patient outcomes (Batawi et al., 2019); increased cancer-related health education on symptoms and signs of the disease, early detection and treatment; and advancements in science and technology, which enable more efficient cancer-related investigations and staging of the disease, thereby improving the efficacy of cancer treatments (Lazenby et al, 2013). These are some of the factors that have contributed

to positive outcomes for cancer patients. The problem of the quality of life (QoL) of cancer survivors is becoming increasingly urgent as the number of cancer survivors continues to climb.

In addition to the physical problems that are the most prevalent in the lives of cancer patients, the potentially deadly nature of the disease also has an effect on the patient's other concerns. According to WHOQOL (2020), these issues were grouped into four categories: the physical, psychological, social, and environmental domains of quality of life. These domains are the four categories that make up quality of life. Every one of these aspects has the potential to have an effect, either positively or negatively, on the quality of life suffered by a cancer patient. According to the findings of a number of studies, the percentage of cancer survivors who are beginning to question their quality of life has shown an upward trend. A significant amount of research has not been done on the relationship between the quality of life of cancer survivors and their sociodemographic characteristics, the characteristics of their illness, and their spiritual views.

The following are some examples of socio-demographic characteristics that have an effect on quality of life: age, degree of education, marital status, gender, and employment position. Age was found to be a significant factor in determining the quality of life of cancer patients, as demonstrated by the research conducted by Batawi et al. (2019) who compared younger and older breast cancer patients. Studies conducted by Ashing-Giwa and Lim (2010) have shown that younger people have a lower level of social functioning compared to older adults. It is due to the fact that younger women, particularly those who have gone through menopause, have a more difficult time dealing with sexual issues and have a more negative perception of their

bodies than older women. According to the findings of their analysis, Sharma and Purkayastha (2017) found that the consequences were comparable for both genders.

Additionally, they made the observation that the quality of life (QoL) was much lower for the younger age group, with the exception of sexual functioning, for those who were between the ages of 30 and 39. According to Sharma and Purkayastha, the EORTC scale was utilised in order to assess the quality of life (QoL) of individuals of varying ages. Among the factors that were investigated in a study that looked at the connections between demographic features and quality of life in older persons, it was discovered that gender had a significant influence. Women rated the quality of their social ties higher than men did, indicating that they are more important to them. Ghosh et al. (2014) found that women are more likely to participate in social activities and engage in social interaction than men do. This was the explanation for this phenomenon.

The findings were consistent with those of a study that was carried out in the United States in 2013 by Dunneram and Jeewon on nutrition and health assessment surveys. This study also discovered that women's social functions considerably improved their quality of life (QoL) in comparison to men's. In contrast to the findings of the Lee et al., (2020) study, which discovered that gender did not significantly correlate with quality of life due to the fact that both men and women had a low quality of life, the findings of this study supported the opposite conclusion. The marital status of cancer patients has a substantial impact on the quality of life they experience during their treatment. An analysis that was carried out on cancer patients who were older indicated that being alone as a result of a divorce, separation, or widowhood was connected with a lower quality of life compared to patients who were cohabitating or

married (Bowling et al., 2013). As a result of the fact that single people do not have any social connections, they are more likely to experience feelings of loneliness and hopelessness, and as a result, they have a lower quality of life satisfaction. According to Hoi, Chuc, and Lindholm (2010), these findings are consistent with the findings of a study that was carried out in Central Europe on the factors that influence the quality of life of elderly persons. On the other hand, Lee et al. (2020) discovered that there was no association between a person's marital status and their quality of life. This finding suggests that the improved quality of life that married people experience may be primarily attributable to the social support they receive.

There is a connection between education and quality of life, according to the findings of some researchers, while others have discovered no discernable correlation between the two. Stundag and Zencirci (2015) conducted a study on the quality of life of cancer patients who were receiving treatment. The findings of this study indicated that there is no significant correlation between education and QoL. According to Üstündag et al. (2015), cancer patients with lower levels of education have weaker physical, social, and functional responsibilities, which results in a decrease in their quality of life. According to Ramasubbu et al. (2020), cancer patients who have greater levels of education tend to have better quality of life (QoL) than those who have lower levels of education. This is because cancer patients with higher levels of education tend to have better physical and psychological health for themselves. The quality of life of cancer patients is substantially connected with their income, with patients with lower incomes having a lower quality of life because of this correlation. It has been found by Cheng et al. (2012) that people with medium incomes and those with high incomes had the same quality of life. There was a significant association between high income

and high quality of life among Dutch elderly cancer patients, according to Gobben and Remmen (2019). This is in contrast to the findings of a study that examined the perspective of community-dwelling adults on quality of life (QoL), which found that there was no significant association between income and QoL for older cancer patients (Boggatz, 2019). The Gobben study made use of the WHOQOL-OLD questionnaire, whereas the Boggatz study made use of the WHO-AGE and older persons QoL questionnaire. Both questionnaires were used to assess quality of life. One possible explanation for the differences in the results is that the various instruments that were utilized brought to the variations. It has been suggested that individuals who are employed full-time enjoy a higher quality of life than those who are unemployed or who work on a casual basis.

There is a possibility that the worse quality of life of housewives is due to the fact that they do not have strong social support networks and that they are also removed from social life (Li, Han, and Chen, 2020). Cancer sufferers have been subjected to a significant amount of financial burden as a result of receiving a diagnosis of cancer. According to Akinyemiju et al. (2015), there are three types of costs associated with the disease: direct costs, which include any expenses directly related to treatment, transportation, consultation, and special nutrition; indirect costs, which include income loss due to the disease, early retirement, and the use of retirement savings for treatment; and psychosocial costs, which include social isolation, depression, anxiety, marital constraints, and an uncertain future. According to Nayak et al. (2017), insufficient financial resources are a significant challenge for both patients and carers, which in turn has a negative impact on the quality of life of both groups. Because of the implications, which can include financial ones, receiving a diagnosis of cancer is

typically not something that is welcomed. There is a possibility that a person who has been diagnosed with cancer may not be as productive as they once were. This is due to the fact that the sickness makes an employee appear unfit for employment. As a result of the fact that the majority of cancer patients spend their time in hospitals receiving or undergoing treatment, the diagnosis becomes a potential obstacle for their advancement. A study that was carried out among adolescents who had survived cancer found that young adults who have been diagnosed with cancer, are currently undergoing treatment, or have finished treatment are less likely to have job stability. This is due to the fact that their coworkers perceive them to be less productive than those who are cancer-free (DeRouen et al., 2017).

As a result of the fact that people who have been diagnosed with cancer tend to concentrate more on their diagnosis, they spend the majority of their time receiving treatment and recovering from the adverse effects of their treatment (DeRouen et al., 2017). This has had a significant negative impact on the quality of life of their cancer patients with the disease. According to a study that included cancer survivors from the United States, forty percent of them stopped working while they were receiving treatment, and eighty-four percent of those who did return their jobs after four years. According to Ladenburg et al.'s 2019 research, those who were diagnosed with cancer experienced a reduction in employment that was greater than fifty percent in the first year after receiving the diagnosis. These findings indicate that cancer patients have a large financial burden, which has a negative impact on the quality of life they are able to enjoy. On the other hand, it has been discovered that certain sociodemographic characteristics linked with cancer patients are strongly associated with their quality of life, while other factors have not been found to be significantly correlated with quality

of life.

Logistic regression was utilized by Landy, Pesola, Castanon, and Sasieni (2016) in order to assess the odds ratio (OR) of acquiring stage-specific cancer in women who were either routinely screened or irregularly screened in comparison to women who had not been screened in the preceding 15 years. Using stage-specific 5-year relative survival data from England and adjusting for age within stage based on SEER (Surveillance, Epidemiology and End Results, USA) data, mortality was computed based on the number of deaths that occurred within five years of the diagnosis.

It was disclosed by Kim, Uno, and Wei (2017) that the restricted mean survival time (RMST) was presented as an alternative measure of treatment effect. This measure has certain advantages in design, analysis, and interpretation in comparison to the standard measures. The research conducted by Oza (2015) was able to identify a discrepancy in overall survival. Intention to treat was the method of analysis. According to the findings of the study, the major method for estimating the effect was the difference in restricted mean survival time. A restricted mean survival time of 44·6 months was obtained, indicating that there was no overall survival benefit associated with bevacizumab. In terms of overall survival, it was seen that there was a noteworthy distinction between women who got bevacizumab in conjunction with chemotherapy and those who had chemotherapy on its own (with a restricted mean survival time of 34·5 months). It is worth noting that the restricted mean survival time did not exhibit a significant difference between the two therapy groups in individuals who were not considered to be at high risk (49·7 months). There was no discernible difference between the therapy groups, according to the most recent examination of progression-free survival.

The researchers Viganó et al. (2000) conducted univariate Kaplan-Meier and multivariate Cox regression analyses in order to determine the correlations between survival time and variables that were particular to the tumour and the treatment, as well as clinical, laboratory, demographic, and socioeconomic factors. According to the findings of the study, potential methodological advancements in the design and implementation of survival studies have the potential to lessen the amount of uncertainty regarding the prognosis, which would ultimately result in improved care for patients who are terminally ill and their families.

A cox regression analysis was performed by Ashworth et al. (2014) in order to determine the parameters that are predictive of overall survival (OS) and progression-free survival. RPA, which stands for recursive partitioning analysis, was utilized in order to create risk groups. According to the findings of the study, patients who have metachronous oligometastases have a high probability of surviving for an extended period of time. This method of risk assessment can be utilized to provide direction for the selection of patients to participate in clinical trials of ablative treatment.

A total of 1,107 individuals with Protease Nexin 1 (pN1) prostate cancer were analyzed by Abdollah et al. (2014). These patients were treated with radical prostatectomy and anatomically expanded pelvic lymph node dissection between the years 1988 and 2010. The study was conducted at two tertiary care centres. Through the use of regression tree analysis, patients were divided into risk groups according to the tumour predictors that they possessed and the cancer-specific mortality (CSM) rate that corresponded to those predictors. A Cox regression analysis was performed to investigate the link between adjuvant radiotherapy (aRT) and the rate of chronic squamous cell carcinoma (CSM), as well as the overall mortality (OM) rate in each

risk group individually. Based on these findings, it was observed that tumour predictors have a significant impact on the positive impact that aRT has on survival in patients who have cancer of the prostate type pN1. The total death rates from cervical cancer were shown to increase with women's age, according to the findings of an investigation conducted by Wang et al. (2021). When it came to death rates from cervical cancer, the age effect was that the rates increased with increasing age.

According to Wang, Xue, Wang, and Bai (2018), women who are over the age of 40 have a higher risk of dying from cervical cancer due to the fact that they are older. The findings of the research conducted by Luo (2017) indicate that the survival rate for individuals diagnosed with cervical cancer has a tendency to decrease with increasing age. The fatality rate from cervical cancer has been shown to have a tendency to increase with age, according to a number of studies and statistics. In three nations with high incomes, the overall death rates from cervical cancer increased with age and decreased with birth (Bedell, Goldstein, Goldstein, & Goldstein, 2020). Furthermore, the death rates decreased with birth. It may be possible to reduce the high death rate that is associated with cervical cancer around the world with the implementation of effective interventions at various stages of life. If we want to reduce the mortality rate associated with cervical cancer, this demonstrates how essential age is.

With the purpose of determining the epidemiologic determinants and prognostic factors for survival in patients who had been diagnosed with osteosarcoma of the jaws, Lee et al. (2015) conducted research. Review was conducted on retrospective, population-based cohort research that included 541 patients in the SEER tumour registry who were diagnosed with osteosarcoma of the jaws between the years 1973

and 2011. In the study, Kaplan-Meier analysis was utilized, and the results showed that the overall survival (OS) and disease-specific survival (DSS) rates were 53% and 62%, respectively, at 5 years, and 35% and 54%, respectively, after 5 years. Age at diagnosis, stage at presentation, and surgical resection were found to be independent predictors of both OS and DSS, according to the findings of a multivariate Cox regression analysis. In terms of OS, the size of the tumour was not important, however it was significant for DSS.

Through the utilization of a pooled analysis of individual patient data, Bidard et al. (2014) endeavoured to evaluate the clinical validity of circulating tumour cell (CTC) quantification for the purpose of prognosticating patients who were diagnosed with metastatic breast cancer. Cox regression models, which were stratified according to study, were utilized in the research project to determine the correlation between the number of CTCs and progression-free survival as well as overall survival. The landmark method was utilized by the researchers in order to evaluate the prognostic value of changes in CTC and serum markers that occurred simultaneously with therapy. In addition, the researchers utilized likelihood ratio (LR) statistics in order to evaluate the additional value that CTCs or serum indicators brought to predictive clinicopathological models through the use of a resampling technique. The findings of the study provide evidence that the count of CTCs confers an independent predictive effect on progression-free survival as well as overall survival. However, the addition of CTC counts to comprehensive clinicopathological predictive models does not improve the prognostication of metastatic breast cancer. Serum tumour markers, on the other hand, demonstrate no such improvement.

Individuals who were diagnosed with pancreatic cancer–related diabetes (PCRD) and post pancreatitis diabetes mellitus (PPDM) were evaluated by Cho et al. (2019) to assess the risk of mortality that was associated with the usage of antidiabetic drugs. An investigation using multivariable Cox regression was carried out, and the risk was represented by the hazard ratio (HR) and the 95% confidence intervals. We employed a latency of six months to reduce the possibility of reverse causality. In persons with PPDM, metformin was found to produce a survival benefit; however, it did not enhance survival in individuals with PCRD. There is a possibility that the link between insulin use and mortality in PCRD is due to the phenomenon of reverse causality.

In their 2012 study, Stark and colleagues provided a large case series from a single institution that was analyzed for prognostic markers using both univariate and multivariate survival analysis. Using the log-rank test for univariate analysis and the cox regression approach for multivariate analysis, we were able to evaluate the association between the two variables and patient survival. In the multivariate analysis, the following parameters were found to have a significant association with survival: age, performance, multifocal tumour, total or subtotal resection, radiotherapy, chemotherapy, and combined radiotherapy and chemotherapy with temozolomide.
Within the context of the scenario, Niegisch et al. (2018) provided a description of clinical determinants, treatment patterns, and subsequent outcomes.

The purpose of this retrospective observational cohort analysis was to assess the treatment patterns of 1L and 2L, as well as the overall survival (OS) of patients aged 18 years or older who were diagnosed with advanced urological cancer (UC) or metastatic urological cancer (mUC) (T4b, N2-3, and/or M1) at office-based urology

clinics, academic clinics, and nonacademic clinics across Germany between November 1, 2009 and June 2, 2016. The German Oncology database and other treatment centres that used computerized case report forms that were comparable to those used in Germany were utilized to collect the records. This study offers a contemporary multicenter evaluation of treatment patterns and results among palliatively treated individuals in Germany who were diagnosed with ulcerative colitis (UC). The findings were, for the most part, in agreement with the generally negative treatment outcomes that have been reported all over the world, highlighting the importance of developing effective 1L and 2L treatment for advanced UC or mUC.

As part of their study, Cormedi et al. (2018) evaluated the clinicopathological variables and survival rates of patients with stomach cancer who were younger and those who were older. Patients were classified into three distinct groups: young adults (with a minimum age of 40 years; N=71), older adults (with a minimum age of 41 to 65 years; N=129), and elderly individuals (with a minimum age of 66 years; N=94). It was determined that Pearson's $\chi 2$ test, Kaplan-Meier analysis, Log rank test, and Cox regression were utilized to evaluate the differences. According to the findings of the study, general survival rates were comparable across all age categories. The only characteristic that was related with a worse prognosis in young adults was the presence of metastatic illness at the time of diagnosis. Given these findings, it appears that younger individuals should be given additional consideration when it comes to the diagnosis of disease in its early stages.

Zhang and Gong (2017) conducted research to determine the parameters that determine the prognosis of bone metastases caused by lung cancer. The log rank univariate test was utilized in order to compute and analyze the Kaplan-Meier survival

curves. Cox's regression model was utilized in order to carry out multivariate regression analysis. A statistically significant correlation ($P<0.05$) was found between survival and pathologic kinds, the number of bone metastases, the clinical stage, the ECOG scores, and the serum ALP levels. This was determined by the use of univariate regression analysis. According to the results of a multivariate regression analysis, the number of bone metastases, clinical stage, and serum ALP levels were found to have a significant correlation with the prognosis ($P<0.05$). When compared to the risk associated with a single bone metastasis, the risk associated with multiple bone metastases was 1.72 times higher ($P = 0.029$). The risk associated with advanced clinical stage was 1.49 times higher than the risk associated with early clinical stage ($P = 0.001$). Furthermore, the risk associated with a high serum ALP level was 1.75 times higher than the risk associated with a low serum ALP level ($P = 0.006$). The clinical stage, the number of bone metastases, the ECOG scores, and the serum ALP levels were the parameters that were used to determine the prognosis for bone metastases occurring as a result of lung cancer.

In their 2019 study, Wang et al. focused on conducting a retrospective analysis of data collected from 14,528 patients diagnosed with lung cancer who had multiple primary malignant neoplasms (MPMN). According to the findings of a multivariate analysis, the factors of SMPMN, LCF, and the age of the primary malignancy identified first (at least 60 years) as well as NSCLC staging greater than II were found to be significant independent predictors for individuals with an inferior prognosis.

CHAPTER THREE : METHODOLOGY

3.0 Introduction

The chapter introduces the study site and population, study design, sample and sampling techniques, data collection, validity and reliability, and data analysis methods with tabular formulae presentation that was adopted in the current research.

3.1 Study area

This study was conducted at Alexandria Cancer Center and Palliative Care Hospital where breast cancer among other patients receive treatment. The hospital is located within Eldoret City along Lumumba Avenue in Uasin Gishu County. Its catchment area is mostly the western region of Kenya with a population of approximately 24 million people with Uasin Gishu County contribution 1,163,186 people (2019 census). Breast cancer is the leading cancer diagnosis treated at the hospital and also poses high mortality. Eldoret City is surrounded by agricultural regions which are the majority. This hospital provide both out-patient and in-patient services and has a bed capacity of 50. It provides comprehensive healthcare through health promotion, treatment, curative and palliative care services (mainly oncology) while embracing research, innovation and collaboration in patients' care.

3.2 Study population

The study population was breast cancer patients that were managed at Alexandria Cancer Center and Palliative Care Hospital during the years 2016 and 2017 and met the inclusion criteria.

3.3 Study design

This was cross-sectional study design and focused on respondents who were in treatment follow up.

3.4 Eligibility criteria

3.4.1 Inclusion criteria

- All patients that were histologically confirmed to have cancer of the breast
- The patients who received and completed treatment at Alexandria Cancer Centre.
- Those aged 18 years and above

3.4.2 Exclusion criteria

Patients' records without verifiable information.

3.5 Sample size determination

This study included all the breast cancer patients that were diagnosed with and sought health care services at Alexandria Cancer Center and Palliative Care Hospital during the study period. Since breast cancer is one sub-group of cancer population. The sample size was 54 participants. This was a census of all the cases that met the eligibility criteria.

3.6 Sampling procedure

This study was a census study hence all eligible participants were included.

3.7 Data collection

A well-designed structured data abstraction tool was used to extract data from patients' records. The variables of interest were gender, age, ethnicity, date of encounter, basis of diagnosis, morphology of the tumour, mechanism of cancer spread, stage, laterality of the cancer, metastasis, organ of metastasis, date of the last contact, response to treatment and status of the last contact.

3.8 Data entry, analysis, and presentation

Data was entered and cleaned using Microsoft excel while analysis was done using R-3.6.1 for windows software. Demographic and clinical characteristics were analyzed using descriptive statistics by use of frequencies, percentages, means and standard deviations while survival analysis was estimated using Kaplan Meier curves and cox regression analysis. The study results were presented in the form of tables, graphs, and figures as appropriate.

3.9 Ethical consideration

Ethical approval was obtained from the Moi University/MTRH Institutional Research and Ethics Committee (MU/MTRH IREC) and administrative and institutional permission was sought from Alexandria Cancer Center and Palliative Care Hospital for data collection. The patients' data was collected only for the purposes of this study. After data collection was done, it was then de-identified in the database by removing patients' personal identifiers like name, national identity number, mobile number and next of kin. Each subject later assigned a unique study identifier for confidentiality. Data collection tools were later kept in lockable rooms/cabinets, and they can only be handled by the principal investigator and research assistants who were trained for the purposes of this research. After entry, data was stored in password-secured laptop/computers

3.10 Limitation of the study

- This study was a hospital-based research and therefore, its findings cannot be generalized to the larger population.
- The study was purely retrospective and sought to analyze already collected data; hence did not have the ability to modify it to capture any emerging issues.

Despite these limitations, the study has provided local epidemiological data on breast cancer patients that can help health care providers in the management of patients.

CHAPTER FOUR: RESULTS

4.0 Introduction

There were 89 patients who had been considered and all of them had breast cancer. Those who met the criteria were 54.

4.1 Characteristics of patients with breast cancer

4.1.1 Demographic characteristics

There were 54 breast cancer cases that were involved in this study. The mean age was 46 years.

4.1.1.1 Gender proportion

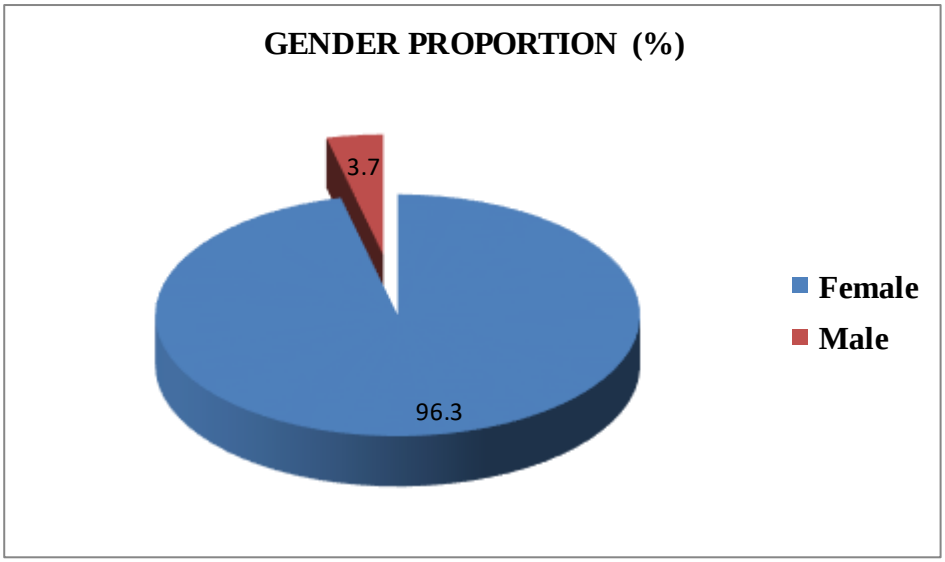

Figure 2: Breast cancer gender proportion
Female had the highest proportion.

4.1.1.2 Age-group distribution

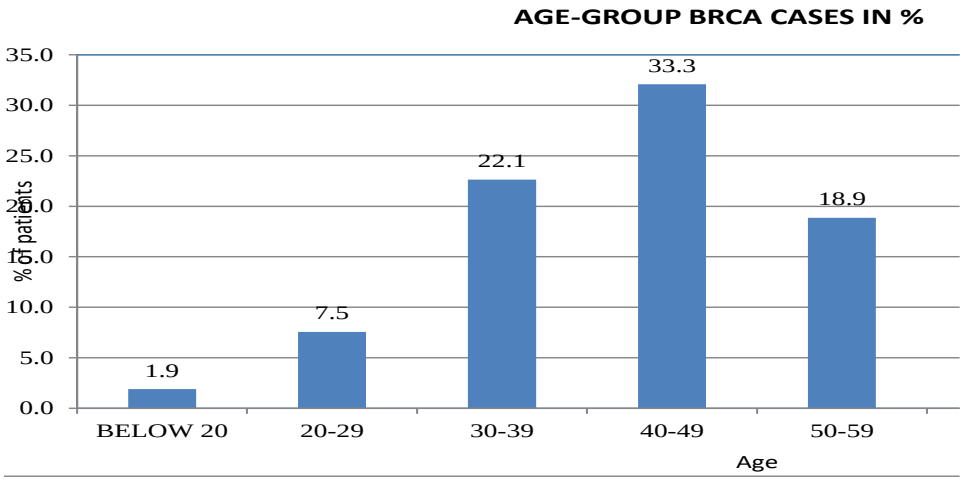

Figure 3: Age distribution of breast cancer cases

Most patients were in the age group of 40-49 years (33.3%).

4.1.1.3 Distribution of breast cancer in different ethnic groups

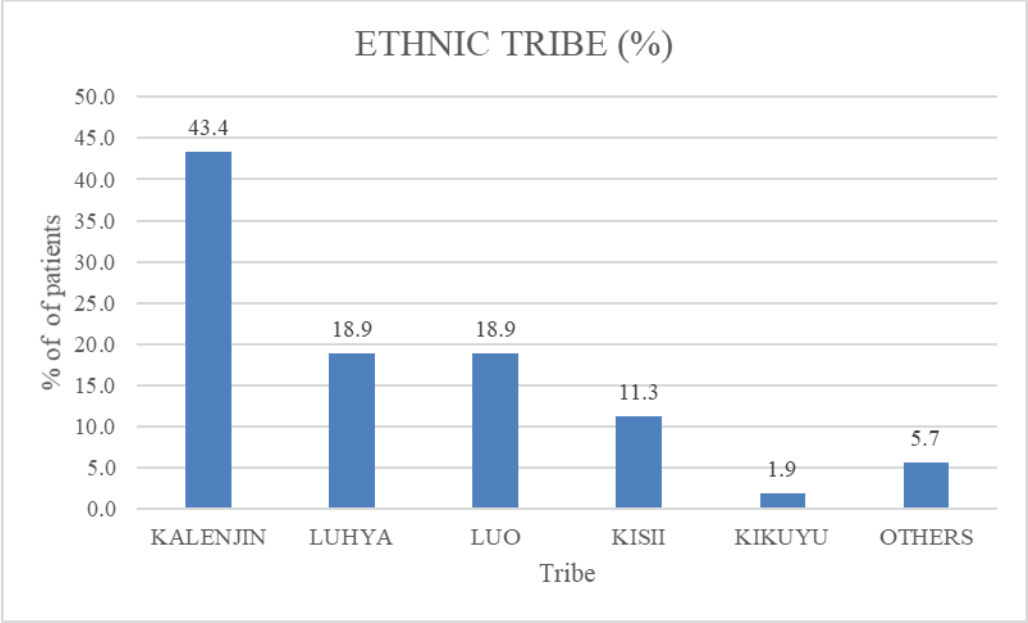

Figure 4: A graph of percentage of breast cancer in different ethnic tribes

The above graph shows that the Kalenjin tribe had the highest number of breast cancer (43.4 %,) among the top five tribes. In the category of other tribes, there were: Turkana, Meru and Kamba.

4.1.2 Breast cancer characteristics

4.1.2.1 Basis of diagnosing breast cancer

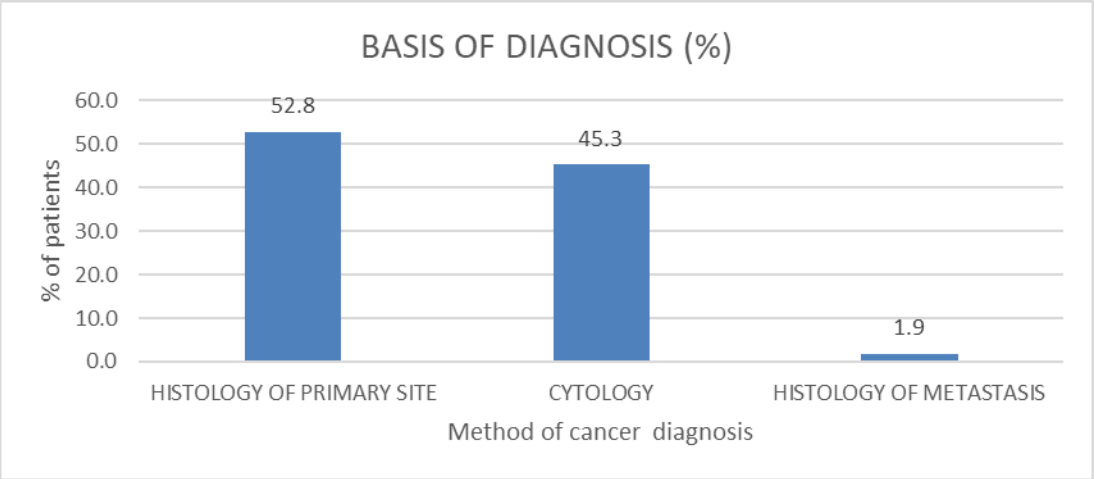

Figure 5: A graph showing method of tissue examination

Most (52.8%) of the breast cancer patients were diagnosed through the histology of the primary.

4.1.2.2 Laterality of breast cancer

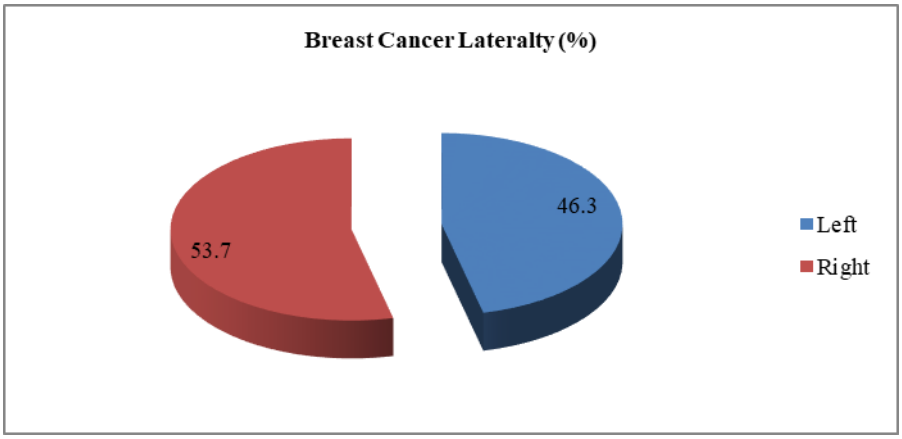

Figure 6: Laterality of breast cancer

In relation to laterality, majority (53.7%) of the breast cancer patients had their right breast affected by breast cancer, there were no bilaterally in the context.

4.1.2.3 Site(s) of metastasis at diagnosis

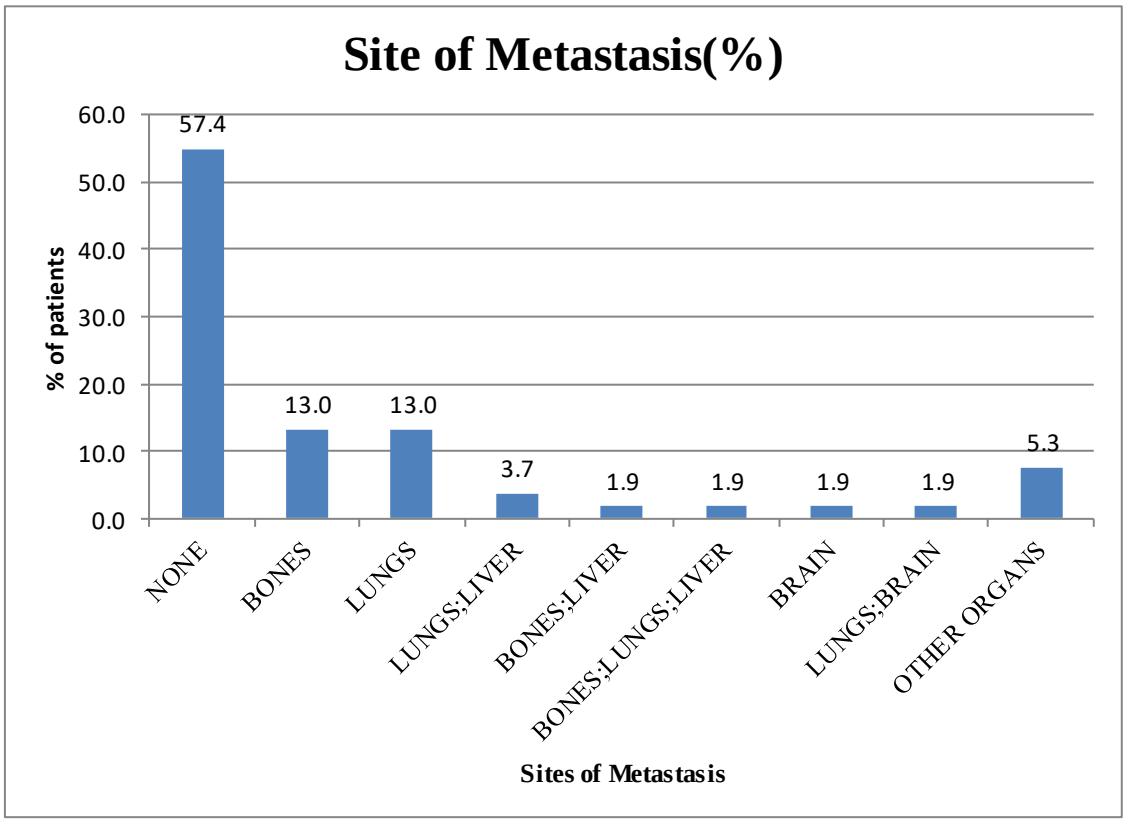

Figure 7: Site of metastasis of breast cancer.

Majority of breast cancer (57.4%) didn't experience any metastasis at the time of diagnosis. However, for those which had metastasis, bones and lungs were the organs that were highly affected with 13.0% each. Multiple organ metastases were also encountered.

4.1.2.4 Modality used in treatment

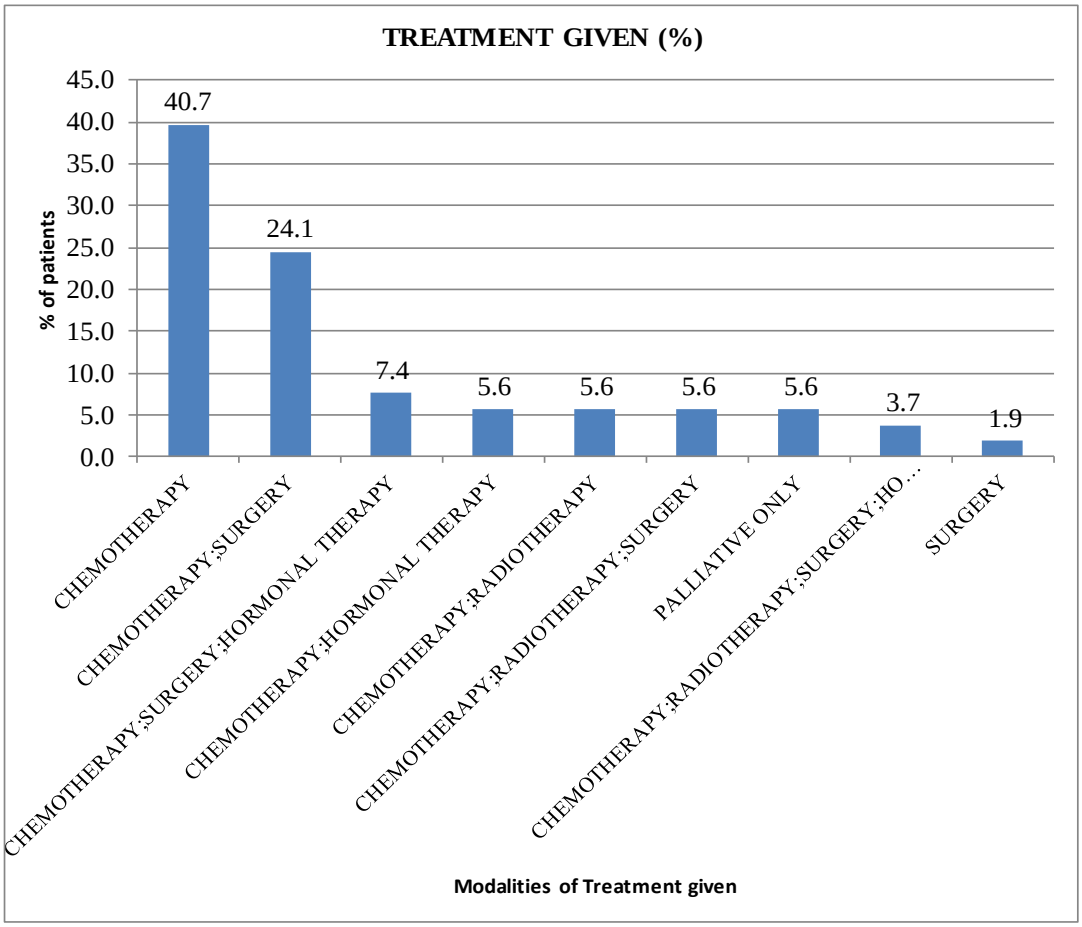

Figure 8: Treatment given to patients with breast cancer

Among the different types of therapy given, chemotherapy was the most commonly used accounting for 39.6% without being combined with any other anticancer treatment as indicated by the graph above.

4.1.2.5 Status as at last visit

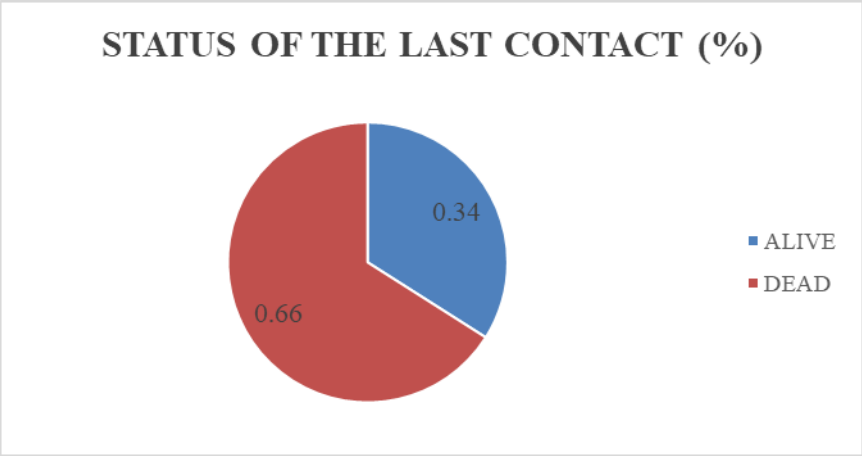

Figure 9: Status as at last visit

According to the results of this study, 66% of the patients with breast cancer were alive during the last contact with the care provider.

4.2 Types of Breast cancer

4.2.1 Histopathological description of breast cancer

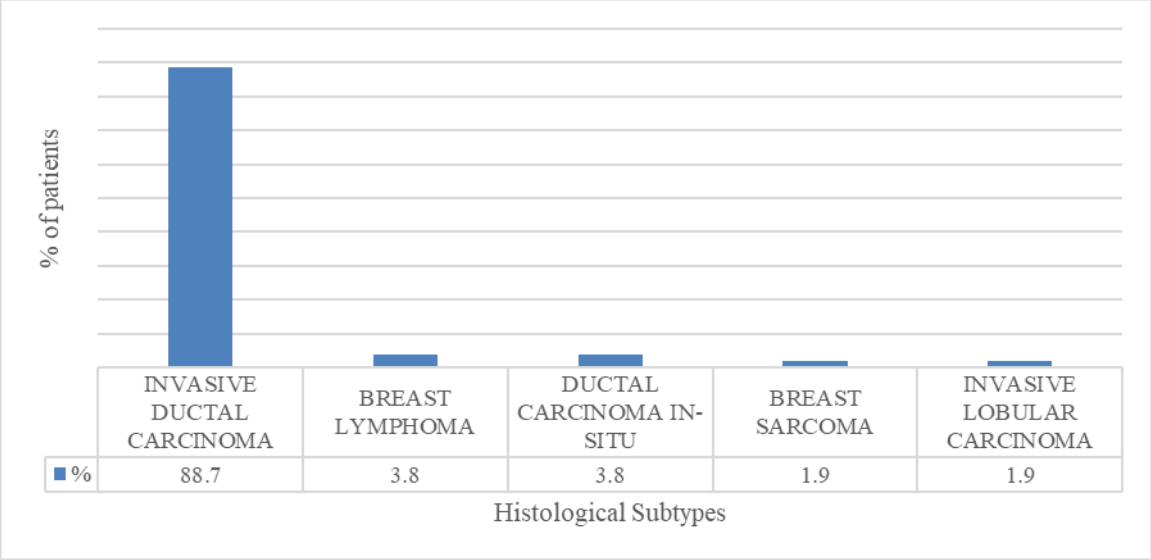

Figure 10: Histopathological description of breast cancer

Majority of the breast cancer cases diagnosed between the study period were invasive ductal carcinoma accounting for88.9%.

4.2.2 Hormone receptor status

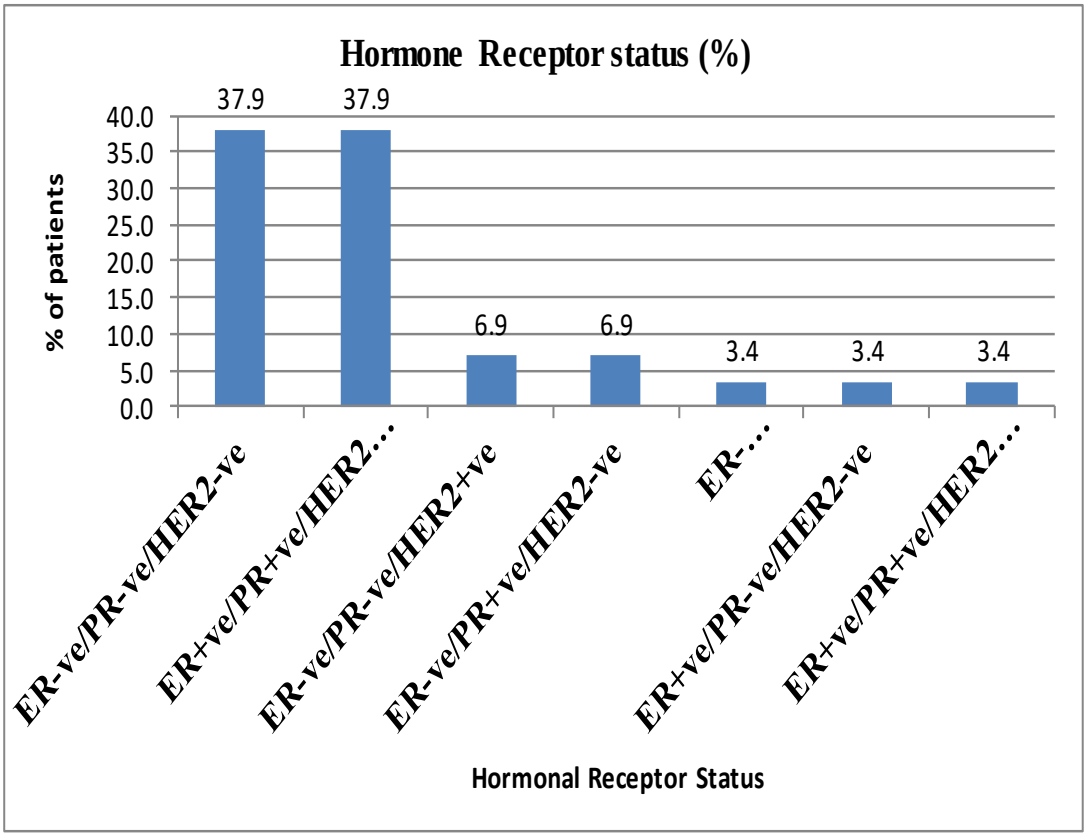

Figure 11: Hormone receptor status

Among the 29 case patients with known HR/HER2 status, double positive (ER +ve & PR +ve) and triple negative breast (TNB) were the leading each with 37.9%.

4.3 Association between death and patient characteristics

Table 1: Bivariate test of association between death and patient characteristics

	Alive (N=35)	Dead (N=19)	p value
Female	33 (94.3%)	19 (100.0%)	0.288
Male	2 (5.7%)	0 (0.0%)	
Below_39	11 (31.4%)	6 (31.6%)	0.660
40-49	13 (37.1%)	5 (26.3%)	
Above_50	11 (31.4%)	8 (42.1%)	
BREAST LYMPHOMA	1 (2.9%)	1 (5.3%)	0.832
BREAST SARCOMA	1 (2.9%)	0 (0.0%)	
DUCTAL CARCINOMA IN-SITU	1 (2.9%)	1 (5.3%)	
INVASIVE DUCTAL CARCINOMA	31 (88.6%)	17 (89.5%)	
INVASIVE LOBULAR CARCINOMA	1 (2.9%)	0 (0.0%)	
HEMATOGENOUS	7 (20.0%)	3 (15.8%)	0.497
LOCAL INFILTRATION	6 (17.1%)	2 (10.5%)	
LYMPHOID	11 (31.4%)	10 (52.6%)	
UNKNOWN	11 (31.4%)	4 (21.1%)	
LEFT	19 (54.3%)	6 (31.6%)	0.110
RIGHT	16 (45.7%)	13 (68.4%)	
No	23 (65.7%)	7 (36.8%)	0.164
Yes	12 (34.3%)	12 (63.2%)	
BONES	5 (14.3%)	2 (10.5%)	0.041
BONES;BRAIN;SPINE	0 (0.0%)	1 (5.3%)	
BONES;LIVER	1 (2.9%)	0 (0.0%)	
BONES;LUNGS;LIVER	0 (0.0%)	1 (5.3%)	
BRAIN	0 (0.0%)	1 (5.3%)	
BRAIN;SPINE	1 (2.9%)	0 (0.0%)	
BRAIN;THYROID	0 (0.0%)	1 (5.3%)	
LUNGS	3 (8.6%)	4 (21.1%)	
LUNGS;BRAIN	0 (0.0%)	1 (5.3%)	
LUNGS;LIVER	2 (5.7%)	0 (0.0%)	
NONE	23 (65.7%)	8 (42.1%)	
CHEMOTHERAPY	11 (31.4%)	11 (57.9%)	0.359
CHEMOTHERAPY;HORMONAL THERAPY	3 (8.6%)	0 (0.0%)	
CHEMOTHERAPY;RADIOTHERAPY	2 (5.7%)	1 (5.3%)	
CHEMOTHERAPY;RADIOTHERAPY;SURGERY	2 (5.7%)	1 (5.3%)	
CHEMOTHERAPY;RADIOTHERAPY;SURGERY; HORMONAL THERAPY	1 (2.9%)	1 (5.3%)	
CHEMOTHERAPY;SURGERY	10 (28.6%)	3 (15.8%)	
CHEMOTHERAPY;SURGERY;HORMONAL THERAPY	4 (11.4%)	0 (0.0%)	
PALLIATIVE ONLY	1 (2.9%)	2 (10.5%)	
SURGERY	1 (2.9%)	0 (0.0%)	
PARTIAL RESPONSE	2 (5.7%)	0 (0.0%)	**< 0.001**
PROGRESSION	8 (22.9%)	15 (78.9%)	
STABLE DISEASE	25 (71.4%)	4 (21.1%)	

Among the different patient characteristics, metastases and treatment response showed statistically significant association with death using Fisher exact test with $p= 0.04$ and $p<0.001$ respectively**.**

4.4 Survival analysis by Kaplan-Meier curves

The 2-year survival was 64.8% where the 19 participants experienced the event (death) within the first 20 weeks after diagnosis.

In this Fig below shown is the survival rate of BC patients after diagnosis. The doted lines above and below the survival curve are the 95% Lower and Upper Confidence bands. So, we do not need a legend

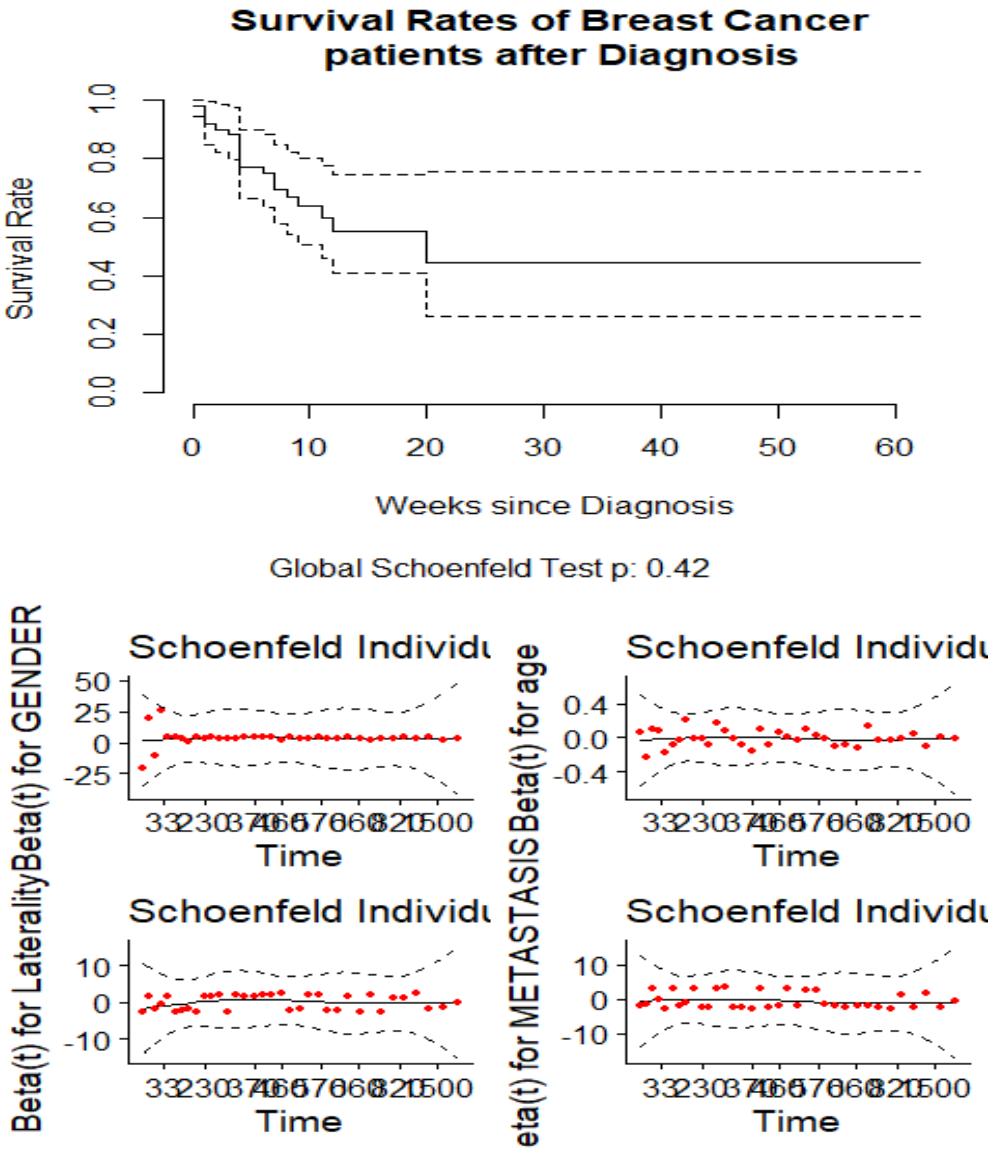

Figure 12: Survival analysis by Kaplan-Meier curves

Proportional Hazard Assumptions

Schoenfeld's procedure was used to evaluate the Proportional Hazard assumptions. Graph above is a plot of Residuals against Time for Gender, Age, Laterality and Metastasis. In all the plots, is a straight line passing through a residual value of "zero" with a "zero" gradient indicating that the variables satisfy the PH assumptions and are thus time independent.

Table 2: Multivariate Analysis of predictors of survival

```
## # A tibble: 8 × 7
  term       estimate  std.error  statistic p.value conf.low conf.hi
gh
 <chr>         <dbl>      <dbl>      <dbl>   <dbl>    <dbl>     <dbl
>
1 GENDER

                  0.12     1.05     3.28      0.0014    3.99     24.
4
2 age             0.093    0.0163   -0.459     0.0460   1.961    2.0
2
3 Laterality

 Right             9.65     0.0369  -0.0962     0.923    0.468   1.99


4 Metastasis

 Yes              0.192       0.938  -0.00184   0.029   1.876    12.
67
```

The Cox regression model was used to analyze survival time in relation to gender, age, laterality, and metastasis. The study found that gender, age, and metastasis were significantly associated with survival. Females had a 12.7% increased hazard of death compared to males, with a hazard ratio (HR) of 1.127, 95% confidence interval (CI) 3.99–24.4, and a p-value of 0.0014. Each additional year of age corresponded to a 10.4% increase in the hazard of death (CI: 1.961–2.02, p=0.046). Additionally, patients with metastasis had a 20.9% higher hazard of death than those without (CI: 1.876–12.67, p=0.029), and their median survival time was lower. Laterality did not

show any significant relationship with survival. This underscores the importance of age, gender, and metastasis in predicting survival outcomes.

In hazard regression, we interpret significant coefficients by checking whether the 95% CI for the HR excludes 1. If it does, we conclude there is a statistically significant effect. All the presented coefficients are statistically significant. In the Table the coefficients are rounded off to 2 decimal points but in the text, they are presented to 3 decimal places.

CHAPTER FIVE: DISCUSSION

5.0 Introduction

The discussion is based on findings and how it compares with other similar studies in literature.

5.1 Characteristics of patients with breast cancer

5.1.1 Socio- demographic characteristics

5.1.1.1 Gender

The female gender had the highest percentage (96.3%) compared to male (3.7%). This compares well with other studies carried out in East Africa (Kijabe - Kenya, Uganda and Tanzania) which reported a similar rate of male breast cancer within a range of 3 to 4% (Bird et al., 2008; Roy & Othieno, 2011; Burson et al., 2010). In contrast, a study done in Western Kenya at MTRH, reported 7% of the total breast cancer patients being males (Sawe et al., 2016) which seems much higher than other studies done in East Africa that included men in their analysis.

5.1.1.2 Age

The mean age in this study was 46.27 ± 14.35 with a median of 45 years. However, in a retrospective study comparing breast cancer in Egypt, an African country, (n=3,819 cases) and United State of America (n=273,019) reported varying average ages of 51.0 versus 61.4 years respectively (Schlichting et al., 2015). In addition, a study by Abadi et al reported a mean age of 59.1± 13.4 in Iran (Abadi et al., 2014).

The results of this study showed a remarkable increase of breast cancer with increased age group to a peak of 40 to 49 years with 33.3% of all the total cases. This is in agreement with a study done by Lan et al in which the same age group had the majority (43%) (Lan, Laohasiriwong, & Stewart, 2013) and a study undertaken to

evaluate trends in breast cancer incidence in Egypt from 1999 to 2008 with 31.8% (2223/6997) within the same age group (Hirko et al., 2013). Similar results were also found in India with the majority of the women (59 of 126; 46.8%) being in the age group of 41 to 50 years (Rao et al., 2013). However, studies from western countries reported a peak incidence of breast cancer to have occurred between 60 to 64 years (Vidhya, Kalaichelvi, S, Raja, & Karthik, 2019) which varies with the results of this study.

In grouping the participants of this study into three age categories: <39 years; 40-49 years; ≥50 years, majority were 50 and above years with 33.3% (18/54) which is in agreement with a trend reported by a study done in Kenya among 823 breast cancer patients where the majority were from the same age group (≥50 years) with 46.3% (379/823) (Sayed et al., 2018). Higher results in this group were experienced in Iran, with 69.6% of 15,830 being older than 50 years (Abadi et al., 2014). On the other hand, different results were reported in 2014 by Agha Khan Hospital, Kenya, where the tumors were almost equally distributed between women less than and more than 50 years of age with 54%, 164/304 cases and 46%, 140/304 cases respectively (Sayed et al., 2014).

5.1.1.3 Ethnicity

The Kalenjin (Nilotes) had the highest number of breast cancer (43.4 % of the entire total,) followed by Luhya (Bantus) and Luo (Nilotes) with 18.9% each, among the top five tribes. These results could have been attributed to the fact that the area of study was located in Uasin Gishu County where the majority of the residents are the Kalenjin tribe. However, in a Kenyan-wide study involving a total of 11 health institutions with 823 female study participants with invasive breast tumors, 661

(80.3%) were Bantus, 143 (17.4%) were Nilotes, and 19 (2.3%) were Cushites (Sayed et al., 2018).

5.1.2 Clinical characteristics

In Kenya, 42% of women with breast cancer present in stage III and 18% in stage IV (metastatic disease) (Sayed et al., 2014).

5.2 Breast cancer sub-types

5.2.1 Histological patterns of breast cancer

Majority of breast cancer patients seen in Alexandria Cancer Center during the time of study had infiltrating (invasive) ductal carcinoma with 88.9% (48/54) and 1/54 (1.9%) had lobular carcinoma. This is consistent with several other studies with similar results (Chahine et al., 2015); (Waks & Winer, 2019); (Mirmalek et al., 2014); (Sayed et al., 2014) recording invasive ductal carcinoma as the highest histological type of breast cancer. In Angola, in a total of 140 cases that were evaluated, invasive ductal carcinoma, was the most common type with 91.4%; n = 128 (Miguel et al., 2017) which seems higher than the former studies. However, in a study done on an Indian population, despite invasive ductal breast carcinoma being the leading sub-type; the proportion was lower (58.7%) than other studies but with 19 of 126 (15.1%) being invasive lobular carcinoma (Rao et al., 2013) contrary to lower proportion of this study. In Ghana, 1.4% of the total breast cancer diagnosis represented lobular carcinoma (Mensah, Yarney, Nokoe, Opoku, & Clegg-Lamptey, 2016) which is closer to results of this study.

5.2.2 Molecular status of breast cancer

The majority (46.3 %) of the breast cancer cases did not have the hormone receptor status results in their health records. In regard to molecular status, among the 29 case patients with known HR/HER2 status, double positive (ER +ve & PR +ve) and triple negative breast (ER -ve/PR -ve/HER2 -ve) were the leading each with 37.9%. This is in contrast with a study done in US, where 72.7% of 36810 were found to be HR +ve/HER2 -ve as the majority with 12% unknown molecular status (Howlader et al., 2014). Determination of ER and progesterone receptor (PR) status of patients with breast carcinoma has become the standard practice (Rajan, Culas, & Jayalakshmy, 2014). However, not all breast cancer performs this immuno-histochemical test.

Regarding individual hormone receptor status, majority had progesterone receptor positive with 51% positivity while ER positivity was 44% (with 55.2% ER negative). This agrees with previous studies recording the majority of breast cancers in sub-Saharan Africa being estrogen-receptor negative (J. J. Kantelhardt et al., 2014). However, some other studies have shown ER positivity being relatively high, (above 60%), for example: a study on Estrogen receptor variants reported 64.7% ER positive (Groenendijk et al., 2019) and in Kenya, of all breast cancers, 68.8% were ER positive, 59.4% were PR positive, and 25.6% were HER2 positive (Sayed et al., 2018). In India, the prevalence of ER, PR and HER-2/neu expression were 36.5%, 31.7% and 2.4%, respectively which seems to be very unique than many other studies (Rao et al., 2013).

5.3 Association between death status and patient characteristics

Metastases (42.1%) and treatment response (42.6% had disease progression) showed statistically significant association with death using Fisher exact test with p= 0.04 and p<0.001 respectively. Metastasis was found in 42.6% of all breast cancers which was too far much higher compared to an Indian study where only 16.8% had distant metastasis at the time of presentation (Vidhya et al., 2019). In USA, between 1990 and 2014, 3.4% (27,418/819,647) of women diagnosed with invasive breast cancer had evidence of distant metastases at the time of diagnosis which was far much lower compared with this study. Both tumor characteristics and patient characteristics have been considered as prognostic factors of occurrence of death after a diagnosis of breast cancer (Lafourcade et al., 2018).

For the breast cancers that had metastasis, bones and lungs were the single organs that were highly affected with 13.0% each; multiple organ metastases were also encountered. This agrees with a study done in China on a total of 18,322 patients that reported bone-only metastasis as the leading organ (accounting for 39.80% of all patients), followed by lung metastasis (10.94%), as single organ metastasis and there were multiple organ metastases too (Wang et al., 2019). In Agha Khan, Kenya, fifty-eight percent of patients had metastases to bone, 14% to brain, 57% to lungs, and 50% to liver. Seventy-four percent of patients presented with more than one metastatic site (Ekpe, Shaikh, Shah, Jacobson, & Sayed, 2019).

In as much as young age at diagnosis has been associated with a worse clinical outcome (Lafourcade et al., 2018)**,** in this study, however, there was no association between death and age of the patients.

5.3 Survival analysis

Two-year breast cancer survival estimated by Kaplan-Meier was 64.8%. Similar results were reported in China, where the two-year overall survival for the whole study cohort of 2,384 breast cancer patients was 63% (Dawood et al., 2012). The results of this varied from a hospital-based study in western Amazon area in Brazil where the 2-year overall specific-survival was as high as 83.7% (Fujimoto, Koifman, & da Silva, 2019). A study in Vietnam recorded a declining overall survival rate over time from 94%, 83%, and 74% at 1, 3, and 5 years, respectively, following diagnosis of breast cancer (Lan et al., 2013). A metastatic Free Survival probability of 74% has been reported in Ethiopian women with breast cancer after 2 years (Kantelhardt et al., 2014).

The graph in Cox Proportional Hazard has a plot of Residuals against Time for Gender, Age, Laterality and Metastasis. In all the plots, is a straight line passing through a residual value of “zero” with a “zero” gradient indicating that the variables satisfy the PH assumptions and are thus time independent. The p value was 0.42. This compares with other studies done.

CHAPTER SIX: CONCLUSION AND RECOMMENDATION

6.0 Introduction

The presentation in this chapter summarizes the conclusion, drawing recommendations and further research areas.

6.1 Conclusion

The most affected age group was 40 to 49 years with invasive ductal carcinoma being the most common histological sub-type of breast cancer. Two-year survival rate among the study population was 64.8%. Metastases at diagnosis and disease progression increased the risk of death from breast cancer.

6.2 Recommendation

- This study recommends that there should be efficient role out of breast cancer prevention and screening programs targeting the middle-aged group (40 to 49 years).
- There should be targeted technology enhanced screening for early detection and treatment aimed at improving 2-year survival rate to above 65%.
- Timely efficacious evidence-based treatment should be provided to prevent disease progression.
- There should be additional research into using a bigger sample size to increase validity and reliability of the findings and should be conducted in multiple centers to reduce any bias.

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APPENDICES

Appendix 1: Study checklist

Read the appropriate instructions and ensure all the statements are completed correctly.

Demographic characteristics

Age group (tick appropriately)

a) 0-9 b) 10-19 c) 20-29 d) 30-39 e) 40-49 f) 50-59 g) 60-69

h) 70-79 i) 80 and above

Gender

a) Male

b) Female

Ethnicity

Write the appropriate ethnic group…….

Tumour information

Date of incidence (dd/mm/yyyy)

Indicate the specific date of tumour diagnosis..…../…..../……

Basis of diagnosis (tick appropriately)

a) Histology of the primary site

b) Histology of metastasis

c) Cytology

Morphology of the tumour

a) Invasive ductal carcinoma

b) Invasive lobular carcinoma

c) Ductal carcinoma in-situ

d) Breast lymphoma

e) Breast Sarcoma

Mechanism of cancer spread

a) Perineural invasion

b) Lymphovascular invasion

Laterality of the breast (tick appropriately)

a) Right

b) Left

c) Unknown

Any metastasis? (Tick appropriately)

a) Yes

b) No

Organ of metastasis

Write the specific organ of metastasis……

Date of the last contact (dd/mm/yyyy)

Indicate the specific date of last contact with the patient……/……./……..

Response to treatment

a) Partial response

b) Complete remission

c) Stable disease

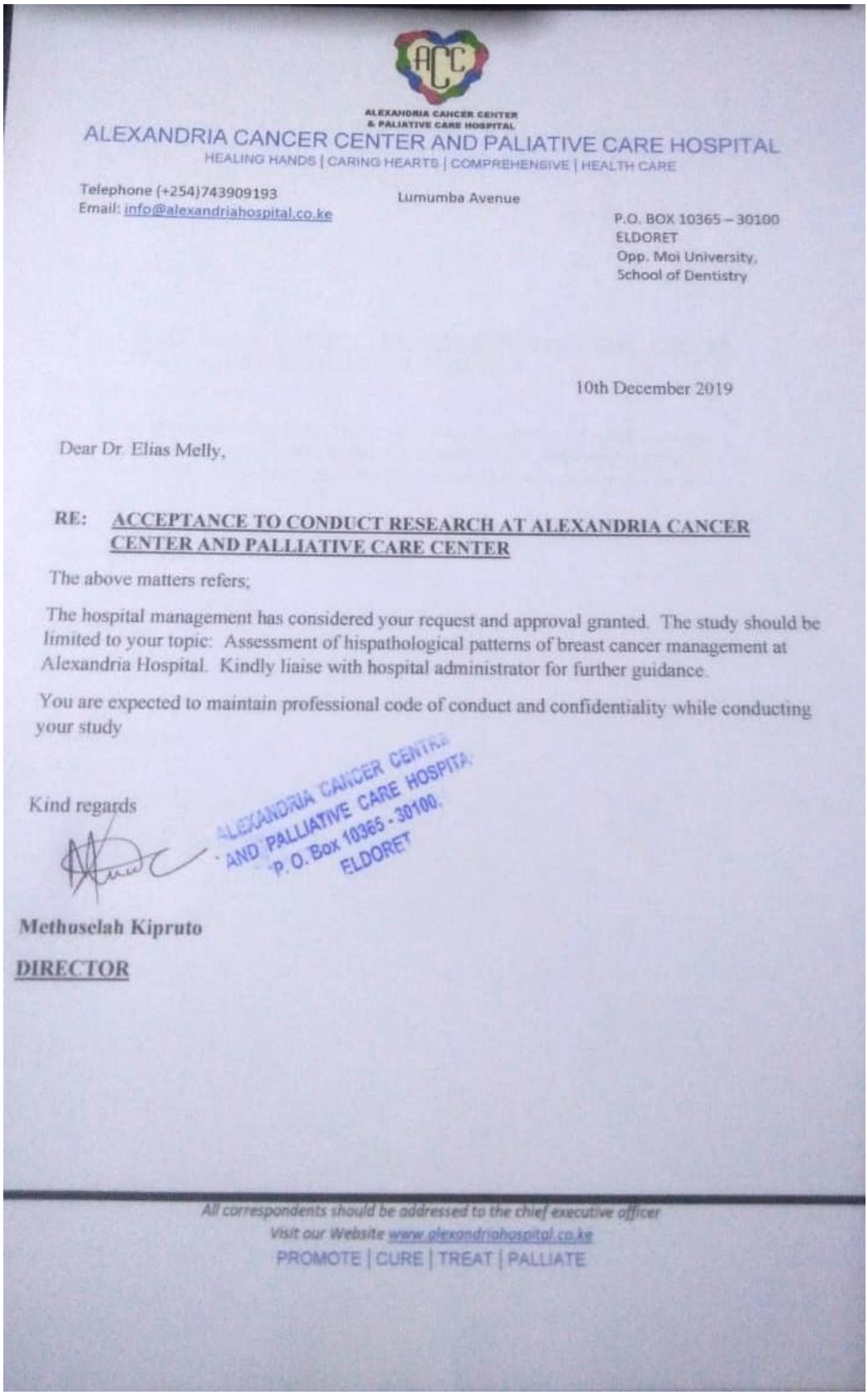
d) Progression

Status of the last contact (tick appropriately)

a) Alive

b) Dead

Appendix II: Approval to Conduct Research



ALEXANDRIA CANCER CENTER & PALIATIVE CARE HOSPITAL

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P.O. BOX 10365 – 30100
ELDORET
Opp. Moi University,
School of Dentistry

10th December 2019

Dear Dr. Elias Melly,

RE: ACCEPTANCE TO CONDUCT RESEARCH AT ALEXANDRIA CANCER CENTER AND PALLIATIVE CARE CENTER

The above matters refers;

The hospital management has considered your request and approval granted. The study should be limited to your topic: Assessment of hispathological patterns of breast cancer management at Alexandria Hospital. Kindly liaise with hospital administrator for further guidance.

You are expected to maintain professional code of conduct and confidentiality while conducting your study

Kind regards

ALEXANDRIA CANCER CENTRE AND PALLIATIVE CARE HOSPITAL P. O. Box 10365 - 30100, ELDORET

Methuselah Kipruto

DIRECTOR

All correspondents should be addressed to the chief executive officer
Visit our Website www.alexandriahospital.co.ke
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