SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA, LEGON

RISK FACTORS FOR BREAST CANCER AMONG WOMEN IN
FREETOWN, SIERRA LEONE.

BY

PHILIP PELEMA GEVAO

(10553225)

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LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT
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DEGREE

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DECLARATION

I, Philip Pelema Gevao hereby declare that apart from the references made to other people’s work which have been duly acknowledged, this work is the result of my own research work done under supervision and that this work has neither in whole nor part been presented to the University or elsewhere for another degree.

Date………………………...  Date…………………………...

Philip Pelema Gevao  Dr. Ernest Kenu  Dr. Alfred E. Yawson
(Student)  (Supervisor)  (Co-Supervisor)
DEDICATION

This work is dedicated to my late Mum, Agnes Kumba Satta Gevao, and my late Dad, Sahr F.M. Gevao for their support, care love and commitment to my life, teaching me to being kind, love and respect
ACKNOWLEDGEMENT

My sincere thanks go to God Almighty for enabling me to finish this course. My greatest thanks goes to Dr. Ernest Kenu, and Dr. Alfred E. Yawson my supervisors for their overwhelming support, ideas he shared with me, guidance, and encouragements he rendered to me which helped me to become better.

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Last, but not least, I would like to thank my brothers for their support and encouragement. My wife Patricia and Amarrah my lovely daughter for their unconditional love.
ABSTRACT

Background: Breast cancer is the most commonly diagnosed malignancy and an important cause of cancer death among females worldwide, it accounted for 25% (1.67 million) of the total new cancer cases diagnosed and the fifth cause of overall cancer deaths. Approximately half the breast cancer cases and 14.3% (324,000) of the deaths from cancer are attributed to breast cancer and are expected to occur in poor developing countries of the world (Ferlay et al., 2015). The main aim of this study was to assess risk factors associated with breast cancer among women screened for breast cancer in Freetown Sierra Leone.

Methods: This case control study, involved 116 Histopathologically confirmed breast cancer cases and 116 controls were recruited from women participating in breast cancer screening program at Well Woman and Thinking Pink Clinics in Freetown. Information on Socio-demographic, Reproductive and behavioral risk factors were collected from the two groups using a well-structured questionnaire. Analysis was carried using logistic regression to assess the associations between breast cancer and the risk factors.

Results: In the final multiple logistic regression, Educational level, (OR 0.09, 0.03-0.26, p= 0.001) Physical activity for more than 30 minutes per week (OR 0.52 (1.9-16.7, p=0.001) Cigarette smoking (OR 4.4, 1.2-18.5, p=0.023) and Family history of breast cancer (OR 9.9, 2.7-36.45, p=0.040) were identified as the most significant risk factors for breast cancer. This study did not find any statistically significant associations between reproductive risk factors and breast cancer.

Conclusion: This study showed that the possible risk factors for breast cancer among women in Sierra Leone include Educational level, Physical activity, cigarette smoking and Family history of breast cancer. This study therefore demonstrates that breast cancer in
Sierra Leone is associated with a number of but not all of the established risk factors in other regions of the world.

Keywords: breast cancer, socio-demographic risk factors, reproductive risk factors, behavioral risk factors
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AMC-</td>
<td>America Cancer Society</td>
</tr>
<tr>
<td>BMI –</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>BRCA –</td>
<td>Breast Cancer Susceptibility Genes</td>
</tr>
<tr>
<td>CDC –</td>
<td>Center for Disease Control</td>
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<tr>
<td>DNA –</td>
<td>Deoxyribonucleic Acid</td>
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<tr>
<td>FSH –</td>
<td>Follicular Stimulating Hormone</td>
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<tr>
<td>GLOBACAN –</td>
<td>Global Burden of Cancer Study</td>
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<tr>
<td>LH –</td>
<td>Luteinizing Hormone</td>
</tr>
<tr>
<td>SPSS –</td>
<td>Statistical Package Service</td>
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<tr>
<td>US Scan –</td>
<td>Ultra Sound Scan</td>
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<td>WHO –</td>
<td>World Health Organization</td>
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CHAPTER ONE

INTRODUCTION

1.1 Background

The breast serves as a very important function in a woman’s sexuality, and also serves as a symbol of beauty. Therefore, when a woman observes changes in her breast she becomes worried about the disfiguration and loss of sexual attractiveness, or even fear of death. According to GLOBACOM, “in 2012 breast cancer was diagnosed as the most common malignancy and one of the main cause of cancer death among females globally, it accounted for 25% (1.67 million) of the total new cancer cases diagnosed and the fifth cause of overall cancer deaths. Approximately half the breast cancer cases and 14.3% (324,000) of the deaths from cancer are attributed to breast cancer and are expected to occur in poor developing countries of the world”. In developing regions, Cancer of the breast remains the second leading mortality rate with 54% (198,000) after cancer of the lungs (Ferlay et al., 2015).

In most sub-Saharan African countries, there has been a change from cervical to breast cancer as the leading cancer cases diagnosed. Some of the reasons for this change may be due to rising in the occurrence of risk factors, and increased awareness and detection, which are related to the development and financial growth (Jemal et al., 2012). The most likely aetiology of breast cancer is uncertain however, research in Nigeria and globally have implicated a wide variety of factors like age, gender, heredity, reproductive, diet, anthropometric characteristics, psychological factors, and environmental factors as possible risk factors (Oladimeji et al., 2016).

In Africa, poverty accounts for the high death rates from breast cancer. Women present with breast cancer at a very late stage because of high cost and poor health care delivery
system. Women in Africa may have sought other forms of treatment before coming to hospital, and this probably explains why women in Africa present with breast cancer at advanced stage. However, in advanced countries where health delivery is free and breast cancer screening is done above 50 years increases the likelihood of detecting breast cancer at an early stage (Opeyemi, Jnr, & Rahman, 2012).

If detected early through recognized screening procedures can lead to breast cancer prevention and cure (Akigbe & Omuemu, 2009).

Breast cancer screening with mammogram is an effective method. This method accounts for a substantial reduction in the presentation of advanced stage breast cancer especially in developed countries. Low resourced countries are advocating for the mass use of cheaper, more widely available alternatives to mammography like Breast Self-Examination and US Scan for mass screening until such a time when they can afford mammograms (Galukande, 2010). There are no generally acceptable reasons for the features with the aim of differentiating this disease condition among those who have their origin from Africa. However, research have shown that in Africans cancer of the breast typically manifest with a very aggressive nature (Sighoko et al., 2010). Other recent reported studies support the opposing view that these features only reflect the late stage at diagnosis and the adverse effect of lack of awareness of the disease, unavailability of screening methods and some other epidemiologic risk factors (Adjei, 2012)

1.2 Problem Statement

In Sierra Leone, cancer of the breast is the second most common cancer after cervical cancer. It accounts for 14.13 deaths per 100,000 populations according to World Health Ranking (WHO, 2015). A Ten (10) Year mortality analysis on cancer among women in
Freetown Sierra Leone shows that out of 2.20% of overall cancer-related deaths, 24.12% was attributed to breast cancer. (Gevao, 2010).

Risk factors like early menarche, late menopause, parity, breast-feeding, sedentary lifestyle, alcohol, etc., have been documented for breast cancer among women in other part of the world (Aich et al., 2016) and some African studies (Jia et al., 2015. Huo et al., 2008). However, in Sierra Leone, there is no documented evidence on risk factors for breast cancer among women. Hence, the importance to assess these risks factors.

We can prevent breast cancer if modifiable risk factors like alcohol intake, cigarette smoking physical inactivity, oral contraceptive use, obesity, to name a few are avoided (American Cancer Society, 2015).

On the other hand, the ignorance of these risk factors for breast cancer among women in Sierra Leone of which most are preventable will continue if studies are not carried out to pinpoint them. This study will, therefore, focus on the risk factors for breast cancer among women in Sierra Leone in order to ensure informed decision making.
1.3 Conceptual framework for Breast Cancer Risk Factors.

Figure 1: Conceptual Framework for Breast Cancer Risk Factors

The conceptual framework above shows the various risk factors that independently affect breast cancer and the how some of the risk factors inter-relate. The factors were categorized into socio-demographic, reproductive and behavioral risk factors.
AGE- The probability of developing breast cancer increases with age. With aging, there is an increase in the levels of estrogen especially in obese post-menopausal. This increase, therefore, is as a result of the conversion of androgen to estrogen in fat cells.

FAMILY HISTORY/ GENETIC FACTORS-The influence of family history on breast cancer development will possibly be as a result of genetic predisposition especially in those with alterations in BRCA1 and BRCA2 genes. Breast cancer risk tends to be higher in those women who have a close blood relation previously diagnosed with breast cancer.

REPRODUCTIVE HISTORY – Breast cancer is more likely to develop among women who start their menses at a very early age in life, and those who stop to menstruate at late age compared to the other women in the general population. The risk of breast cancer is higher in these two groups of women because they are more exposed to prolong effect of estrogen produced during their reproductive life as compared to those who had late menarche or early menopause. Breast-feeding and age of first birth also run a lower chance for development breast cancer. Given birth early and breast-feeds have a lower risk of breast cancer than those who don’t. The risk of breast cancer is low among women with high parity than nulliparous women because multiparous women are less exposed to the pronged effect of reproductive hormones.

OBESITY AND PHYSICAL INACTIVITY- The breast cancer risk is increased among postmenopausal obese women. Women who are fat, and have reached menopause usually have high levels of estrogen in their blood because the excess fat produce more of estrogen. Exercise, especially in those who had early child birth, are protected against breast cancer for this same reason of fat breakdown.
TOBACCO SMOKING - Smoking cigarette increases the chance of breast cancer compared to those who don’t smoke because of the number of carcinogenic substances found in tobacco products.

ALCOHOL- Breast cancer risk possibly increases among those individuals who consume Alcoholic drinks, because alcohol causes alterations of the immune system and nutritional deficiencies, enhancing susceptibility to carcinogenesis. Alcohol impairs folate absorption, potentially limiting tissue folate stores. Folate deficiency may lead to deficiencies in the DNA repair process, thereby increasing the risk of malignancy.

ORAL CONTRACEPTIVES– Contraceptive use is believed to increase the possibility of developing cancer of the breast because it users provide more levels of hormones throughout ovulation than normal.

SOCIOECONOMIC STATUS- Higher socioeconomic status is associated with risk of breast cancer, and education is used as an indirect means of high social class. Women who are more educated tend to have fewer children, and also use contraceptive methods to prevent pregnancy culminating into increased risk for breast cancer. Socioeconomic status also has an influence on risk factors associated with life-style for breast cancer because women of higher socioeconomic status have fewer children, live a sedentary life style, and frequent use of oral contraceptives.

1.4 Justification
In European countries, health care is easy to get to and affordable, and the awareness of the female population on breast cancer is high. Screening of breast cancer is available and knowledge of the likely risk factors is well defined among its population.
In Africa, only a few studies have been carried out on risk factors for breast cancer, and most African Women present with breast cancer at an advanced stage. Some of the reasons for this may possibly be as a result of lack of exposure aimed at Mammographic screening, Health education, and poverty. Breast cancer can be prevented from occurring if risk factors that influence its development are identified and controlled. This can be achieved only through readily available screening facilities and other preventive and therapeutic measures for breast cancer. Secondly, to conduct research and identify the possible aetiologies for breast cancer which is yet to be done in Sierra Leone.

To address this issue, therefore, this study was carried out to identify risk factors for breast cancer among women in Sierra Leone. The information will also help to understand the interaction of these factors among women in Sierra Leone, where there are a limited research and insufficient knowledge about this disease. The findings of the study may help set guidelines for prevention, Diagnostic, and management plans for women living with breast cancer in Sierra Leone. Adequate data and information are needed to monitor breast cancer cases in Sierra Leone. The findings of this study will provide information to be included in the cancer registry that is to be setup by the government of Sierra Leone.

1.5 Hypothesis and Objectives

1.5.1 Hypothesis

1. H0: Socio-demographic risk factors for breast cancer do not differ among breast cancer cases and controls in Freetown

H1: Socio-demographic risk factors for breast cancer differ among breast cancer cases and controls in Freetown
2. H0: Reproductive risk factors do not differ among those having breast cancer and those who do not have breast cancer in Freetown

H1: Reproductive risk factors differ among those having breast cancer and those who do not have breast cancer in Freetown

3. H0: Behavioral risk factors for breast cancer do not differ among breast cancer cases and controls in Freetown

H1: Behavioral risk factors for breast cancer differ among breast cancer cases and controls in Freetown.

1.5.2. General Objective

To assess risk factors associated with breast cancer among women screened for breast cancer in Freetown Sierra Leone.

1.5.3. Specific Objectives

1. To assess the socio-demographic factors associated with breast cancer among women in Freetown

2. To determine the reproductive risk factors associated with breast cancer among women in Freetown

3. To determine Behavioral risk factors associated with breast cancer among women in Freetown
CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

According to GLOBOCAN ‘in 2012, 1.7 million women were diagnosed with breast cancer and there were 6.3 million women alive who had been diagnosed with breast cancer the previous five years. Breast cancer is the most frequently diagnosed cancer among women in 140 of 148 countries of the world, and the most common cause of death’ (Ferlay et al., 2013)

Even though the exact etiology of breast cancer is not fully known, however, a range of breast cancer risk factors have been recorded, along with; aging, oral contraceptive use, physical inactivity, too much consumption of alcohol, parity among others. Therefore, knowledge of these risk factors, and it consequences together with the need for every single female become conscious of observation on her breasts and the various ways in which to do it cannot be over stressed (Aich et al., 2016)

The segment of breast cancer cases attributable to life-style and environmental factors in the United Kingdom was estimated to be 26.8% in 2010, and available data shows that half of breast cancer cases are prevented by the appropriate use of preventive medicine. Therefore, the chances of breast cancer occurrence are reduced. Nonetheless, most important areas exist in the facts to find out breast cancer risk correctly, and the use of strategies to suitable targeted groups (Howell et al., 2014).

In view of the huge diversity of the African continent in terms of customs and genetic background, socio-economic development and health system status, values and behavior, and a lot of other areas, it is difficult to talk about breast cancer in Africa in general.
Therefore, it is important for each country in Africa to setup and maintains a fully functioning breast cancer screening control program (Kantelhardt et al., 2015).

2.2. Socio-Demographic Risk Factors

2.2.1. Age

Breast cancer is a condition that is attributed to increasing age. Only about 5-7% of cases of this condition among Europeans are diagnosed under the age of 40 years, unlike Africa in which a higher proportion of patients as high as 20% are diagnosed below 40 years (H. A. A. Jr & Partridge, 2014). It is known that for every ten years the risk for breast cancer doubles until menopause when it declines, and Age is considered as one of the leading cause of breast cancer (Nazir et al., 2015).

The presentation of breast cancer is usually early among Blacks living in U.S.A compared to Caucasian women with a mean age at presentation of 54 as opposed to 61 years (D. N. D. Jr, 2013). Studies done on breast cancer in Kumasi, Ghana show that majority of patients who were diagnosed were younger with a peak age of between 40-49 years (Adjei, 2012).

Breast cancer usually presents among Asians around 40-50 years as opposed to western countries between 60-70 years (Wani et al., 2014).

2.2.2. Socioeconomic factors

Higher education level serves as a very important constituent, and an indirect reflection of socioeconomic status. Education tends to have an influence on breast cancer because women who are educated have fewer children, late age at child birth and utilize family planning methods (Hussain et al., 2008).
The occurrence of this disease condition is high among those with higher socioeconomic status compared to those of lower status. In addition, this relationship could be due to predispose factors like low birth rate, and late age at first birth among women of higher socioeconomic status (Julie et al., 2012). Death rates from breast cancer have been shown to be higher among poorer countries compared developed countries due to socioeconomic disparities (Ward et al., 2010).

2.3. Reproductive Risk Factors

2.3.1. Family history of breast

Hereditary factors possibly will contribute in affecting some proportion of early onset breast cancer in different part around the globe; however, the role of hereditary factors cannot by itself be the sole reason for universal differences in risk. In the UK, about 3% of all cases of breast cancer are due to mutations in BRCA1 or BRCA2 genes (Assi et al., 2008). Breast cancer susceptibility genes 1 and 2 are tumor suppressor genes, and alterations in these genes have been to cause breast cancer.

Studies done in Sweden, showed alterations in the BRCA genes were seen more among cases with a close relative with cancer of the breast, as oppose to those with no positive family history (Opeyemi et al., 2012). The possibility of developing breast cancer is greater among females with a history of a close family member who have suffered from breast cancer before. This risk is even worse if the relative had the disease before age 50 years (Ponirovskaya, 2000).

A population-based study carried out on young women in the USA also showed that women with first and second-degree relative family history of breast cancer had a higher proportion of breast cancer (60.7% and 61.1%) respectively compared to those with no
family history who reported with lower proportion of (55.1%) (Malone et al., 2012). A Case control study of risk factors associated with family history of breast cancer carried out in Pakistan did not find any association between risk of breast cancer and family history (Nazir et al., 2015).

2.3.2. Age at Menarche

Menarche marks the beginning of menstruation and is a normal physiological process that occurs in females at regular intervals each month. However, the first menstrual periods usually are very light and irregular. Menstruation normally commences around age 12 years although in some it can occur as early as 9 years or delay until 15 years. Breast cancer runs a risk by every year younger at menses, and the reverse is true for every one age older at menopause (Hamajima et al., 2012).

A cohort study carried out over a period of 10 years in the USA from 1993-1996 and 2004/2005 to determine the link between risk factors for breast cancer and hormone receptors showed that experiencing delayed menarche was significantly related to reduced risk of estrogen and progesterone positive breast cancer. However, those who reach menarche early by 12 years had a higher risk. Approximately 18% reduction in risk was also observed for estrogen and progesterone positive tumors among women who start menstruating above 15years (Setiawan et al., 2009).

Case Control study done in Morocco showed that females who start menstruation early had an increase in odds of developing breast cancer, as oppose those who menstruate at a late age. This relationship was significant and observed among the age group 22 and 34 years (Laamiri et al., 2015). Another study done in China, however, disagrees with the claim that breast cancer incidence increases with decreasing age at menarche. The findings of this study suggest that there was an increased in the proportion of Progesterone positive
cancers among patients whose menarche was ≥15 years as oppose to those above <15 years (Jia et al., 2015).

2.3.3. Breastfeeding

The duration of breast feeding determines the risk of breast cancer. Breast feeding has been shown to have lesser odds among those women with more than 3 children who breastfeed (Kobayashi & Sugiura, 2012). Studies in Eastern India comprising of 1,463 cases and 1,440 healthy controls showed that 88.1% of participants had breastfed, and this association was significant compared to control population 90.6%, and the odds of breast cancer was higher among women who had not breastfed their children (Aich et al., 2016). Another study done in North India found out a significant decrease in the number of breast cancer cases among those who breastfeed for prolong periods (Babita et al., 2014). Prospective cohort study carried out in Sweden found out that risk of breast cancer was not related to the duration of breast feeding (Butt et al., 2014). In Nigeria another case-control study conducted shows risk of developing breast cancer to be reduced by 5% per each additional birth after the first birth and by 7% per 12 months of breastfeeding (Huo et al., 2008).

2.3.4. Age at first child-birth

Evidence available from case-control studies carried out in the world showed that women who give birth before 20 years are 50 times less likely of developing breast cancer. Furthermore, those who had their first child after age 35 were 22 % increased odds of breast cancer (Kobayashi & Sugiura, 2012).

A prospective hospital-based study conducted in Kashmir India among 132 breast cancer cases revealed that the incidence of breast cancer increases with increase in age at first live birth. There was an increased risk of breast cancer among those who gave birth after 30 years when compared to those who were below 18 years (Wani et al., 2014). However, a
study conducted in Iran did not find an independent relationship between age at first child birth and breast cancer (Ghiasvand et al., 2012).

2.3.5. Age at menopause

It is generally defined when there is cessation of menstrual flow for a successive period of 12 months, and the average for menopause to occur in a woman is around 51 years though there is wide variation. The record shows that most women reach their natural menopause between the ages of 45 and 54 years (Hamajima et al., 2012).

Scientists have shown that women who reach menopause before the age of 45 years have a risk reduction by 50% compared to women who continue menstruating around 55 years and above (Kapil et al., 2014).

Case-control study conducted in Pakistan showed that menopause above 50 years was associated with breast cancer (Nazir et al., 2015). A 10- years nationwide multicenter cross-sectional study carried out in China showed that late age at menopause was significantly associated with breast cancer (Lee et al., 2014).

2.3.6. Oral contraceptive use

Oral contraceptives are drugs which prevent pregnancy from occurring. They are usually a combination of the hormone estrogen and progestin or in some cases progestin alone. This combination, when taken, is capable of preventing pregnancy by inhibiting the release of the hormones luteinizing hormone (LH) and follicular stimulating hormone (FSH) from the pituitary glands.

A case-control study conducted in the Morocco suggested that oral contraceptive use above 6 months is linked with breast cancer. Findings further noted that the widespread use of contraceptive at a very late age in life leads to a significant increase in the development of cancer of the breast (Laamiri et al., 2015). A large cohort study conducted from 1968-
2004 on oral contraceptive use and cancer in the UK did not show a significant relationship between the incidence of breast cancer and duration of oral contraceptive use (Vessey & Painter, 2006). According to the American cancer society use of contraceptive drugs is not a risk for breast cancer based on twenty three (23) articles they reviewed. In order to ascertain the effect of these drugs and the risk of breast cancer they concluded that more studies need to be carried out. (American Cancer Society, 2015).

2.3.7. PARITY

The risk of breast cancer is higher in women with no children or those having children very late in life, Therefore, giving birth at a younger age and giving birth to many children is associated with reduced risk for breast cancer (American Cancer Society, 2015). Studies done in Iran revealed that multiparous women had a very strong protective factor for breast cancer when compared with nulliparous women (Ghiasvand et al., 2012). Similar studies carried out in Nigeria observed a 19% reduction in risk for breast cancer among women giving birth for the first time. However, the transient increase after the first birth as reported by other studies was not seen. Furthermore, this study found a 5% reduced risk for each additional birth after the first birth (Huo et al., 2008)

2.4. Behavioral Risk Factors

2.4.1. Consumption of Alcohol

Alcohol according to “the international agency for research on cancer considers it to be causally related to the risk of breast cancer, with a 7-10% increase in risk for each 10g of alcohol consumed by a woman”(Liu & Nguyen, 2015). Alcohol intake increase breast cancer risk in a dose-dependent fashion; this risk is increased on daily basis for each alcoholic drink consumed by roughly 10%. A drink is defined as 12 ounces of beer or 5 ounces of wine. The possibility of Breast cancer risk remains the same irrespective of the
kind of alcoholic drink consumed (Amy w Wong, Jina Hong, 2010). Alcohol drinking defined as consuming at least one alcoholic drink every week continuously for a period of six months or above was used in a study to find out the breast cancer risk among women in Africa. The findings in this study showed a strong association between breast cancer and alcohol use (Qian et al., 2014). In a similar study conducted among women of African descend showed a negative association between alcohol consumption and risk for breast cancer. This study further evaluated the effect of new, light, and lifetime alcohol use and the probability having breast cancer (Chandran et al., 2013). A case-control study of breast cancer risk factors among nulliparous women by (Fioretti et al., 1999) showed no obvious association between the quantity of alcohol and the risk of breast cancer. However, no significant elevation was seen among postmenopausal women.

2.4.2. Tobacco

Tobacco smoking is believed to be implicates as one of the cause for breast cancer because of carcinogenic substances found in tobacco, and being protective as a result of its anti-estrogenic effects. Nevertheless, results from different studies remain to be debatable, with no clear evidence of breast cancer and tobacco use.

In 2009, “the International Agency for Research on Cancer decided that there was limited evidence of a positive association between active smoking and breast cancer risk” (McKenzie et al., 2013). In that same year, “the Canadian Expert Panel on Tobacco Smoke and Breast Cancer Risk established the fact that there was a relationship between smoking and breast cancer” (McKenzie et al., 2013). Among women who smoke, the anti-estrogenic effect of smoking has been shown to an increased risk of osteoporosis, an early age at and natural age at menopause. The course and extent of the general relationship between cigarette smoking and breast cancer possibly will vary according to the hormonal profile and other characteristics of the study population (Michels, 2012).
In the USA, prospective cohort study showed that the status of smoking was absolutely linked with risk for breast cancer; conversely, there was no dose–response effect. (Nyante et al., 2014). A large prospective cohort study found out that beginning smoking before menopause and mainly before first childbirth had a lesser effect on the risk of breast cancer (Michels, 2012).

2.4.3. Obesity

Obesity and overweight is usually measured by using Body mass index (BMI). A body mass index is a number that gives a true reflection on height and weight, and generally the higher the BMI the fatter the person is. It is used as a screening tool, and to categorize different weight groups in adults. Men and women are grouped using the same criteria. The Center for Disease Control (CDC) Defines “Underweight: BMI is less than 18.5kg/m2, Normal weight: BMI is 18.5 - 24.9kg/m2, Overweight: BMI is 25 - 29.9kg/m2, and Obese: BMI is 30kg/m2 or more. Using the metric, BMI is determined by weight in kilograms (kg) divided by height in meters, squared” (Loi et al., 2005).

Women who have reached menopause and are Overweight have a greater chance of developing breast cancer as oppose to those with normal weight, however, among premenopausal women, obese women have a decrease breast cancer risk. The assumption that women who are postmenopausal and obese are having greater risk for breast cancer is due to the fact that after menopause the main source of hormones derived from estrogen is from fat cells. However, the reduced risk seen among obese premenopausal women is not fully understood although it has been attributed to anovulatory menstrual periods, and another mechanism is that the clearance of estrogenic compounds by the liver is very high among obese young women (Palmer er al., 2007).
In India, studies on relationship of overweight and obesity with breast cancer saw a 13.4% of cases and 6.6% of the controls to be obese, and this increase in odds was also associated with increasing levels of Body mass index (Singh et al., 2011). The Iranian showed a very strong association between breast cancer among women who have past menopause and BMI. The association was found among older women above 58 years when analysis was done by stratification (Ghiasvand et al., 2012).

2.2.4. Physical Inactivity

Women who are physically active and do physical activity regularly have a decrease risk of 10%-25% for breast cancer compared to those who are not active, and strong evidence shows that post-menopausal women who are physically active to have a lesser risk for breast cancer than premenopausal women.

An American Cancer Society study that included “more than 73,000 post-menopausal women found that breast cancer risk was 14% lower among women who reported walking 7 or more hours per week compared to women who walked 3 or fewer hours per week’ (American Cancer Society, 2015). In Iraqi studies show that there is a very strong association between physical inactivity and breast cancer risk(Isa, 2013). Another study in Nigeria showed that majority of those with breast cancer had little or no exercise both present or in the past (Oladimeji et al., 2016).

Cohort study carried out in Norway showed that there was link between physical activity level and post-menopausal breast cancer in general. However, there was an increased risk of postmenopausal breast cancer amongst those women who change their physical activity pattern from inactive to active between age 14 and age 30. In addition, the reverse was true for those who changed from inactive to active, because there was a decrease in risk among breast cancer cases who were active. It was further observed that women who had very
low physical activity at the age of 30 years had an increased risk of breast cancer when compared to those who had moderate physical activity at the same age. This study also saw a significant 20% reduction in cases of breast cancer among postmenopausal women whose physical activity levels at age 14 were low, and continued to be low throughout adult life, compared to those at age 14 had a moderate lifestyle and continued throughout adulthood. These findings were found to be very inconsistent. The conclusion from this study was there was no consistent significant relationship between breast cancer and levels of physical activity.(Borch et al., 2014)
CHAPTER THREE

METHODS

3.1 Study design

The research adopted an unmatched case-control study using quantitative research methods between January and July 2017. Anthropometric measurements (weight and height) of both cases and controls were carried out.

3.2 Study site

The study was conducted in Freetown, the capital city of Sierra Leone. The town comprises of all the ethnic groups in Sierra Leone and the main ethnic groups are mainly the Mende, Temne, Limba, and Creole. During the civil war in the 1990’s which engulfed the country, many people migrated towards the capital to seek for greener pastures leading to a significant population increase. Freetown is made up of Western Area Urban and Western area rural. The 2016 population and housing provisional census result estimate the population of Freetown to be 1,493,252 inhabitants, of which 1,050,301 inhabitants are in Western Area Urban and 442,951 in Western area rural (NS, 2016). The population of Freetown has increased almost ten folds since Sierra Leone gained independence in 1961. The study was conducted in two breast cancer screening medical facilities. These were Well Woman clinic located at number 9b Murray town road and Thinking pink clinic of number 11 Percival Street, Freetown, Sierra Leone. These facilities are the two largest medical facilities screening and managing cases of presently in Freetown. Data along with report available at the cancer treatment unit indicated that, on the average, between 100-150 and 30-50 patients are seen at these two clinics for various conditions and most cases of breast cancer in Sierra Leone are detected here. Based on the number of patients
screened, there are more cases of screening for breast cancer at Well woman clinic center compared to thinking pink clinic.

Figure 2: Map of Freetown

3.3 Variables

3.3.1 Outcome variable

The dependent variable is breast cancer
### 3.3.2 Independent Variable

#### Table 1a: Independent Variables

<table>
<thead>
<tr>
<th>Socio-demographic factors</th>
<th>Behavioral risk factors</th>
<th>Reproductive risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Age</td>
<td>- Alcohol consumption</td>
<td>- Age at menarche</td>
</tr>
<tr>
<td>- Education</td>
<td>- Tobacco smoking</td>
<td>- Age at menopause</td>
</tr>
<tr>
<td>- Marital Status</td>
<td>- Physical activity</td>
<td>- Age at first birth</td>
</tr>
<tr>
<td>- Income level</td>
<td>- Obesity</td>
<td>- parity</td>
</tr>
<tr>
<td>- Occupation</td>
<td></td>
<td>- Oral contraceptive use</td>
</tr>
</tbody>
</table>

#### Table 1b: Operational Definitions of the Socio-demographic Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Operational Definition</th>
<th>Scale of Measurement</th>
<th>Source of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of Woman</td>
<td>Age of woman at last birthday</td>
<td>Continuous- in years</td>
<td>Interview</td>
</tr>
<tr>
<td>Income level</td>
<td>Mother’s income level</td>
<td>Continuous</td>
<td>Interview</td>
</tr>
<tr>
<td>Occupation</td>
<td>Woman’s Occupation</td>
<td>Nominal</td>
<td>Interview</td>
</tr>
<tr>
<td>Marital Status</td>
<td>woman’s marital status</td>
<td>Nominal</td>
<td>Interview</td>
</tr>
<tr>
<td>Educational level</td>
<td>Highest formal education</td>
<td>Ordinal</td>
<td>Interview</td>
</tr>
</tbody>
</table>
Table 1c: Operational Definition of Reproductive Risk Factors for Breast Cancer

<table>
<thead>
<tr>
<th>Variable</th>
<th>Operational Definition</th>
<th>Scale of Measurement</th>
<th>Source of Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menarche</td>
<td>Age at Menstruation</td>
<td>Continuous-in Years</td>
<td>Interview</td>
</tr>
<tr>
<td>Menopause</td>
<td>Age at Menopause</td>
<td>Continuous-in Years</td>
<td>Interview</td>
</tr>
<tr>
<td>Parity</td>
<td>Do you have Children</td>
<td></td>
<td>Interview</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contraceptive use</td>
<td>History of contraceptive use</td>
<td>Binary</td>
<td>Interview</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast feeding</td>
<td>Mothers breastfeeding history</td>
<td>Binary</td>
<td>Interview</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family history of breast cancer</td>
<td>Women’s family history of breast cancer</td>
<td>Binary</td>
<td>Interview</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1d: Operational Definition of Behavioral Risk Factors for Breast Cancer

<table>
<thead>
<tr>
<th>Variable</th>
<th>Operational Definition</th>
<th>Scale of Measurement</th>
<th>Source of Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol consumption</td>
<td>Women’s history of alcohol consumption</td>
<td>Binary Yes/No</td>
<td>Interview</td>
</tr>
<tr>
<td>Tobacco smoking</td>
<td>Tobacco use</td>
<td>Binary Yes/No</td>
<td>Interview</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>Moderate activity</td>
<td>Binary Yes/No</td>
<td>Interview</td>
</tr>
<tr>
<td></td>
<td>intense</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>Weight and Height</td>
<td>Continuous</td>
<td>Measurement</td>
</tr>
</tbody>
</table>
3.4 Sampling

3.4.1 Study population

The study population was all women between the ages of 20-70 years who were attending the Well Woman Clinic and Thinking Pink screening center in Freetown from January 2012 to December 2016.

Definitions

Case: Case was defined as a woman living in Freetown attending either Well Woman or Thinking pink clinic from January 2012 to December 2016 between 20-70 years who had undergone screening for breast cancer with confirmed histopathology for breast cancer.

Control: Control was defined as females between 20-70 years residing in Freetown attending Well Woman and Thinking Pink clinics respectively for breast cancer screening and showed to be free from the disease after screening with the mammogram during the period January 2012 to December 2016.

3.4.2 Exclusion criteria

Cases and Controls, not residing in Freetown.

Immobile, unconscious, and disoriented patients were excluded from control selection.

3.4.3 Sample Size Determination

To estimate the sample size for this study, stat calculator in Epi info version 7 was used. A sample size of (n) 116 breast cancer cases was calculated. It is assumed that 9% of the study population are exposed to tobacco smoking (SDHS Survey, 2013). A detection of an odd ratio of 3 with a power of 80% is to be achieved with a 95% confidence level (5% significance). A ratio of 1:1 cases and controls were factored in. Since the prevalence of a number of the known risk factors for breast cancer, such as age at menarche, were not
available and prevalence of most risk factors for breast cancer has not been documented in Sierra Leone, the figure used as the least exposure prevalence was smoking, which was derived from the Sierra Leone Demographic Health Survey, 2013. For this study, a total of 116 cases and 116 controls were used.

### 3.4.4 Sampling Procedure

This study was carried out in two breast cancer screening centers in Freetown and patients with histopathologically breast cancer-positive cases were identified using five-year data records for breast cancer between the period January 2012- December 2016 from the records books of the two screening centers. A simple random sampling technique was used to identify cases for this study. All histopathologically confirmed breast cancer cases in the record books at Well Woman and Thinking Pink clinics from January 2012- December 2016 respectively were merged and there were a total number of 292 cumulative participants. However, after excluding those who were dead and those that could not be reached by phone calls, saw a reduction in the number of available breast cancer cases for interview to 200 participants, of which 120 were from Well Woman Clinic and 80 participants from Thinking Pink Clinic respectively. Around 60%(70) cases were selected from Well Woman Clinic and 40%(46) cases from Well Woman Clinic. These 200 cases were then numbered from 1-120 at Well Woman Clinic and 1-80 at Thinking Pink Clinic. A total of 116 random numbers were generated using Stat Trek’s random number generator. The sample size of 116 positive breast cancer cases were then selected and interviewed with the aid of the random numbers generated. The contact information such as their telephone numbers, house addresses in the record books was identified. A follow-up visit was then made to their houses for the administration of the questionnaire.

Controls were selected among women attending the Well Woman and Thinking Pink clinics in Freetown for breast cancer screening. Approximately 60% (70) of the sample
size population for controls were selected from a number of participants at Well woman clinic and 40% (46) were selected from thinking pink clinic. This is as a result of the differences in a number of patients screened at the two breast cancer screening facilities and the number of cases reported per year. Systematic random sampling method was used for control selection. Since the desired sample size for controls was 116 participants, a list was obtained from both Well Woman and Thinking Pink Clinics bearing names of women screened from January 2012-December 2016 for breast cancer and were free from the disease. A fixed starting point was selected randomly from each list, and sample intervals were obtained by dividing the total breast cancer cases by the desired sample size at Well Woman and Thinking Pink Clinics. The values obtained from the sample intervals were used to facilitate the subsequent selection of participants starting from the fixed starting point that was randomly selected. This technique was used to select 70 and 46 participants from Well woman clinic and Thinking pink clinic respectively.

### 3.5 Data collection Technique and tools

#### 3.5.1 Ethical considerations

Ethical clearance was obtained from the Government of Sierra Leone Ethics and Scientific Review Committee. A formal permission was sought from the in-charge of both Well Woman and Thinking Pink Clinics. Consent was sought from all the study participants. The potential risk of the study was the participant’s time and privacy. Potential study participants were made to understand that participation in the study was entirely voluntary. Their decision not to enter the study, failure to answer any question or termination of the interview was fully respected and considered by the principal investigator. Information provided for this study was handled with strict confidentiality. The information was used purely for research purposes and will never be used against the participants. Data analysis
was done at the aggregate level to ensure anonymity. Participants name or personally identifying information were captured on the questionnaire and hence will not in any way lead to publication in the report. The Principal Investigator and supervisor reviewed the research records, but no unauthorized individual(s) were able to access the information.

3.5.2 Anthropometric measurement (weight and height)

Weight measurements were determined using a portable electronic (Secarobusta 813 extra-large digital reading) weighing scale calibrated to 0.1 kg and measures up to 150 kg. Weight measurement was carried out in a private room. The client was asked to remove any heavy items from their pocket (Keys, Wallet, Phones etc.), and any items of clothing (Chains, Belts, Shoes Jackets etc.). During the process of weighing the scale was brought to Zero before the client steps on it. The person was asked to stand in the middle of the scale with bare feet slightly apart and looking straight ahead to ensure even weight distribution. The person remained still until the weight appeared on the record and weight measured to the nearest 0.1 kg.

The height measurement procedure was carried out by asking the patient to stand against a wall and a point was marked at the top of the persons head and measured using a tape measure in centimeters up to it. During the measurement, the patient was asked to remove their shoes and stand with their back to the wall. The back of their feet, upper back, and back of the head should be in direct contact with the wall with patient looking directly forward. A point was marked at the top of the patients head on the wall and a tape measure was used to measure their height and recorded in centimeters.
3.5.3 Data Collection

A quantitative data collection approach using an adapted standardized questionnaire from the WHO Stepwise Approach to chronic disease risk factor surveillance (STEPS) was designed and used for the data collection. The questionnaire was well structured and used. The questionnaires were pretested at 34 Military hospital in Freetown for reliability and efficiency before actual data collection was done. To gather the quantitative data from the selected participants, the researcher after getting approved consent from the participants then administered the questionnaire to them one at a time, face to face and in their preferred language. The questionnaire was used to seek relevant information to address the specific objectives of the study.

3.5.4 Quality assurance and control

Proper quality assurance procedures and precautions were taken to ensure the reliability and validity of the data. The researcher selected two research assistants that had public health background and gave them adequate training. The content of the training involved; the purpose and objectives of the study, data collection techniques and tools to be used, translation of questionnaires into various local languages, data collection ethical guidelines. The principal investigator was part of the team during the interviews to ensure that relevant information in line with the objectives of the study is collected. The questionnaires were checked for mistakes and completeness before final entry into appropriate software for statistical analysis. Errors and omissions detected were discussed with the respective assistants and asked to go back and make the necessary corrections. All the data collected were entered twice by two different qualified biostatisticians to ensure reliability and validity of the results.
3.5.5 Data processing and Analysis

The raw data was entered into a Microsoft excel spreadsheet windows 8. The data was cleaned, coded and imported into STATA software version 14 for statistical analysis. Continuous variables were analyzed as descriptive statistics and results presented as Mean ±SD. Categorical variables were presented as percentages with 95% confidence intervals (CI). The results were presented using tables and graph. Bivariate logistic regression analysis was conducted to determine the association between breast cancer (dependent) and the risk factors (independent variable). Odds ratio (OR) was computed and statistical significance was accepted at P≤0.05. Variables found to be statically significant at the bivariate analysis was entered into multiple logistic regression for statistical significance. Anthropometric data such as weight and height were determined using means and standard deviations.
CHAPTER FOUR

RESULTS

4.1 Demographic characteristics of respondents

The study included a total population of 232 respondents comprising of 116 breast cancer cases and 116 controls. Majority of the controls were between the ages of 20-49yrs whilst the cases were between 30-59yrs. The mean age of cases and controls were 30.0±10.3 and 36.7±11.8 respectively. The ages of cases and controls is shown in Figure 4.1

Figure 4.1 Age group distribution of cases and controls

Regards to the level of education, 69.8 %( 81/116) cases and 95.7 %( 111/116) controls had some formal education whilst 30.2 %( 35/116) cases and 4.3 %( 5/116) controls had no formal education. 56.9 %( 66/116) cases and 58.6% (68/116) controls were married whilst 43.1 %( 50/116) cases and 41.4 %( 48/116) controls were single. Participants that were divorced or widowed at the time of the study were classified as single for the purpose of this study. Concerning employment status of participants, 72.4% (84/116) cases and 83.6 % (97/116) controls were employed and engaged in various activities whilst 27.6 %( 32/116) cases and 16.4 %( 19/116) controls were unemployed (Table 4.1)
Table 4.1 Demographic characteristics of study participants

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cases (N=116)</th>
<th>Controls (N=116)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency (%)</td>
<td>Frequency (%)</td>
</tr>
<tr>
<td>Level of Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>35 (30.2)</td>
<td>5 (4.3)</td>
</tr>
<tr>
<td>Some formal education</td>
<td>81 (69.4)</td>
<td>111 (95.0)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>66 (56.9)</td>
<td>68 (58.6)</td>
</tr>
<tr>
<td>Single</td>
<td>50 (43.1)</td>
<td>48 (41.4)</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>84 (72.4)</td>
<td>97 (83.6)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>32 (27.6)</td>
<td>19 (16.4)</td>
</tr>
</tbody>
</table>

4.2 Demographic characteristics among study participants

4.2.1 Educational Status

The results revealed that 69.8% (81/116) of cases and 95.7 (111/116) % controls had some formal education whist 30.2% (35/116) cases and 4.3% (5/116) controls have no formal education. Women who had some formal education were 89% smaller odds of developing breast cancer compared to women with no formal education. This implies that participants with some level of education were protected against the development of breast cancer and was statistically significant at 95% confidence level (cOR, 0.11 [95 % CI, 0.031-0.29] (P<0.001) (Table 4.2).
4.2.2 Marital Status

The marital status of cases and controls were classified as either single or married. Participants who were single, separated or divorced were classified and grouped as single. Participants engaged in co-habitation or common law marriages were classified as married. The results revealed that 56.9 % (66/116) cases and 58.6 % (68/116) controls were married whilst 43.1 % (50/116) cases and 41.4 % (48/116) controls were single. Those women who were married had 7% smaller odds of developing breast cancer compared to women who were single. However, this result was not significant at 95% confidence level (cOR, 0.93 [95 % CI, 0.54-1.62], P=0.791).

4.3.3 Employment Status

A participant in the study was classified as employed if engaged in either skilled or unskilled labour. The results revealed that 72.4 % (84/116) cases and 83.6 % (97/116) controls were employed whilst 27.6 % (32/116) cases and 16.4 % (19/116) controls were unemployed. Those women who were employed had 49% lower odds of developing breast cancer compared to those women who were unemployed. This result indicates that participants who are employed were protected against the development of breast cancer though this result was not statistically significant at 95% confidence level (P=0.039), OR=0.51(95%CI 0.26-1.02) (Table 4.2)
Table 4.2 Bivariate analysis of demographic characteristics among study participants

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>Breast Cancer Cases</th>
<th>Controls</th>
<th>cOR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Had formal education</td>
<td>81(69.8)</td>
<td>110(95.6)</td>
<td>0.11 (0.03-0.29)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No formal Education</td>
<td>35(30.2)</td>
<td>5(4.4)</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Breast Cancer Cases</th>
<th>Controls</th>
<th>cOR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>66(56.9)</td>
<td>68(58.6)</td>
<td>0.93 (0.54-1.62)</td>
<td>0.791</td>
</tr>
<tr>
<td>Single</td>
<td>50(43.1)</td>
<td>48(41.4)</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Employment status</th>
<th>Breast Cancer Cases</th>
<th>Controls</th>
<th>cOR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>84(72.4)</td>
<td>97(83.6)</td>
<td>0.51 (0.26-1.02)</td>
<td>0.039</td>
</tr>
<tr>
<td>Unemployed</td>
<td>32(27.6)</td>
<td>19(16.4)</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

*Significant (P≤0.05)

4.3 Reproductive risk factors

4.3.1 Age at Menarche

The age at which participants have their first menstruation of cases and controls were classified as either early menarche (≤13yrs) or late menarche (>13yrs). Out of 232 participants, 1 value of cases and 2 values of controls were missing. The results showed that 43.5 % (50/116) cases and 50.0 % (57/116) controls had early menarche whilst 56.5 % (65/116) cases and 50.0 % (57/116) controls had late menarche. This is an indication that most cases had late menarche compared to controls. Women who had late menarche were 23% smaller odds of developing breast cancer compared to women who had early menarche. Women who had late menarche (>13yrs) were protected for the development of breast cancer in the bivariate logistic regression (cOR=0.77, 95% CI (0.44, 1.34) (Table 4.3). This finding is not statistically significant at 95% confidence level (P=0.323),

4.3.2 Age at Menopause

The results showed that 50 cases and 15 controls out of 232 participants were menopausal. The age at which participants reach menopause for both cases and controls were classified as either early menopause (≤50yrs) or late menopause (>50yrs).28 % (14/116) cases and
20%(3/116) controls were late menopausal (>50yrs) whilst 72%(36/116) cases and 80%
(12/116) controls were early menopausal (≤50yrs). Women who were late menopausal
had higher odds of developing breast cancer compared to those with early menopausal.
This results indicated that participants with late menopausal status were about 1.6 times
more likely to develop breast cancer compared to those with early menopausal status
(OR=1.56 (95% CI 0.34, 9.81)(Table 4.3), though not statistically significant at 95%
confidence level (P=0.536)

4.3.3 Age at First Full Term Pregnancy (First birth)

Age at first full term pregnancy was classified into two groups; 15 to 25 years and 25 years
and above. Ten (10) cases and 37 controls out of 232 participants had never had full term
pregnancy at the time of the study. Cases and controls representing 16.0%(17/116) and
22.5%(18/116) respectively had their first full term pregnancy when they were 26 years
or older whilst 84%(89/116) cases and 87.5%(70/116) controls had their full term
pregnancy between age 15 to 25 years. Women who had their first full term pregnancy
when they were 26 years had 26% smaller odds of breast cancer compared to women who
had their full term pregnancy between ages 15-25 years in the bivariate logistic regression
analysis. This result was not statistically significant at 95% confidence level (cOR=0.743
(95% CI 0.33, 1.65) (Table 4.3).

4.3.4 Breast feeding History

Out of 232 participants, 1 value of cases were missing therefore the analysis were based
on 115 cases and 116 controls. The results indicated that 7%(8/116) cases and 24.3%
(28/116) controls had never breastfed before whilst 93%(107/116) cases and 75.7%
(88/116) controls have ever breastfed before and this group were mostly the nulliparous
women. The results showed that breastfeeding was a protective risk factor in the bivariate
logistic regression analysis cOR, 0.23 [95% CI, 0.088-0.566] and this was statistically
significant at 95% confidence level (P<0.001) (Table 4.3). The result implies that, women who breastfed had 77% lesser odds of developing breast cancer compared to those women who had never breastfed.

4.3.5 Oral Contraceptive Usage

Out of 116 cases, 1 case was missing therefore, 115 cases and 116 controls were used. The results showed that 38.3% (44/110) cases and 40.5% (47/116) controls had ever used oral contraceptives while 61.7% (71/116) cases and 59.5% (69/116) controls had never used oral contraceptives. The use of oral contraceptives was not associated with the development of breast cancer among women in the bivariate logistic regression analysis (OR=0.91 (95% CI 0.52-1.60 (P=0.726) (Table 4.3).

4.3.6 Parity

The results showed that 9.5.0 % (11/116) cases and 23.3% (27/116) controls were nulliparous whilst 90.5% (105/116) cases and 76.7% (89/116) controls were multiparous. The results showed that women who were multiparous were protected against the development of breast cancer in the bivariate logistic regression analysis (OR, 0.35 [95 % CI, 0.147-0.771] and this was statistically significant at 95% confidence level (P=0.005) (Table 4.3). Further analysis was conducted to ascertain whether the number of children respondents have significantly influences the development of breast cancer. The results showed that 40.5% (47/116) cases and 45.7% (53/116) controls have less than 3 children whilst 59.5% (69/106) cases and 54.3% (63/89) controls had at least 3 children. It was observed that women who had at least 3 children had 19% lesser odds of breast cancer compared to those women with less than children (OR, 0.81 [95 % CI, 0.47- 1.41]. However, this association was statistically not significant at 95% confidence level (P=0.43).
4.3.7 Family history of breast cancer

The result shows that 19.0 % (22/116) of cases and 2.6 % (3/116) controls had a positive family history of breast cancer whilst 81.0 % (94/116) of cases and 97.4 % (113) of controls had no family history of breast cancer cOR= 8.82 (95%CI 2.51-47.04). This study indicates that women with a positive family history of breast cancer had 8.82 times greater odds of developing breast cancer compared to those who had no family history of breast cancer.

Table 4.3 Bivariate Analysis showing reproductive risk factors for breast cancer by cases and controls

<table>
<thead>
<tr>
<th>Breasts cancer</th>
<th>Cases</th>
<th>Controls</th>
<th>cOR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age at Menarche</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 13 years</td>
<td>50(43.5)</td>
<td>57(50.0)</td>
<td>0.77 (0.44-1.34)</td>
<td>0.323</td>
</tr>
<tr>
<td>≤ 13 years</td>
<td>65(56.5)</td>
<td>57(50.0)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td><strong>Age at Menopause</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 50 years</td>
<td>14(28.0)</td>
<td>3(20.0)</td>
<td>1.56 (0.34-9.81)</td>
<td>0.536</td>
</tr>
<tr>
<td>≤ 50 years</td>
<td>36(72.0)</td>
<td>12(80.0)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td><strong>Age at first birth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 25 years</td>
<td>17(16.0)</td>
<td>18(22.5)</td>
<td>0.743 (0.33-1.65)</td>
<td>0.426</td>
</tr>
<tr>
<td>15-25 years</td>
<td>89(84.0)</td>
<td>70(87.5)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td><strong>Parity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nulliparous</td>
<td>11(9.5)</td>
<td>27(23.3)</td>
<td>0.35 (0.15-0.77)</td>
<td>0.005</td>
</tr>
<tr>
<td>Multiparous</td>
<td>105(90.5)</td>
<td>89(76.7)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td><strong>Number of children</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 3</td>
<td>47(40.5)</td>
<td>53(45.7)</td>
<td>0.81 (0.47-1.41)</td>
<td>0.43</td>
</tr>
<tr>
<td>&lt; 3</td>
<td>69(59.5)</td>
<td>63(54.3)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td><strong>History of Breastfeeding</strong></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Never</td>
<td>8(7.0)</td>
<td>28(24.3)</td>
<td>0.23 (0.089-0.57)</td>
<td></td>
</tr>
<tr>
<td>Eve</td>
<td>107(93.0)</td>
<td>88(75.7)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td><strong>Oral Contraceptives</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.726</td>
</tr>
<tr>
<td>Ever</td>
<td>44(38.3)</td>
<td>47(40.5)</td>
<td>0.91 (0.52-1.60)</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>71(61.7)</td>
<td>69(59.5)</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td><strong>Family History of Breast Cancer</strong></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>22(19.0)</td>
<td>3(2.6)</td>
<td>8.82 (2.5 1-47.04)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>94(81.0)</td>
<td>113(97.4)</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

*Significant (P≤0.05)
4.4 Lifestyle risk factors of breast cancer

4.4.1 Alcohol Consumption

Out of 232 participants, 33.6 % (39/116) cases and 21.6 % (32/116) controls had ever consume alcoholic beverage before in their lifetime while 66.4 % (77/116) cases 72.4 % (84/116) controls had never consume alcoholic beverage. The results showed that alcohol consumption was associated with the development of breast cancer. The odds of alcohol consumption among women with breast cancer is 1.3 times greater comparing woman who have ever consumed alcohol to those who have never consume alcohol in the bivariate logistic regression, OR=1.3 (95% CI 0.73, 2.42) (Table 4.5). This association was not statistically significant at 95% confidence level (P=0.319).

4.4.2 Smoking

Out of 232 participants, 14.7 % (17/116) cases and 2.6 % (3/116) controls had ever smoked cigarette before in their lifetime while 85.3 % (99/116) cases 97.4 % (113) controls had never smoked in their lifetime. Women who had ever smoked had 6.5 times greater odds of developing breast cancer compared to those women who had never smoked OR= 6.5 (95% CI 1.9, 35.2). This association was statistically significant at 95% confidence level (P=0.001) (Table 4.5).

4.4.3 Body Mass Index (BMI)

The mean BMI of cases was 28.4±6.1 Kg/m² and that of controls was 27.7±5.9 Kg/m². The BMI for both cases and controls were classified as either overweight/obese (≥25kg/m²) and non obese (<25kg/m²). The average BMI for cases and controls showed that both were overweight or obese (25kg/m²<BMI<30.0kg/m²). 69.0 % (80/116) cases and 70.6 % (82/116) controls had their BMI greater than 25Kg/m² whilst 31.0 % (36/116) cases and 29.4 % (34/116) controls had their BMI below 25Kg/m². BMI found not to be
associated with the development of breast cancer in the bivariate logistic regression at 95% confidence level (OR, 0.95 [95% CI, 0.501-1.68], P=0.775) (Table 4.4 & 4.5).

**Table 4.4 Anthropometric measurements between cases and controls**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cases (N=116)</th>
<th>Controls (N=116)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>70.1 ± 17.8</td>
<td>68.3 ± 14.5</td>
</tr>
<tr>
<td>Height (m)</td>
<td>1.6 ± 0.1</td>
<td>1.6 ± 0.1</td>
</tr>
<tr>
<td>BMI (Kg/m²)</td>
<td>28.4 ± 6.1</td>
<td>27.7 ± 5.9</td>
</tr>
</tbody>
</table>

**4.4.4 Physical Activity**

Physical activity in this study is defined as work involving vigorous or moderate-intensity activity continuously at least twice a week in the last 6 months such as brisk walking or skipping. Out of a total of 232 participants in the study, 43.1% (50/116) cases and 31.0% (36/116) controls had not been actively engaged in various kinds of physical activities continuously at least twice a week in the last 6 months while 56.9% (66/116) cases and 69.0% (80/116) controls had engaged in some form of physical activity at least twice a week in the last 6 months. Physical activity was found to be protected against breast cancer in the bivariate logistic regression, OR=0.59 (95% CI 0.33-1.05). This is an indication that women who engaged in physical activity had 41% lesser odds of developing breast cancer compared to women who do not engage in physical activity at least twice a week in the last six months. The association was statistically significant at 95% confidence level (P= 0.05) (Table 4.5)
Table 4.5 Bivariate Analysis lifestyle risk factors for breast cancer by cases and controls

<table>
<thead>
<tr>
<th></th>
<th>Breast cancer</th>
<th></th>
<th></th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cases (n, %)</td>
<td>Controls (n, %)</td>
<td>cOR (95% CI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>39(33.6)</td>
<td>32(21.6)</td>
<td>1.33 (0.73-2.42)</td>
<td>0.319</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>77(66.4)</td>
<td>84(72.4)</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoked cigarette</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>17(14.7)</td>
<td>3(2.6)</td>
<td>6.46 (1.78-35.21)</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>99(85.3)</td>
<td>113(97.4)</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI (Kg/m²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.775</td>
</tr>
<tr>
<td>≥25</td>
<td>80(69.0)</td>
<td>82(70.6)</td>
<td>0.92 (0.51-1.68)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>36(31.0)</td>
<td>34(29.4)</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 30mins physical activity/ week</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>66(56.9)</td>
<td>80(69.0)</td>
<td>0.59 (0.33-1.05)</td>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td>No</td>
<td>50(43.1)</td>
<td>36(31.0)</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant (P≤0.05)

4.5 Multiple Logistic Regression results for associations of breast cancer among participants

Multiple logistic regression analysis was conducted on all risk factors that were statistically significant at 95% CI and P value ≤ 0.05 at the bivariate level. These factors included history of breastfeeding, family history of breast cancer, employment status, physical activity, parity, smoking status and educational level. Out of the 7 risk factors that were significantly associated with breast cancer at the bivariate analysis, only 4 were statistically significant and strongly associated with the development of breast cancer at the multiple logistic regression analysis level (P≤0.05) (Table 4.6). These risk factors include; educational level, physical activity, cigarette smoking, and Family history. Parity
and Breast feeding history that were statistically significant at bivariate analysis were omitted after running with multiple logistic regression in STATA and this may be due to collinearity between the independent variables especially the reproductive risk factors. They were therefore not considered in the model (Table 4.6).

**Table 4.6a Multiple Logistic Regression Results for factors Associated with Breast Cancer**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Breast Cancer Cases</th>
<th>Controls</th>
<th>Unadjusted Odd ratio (95% CI)</th>
<th>P value</th>
<th>Adjusted Odd ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Had formal education</td>
<td>81(69.8)</td>
<td>110(95.6)</td>
<td>0.11 (0.03-0.3)</td>
<td>&lt;0.001</td>
<td>0.09 (0.03-0.3)</td>
<td>0.001</td>
</tr>
<tr>
<td>No formal Education</td>
<td>35(30.2)</td>
<td>5(4.4)</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>84(72.4)</td>
<td>97(83.6)</td>
<td>0.51 (0.3-1.02)</td>
<td>0.039</td>
<td>0.76 (0.4-1.61)</td>
<td>0.142</td>
</tr>
<tr>
<td>Unemployed</td>
<td>32(27.6)</td>
<td>19(16.4)</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>Family History of Breast cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>22(19.0)</td>
<td>3(2.6)</td>
<td>8.82 (2.5-47.04)</td>
<td>&lt;0.001</td>
<td>9.9 (2.7-36.5)</td>
<td>0.001</td>
</tr>
<tr>
<td>No</td>
<td>94(81.0)</td>
<td>113(97.4)</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant (P≤0.05)
Table 4.6b Multiple Logistic Regression Results for factors Associated with Breast Cancer

<table>
<thead>
<tr>
<th>Variable</th>
<th>Breast Cancer Cases</th>
<th>Breast Cancer Controls</th>
<th>Unadjusted Odd ratio (95% CI)</th>
<th>P value</th>
<th>Adjusted Odd ratio (95%CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoked Cigarette</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>17(14.7)</td>
<td>3(2.6)</td>
<td>6.46 (1.8-35.2)</td>
<td>0.001</td>
<td>4.8 (1.2-18.5)</td>
<td>0.023</td>
</tr>
<tr>
<td>Never</td>
<td>99(85.3)</td>
<td>113(97.4)</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>≥ 30mins Physical Activity/ Week</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>39(33.6)</td>
<td>10(8.6)</td>
<td>0.59 (2.4-12.7)</td>
<td>0.05</td>
<td>0.52 (1.9-16.7)</td>
<td>0.04</td>
</tr>
<tr>
<td>No</td>
<td>77(66.4)</td>
<td>106(91.4)</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

*Significant (P≤0.05)
CHAPTER FIVE

DISCUSSION

The actual cause of breast cancer is still poorly understood and so far the speculated and well established risk factors for breast cancer only explain a fraction of cases. Epidemiological studies carried out among women in different populations of the world have identified a diverse range of risk factors for breast cancer. These include age, socioeconomic status, reproductive history, breast feeding, family history, life style Physical activity in the midst of others (Oladimeji et al., 2016, Aich et al., 2016). It is therefore very important to have a better insight on breast cancer risk factors among women in Freetown Sierra Leone especially because of the scantiness of data on risk factors for breast cancer in Sierra Leone.

This present case-control study was aimed at evaluating the role of socio-demographic, reproductive and behavioral risk factors in the vulnerability to breast cancer among women in Sierra Leone. The result of this study showed that there were statistically significant association with the development of breast cancer between educational level, physical activity, Cigarette smoking, and Family history of breast cancer.

The mean age of cases and controls were 30.0±10.3 and 36.7±11.8 respectively. This finding is consistent with various studies (Wani et al, 2014. Adjei, 2012) indicating that breast cancer is diagnosed at an earlier age among African women. In Sierra Leone, there is no formal socio-economic classification unlike European countries. Therefore, in the absence of such organized system of classification on socio-economic indicators for family income educational status was used as proxy. Education may possibly affect breast cancer because women who are educated have fewer children, late age at child birth and utilize family planning methods (Hussain et al., 2008). In contrast to this however, the findings
of this study showed that participants with some level of education were protected against the development of breast cancer and was statistically significant in both bivariate and multiple logistic regression analysis OR, 0.11 [95% CI, 0.03-0.29], 0.09(0.03-0.26) respectively. These findings may be due to the fact that educated women have increased awareness on breast cancer risk factors and they also seek early detection. Secondly, educated women are better informed about the benefits of regular physical exercise and the negative effect of cigarette smoking and alcohol intake.

Positive family history was strongly associated with a 9-fold greater odds of developing breast cancer compared to those with no family history of breast cancer in both bivariate and multivariate analysis OR, 8.82 and 9.9 respectively. This finding agrees with a population-based study carried out on young women in the USA by Malone et al., (2012) showed that women with first and second-degree relative with family history of breast cancer had a higher proportion of breast cancer (60.7% and 61.1%) respectively compared to those with no family history who reported with lower proportion of (55.1%). The possible reason for this could be due to the fact that the study participants are genetically predisposed or maybe because of shared cultural beliefs. In the UK, about 3% of all cases of breast cancer are as a result of mutations in BRCA1 or BRCA2 genes (Assi et al., 2008). This study however, disagrees with a case control study on risk factors associated with family history of breast cancer conducted in Pakistan by Nazir et al., (2015), in which there was no association between risk of breast cancer and family history of breast cancer.

The current result showed that women who had ever smoked cigarette had higher odds of developing breast cancer compared to women who had never smoked. This result agrees with prospective cohort study conducted in USA, by Nyante et al., (2014), found out that smoking status was absolutely linked with risk for breast cancer. Another large prospective cohort study by Michels.,(2012) reported that beginning smoking before menopause and
mainly before first full-term pregnancy was most strongly associated with increased possibility of breast cancer. This study however disagree with the International Agency for Research on Cancer in 2009 when they stated that there was limited evidence to support the positive association between active smoking and breast cancer risk McKenzie et al., (2013).

Physical activity was found to be protected against breast cancer. This study shows that Women who engaged in physical activity more than 30 minutes per week had 41% lesser odds of developing breast cancer compared to women who do not engage in physical activity. This findings are consistent with American Cancer Society (ACS, 2015) conducted a study that included more than 73,000 post-menopausal women. They found out that breast cancer risk was 14% lower among women who reported walking 7 or more hours per week compared to women who walked 3 or fewer hours per week. On the other hand, this study disagrees with studies conducted in Iraqi by Isa, (2013).

Their study showed that there was a very strong relationship between breast cancer risk and reduction in the rate of physical activity. Similarly, Oladimeji et al., (2016) in Nigeria found out that majority of women with breast cancer had little or no exercise before their diagnosis. They therefore concluded that physical exercise has no effect on the risk of breast cancer.

Considering all the reproductive risk factors for breast cancer in the final multiple logistic regression analysis, none was a significant predictor of breast cancer. The reason for this failure of the reproductive variables that were significant in the bivariate analysis especially breast feeding and parity to arrive at statistical significance in the multiple logistic regression may be as a result of collinearity. Similar studies conducted in Cyprus by (Hadjisavvas et al., 2010) found some significant associations between breast cancer
and reproductive risk factors, and a high degree of collinearity as was expected between these variables. The synergistic role of (1) breast feeding and pregnancy and (2) breast feeding and number of children on risk factors for breast cancer shows that the combine effect of breast feeding and pregnancy were stronger than the effect of pregnancy alone. There was also a strong univariable association with number of children attenuated in the multivariate logistics analysis once breast feeding was controlled for, and much change was not seen with breast feeding. They came to the conclusion that these observations cannot be attributed to collinearity alone, but number of children was probably confounded by the effect of breast feeding. The findings of this study also agree with similar studies conducted in Nigeria by Okobia et al.,( 2006).

They found out that apart from age at first full term pregnancy, all the other reproductive variables that were considered failed to show any statistical significance in the multiple conditional logistic regression model and this failure was due to collinearity between age at first full term pregnancy and the other reproductive variables.

With respect to the use of oral contraceptives pills, this current study showed that the use of oral contraceptive pill was not associated with the development of breast cancer among women in the bivariate logistic regression analysis (OR=0.91 (95% CI 0.5, 1.6), and this association was also not statistically significant at 95% confidence level (P=0.73). The American cancer society in 2015 reviewed 23 studies and found out that the use of fertility drugs was not associated with risk of breast cancer. However, in contrast to this findings, case-control study conducted in the Morocco by Laamiri et al.,( 2015) suggested that oral contraceptive use above 6 months is linked with an increased risk of breast cancer.

The BMI was not found to be a risk factor for the development of breast cancer in the bivariate logistic regression at 95% confidence level OR, 0.95 [95 % CI, 0.5-1.7], P=0.76.
This finding disagrees with a case-control study in India by Singh et al, (2011) on the association of overweight and obesity with breast cancer. Their study shows that 13.4% of cases and 6.6% of the controls to be obese, and this increase in risk was also associated with increasing levels of Body mass index. Similar studies in Iran by Ghiasvand et al, (2012) showed a very strong association between BMI and breast cancer among post-menopausal women.

The ‘international agency for research on cancer considers alcohol to be causally related to the risk of breast cancer, with a 7-10% increase in risk for each 10g of alcohol consumed by a woman’” Liu & Nguyen, (2015). The findings of this study showed that the odds of women who have ever consumed alcohol were 1.33 times higher to develop breast cancer than those who have never consume alcohol. However, this association was not statistically significant in the bivariate logistic regression, OR=1.33 (CI95% 0.73, 2.42) Table 4.5.
CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

It can be concluded from this study that risk factors associated with breast cancer among women screened for breast cancer in Freetown are individuals with no formal education, family history of breast cancer, smoking cigarette and individuals with no physical activity more than 30 minutes per week.

A total of Fourteen (14) variables that are possible risk factors for breast cancer were analyzed, and only Four (4) showed strong associations with risk for breast cancer among women studied in Freetown.

However, this study did not show any significant associations between the other risk factors analyzed, even though studies conducted elsewhere suggests associations between some of these risk factors.

6.1 Recommendations

❖ The policy makers to be alerted in order to design Governmental control programs through the Ministry of Health and Sanitation to minimize the incidence of breast cancer in Sierra Leone, and to ensure effective legislations for cigarette smoking as protective measures for high risk groups.

❖ Screening programs to be developed by the Ministry of Health and Sanitation, and all women above 40 years especially those with a positive family of breast cancer to be encouraged to undergo screening for breast cancer.

❖ The ministry of Health and Sanitation in collaboration with the ministry of education and ministry of information to enhance mass health education on breast
cancer in schools, colleges and among women with no formal education with emphasis on the importance of breast self examination

❖ There is need for the Government through the ministry of youth and sports to invest in the creation of more recreational facilities and encourage women to be engaged in physical activities especially those with a positive family history of breast cancer.

❖ The Ministry of Health and Sanitation under the Non-communicable disease program to setup a breast cancer registry, and develop preventive, diagnostic, treatment guidelines and palliative care.
REFERENCES


Adjei, E. (2012). Breast cancer in kumasi, ghana 1, 46(1).


APPENDICES

1. INFORMED CONSENT FORM

**Project Title:**  (Risk factors for breast cancer among women in Freetown, Sierra Leone.)

**Principal Investigator:**

(Philip Pelema Gevao: University of Ghana, School of Public Health, email: ppgevao342gmail.com/Tel: 0265288156)

**General information about the study**

This research study is being undertaken by Philip Pelema Gevao in partial fulfillment of a Masters of Philosophy Degree in Applied Epidemiology and Disease Control. It would provide information that would enrich the understanding of breast cancer risk factors among women in Freetown Sierra Leone. The Purpose of the study is to explore these risk factors among women in Freetown. The increasing numbers in breast cancer cases among women in Freetown in particular raises questions of the most likely causes, which forms the basis for this research. Findings from this research would provide information that would serve as a store of knowledge. This research will also enable me to identify important risk factors for breast cancer, and will also address gaps in knowledge, of the risk factors that lead to breast cancer such as Alcohol use, tobacco smoking, Obesity, Oral contraceptive use, etc.

**Procedures**

134 cases and 134 controls aged 20-65 years in Freetown would be identified and included in the study. If you are eligible and agree to participate, a questionnaire will be administered to you by either the Principal Investigator or a Research Assistants. The survey interview is expected to last 25 minutes.
**Possible Risks and Discomforts**

The study may involve some risks. We anticipate some discomfort during the interview process. We will ask you questions about your background, Age at menarche, Age at menopause, Age at first child birth, contraceptive use and Parity. Some of the questions focus directly on your personal life, and you may feel uncomfortable answering those questions or you may not know the answer to a particular question.

**Possible Benefits**

There is no direct benefit to the participants of this study. However, the information you will provide will contribute to the overall knowledge on breast cancer that will be generated from this study.

**Voluntary Participation and Right to Refuse**

Your participation in this study is absolutely voluntary. During the interview, you can choose not to answer any questions that you do not want to answer. Additionally, you are at liberty to withdraw from the study or stop the interview at any time. However, we will encourage you to participate and complete the questions since your opinions are very important in helping us to examine the risk factors for breast cancer in Sierra Leone.

**Confidentiality**

We would like to assure you that whatever information you provide will be handled with strict confidentiality. The information will be used purely for research purposes and will never be used against you. Data analysis will be done at the aggregate level to ensure anonymity. Your name or personally identifying information will not be captured on the questionnaire and hence will not in any way lead to publication in the report. The Principal Investigator and supervisor will review the research records, but no unauthorized individual(s) will be able to access your information.
Compensation

There is no compensation, financial or material benefit for participating in this study.

Contact for Additional Information

If you have questions later, you may contact:

(Philip Pelema Gevao: University of Ghana, School of Graduate Studies, email ppgevao34@gmail.com. Tel: 0265288156)
VOLUNTARY CONSENT

I declare that the above document describing the purpose, procedures as well as risks and benefits of the research titled “(Risk factors for breast cancer among women in Freetown, Sierra Leone)” has been thoroughly explained to me in English/Creole/ Mende/ Limba/ Temne language. I have been given the opportunity to have any questions about the research answered to my satisfaction. I hereby voluntarily agree to participate as a subject in this study.

______________________________________              _____/_____/_________
Signature or Mark of Participant      Date

If participants cannot read the form themselves, a witness must sign here.

I, ________________________________________ was present while the purpose, procedures as well as risks and benefits were read to the participant. All questions were answered and the participant has voluntarily agreed to participate as a subject in this research study.

______________________________________     _____/_____/_________
Signature of Witness            Date
Interviewer’s statement:

I, __________________________________________, certify that the nature and purpose, the potential benefits and possible risks associated with participating in the study have been explained to the above individual in the English/Creeole/Mende/Limba/Temne language. The participant has freely agreed to participate in the study.

_______________________________  _____/____/__________
Signature of person who obtained consent  Date
2. SAMPLE QUESTIONNAIRE

**QUESTIONNAIRE: RISK FACTORS FOR BREAST CANCER AMONG WOMEN IN FREETOWN, SIERRA LEONE.**

**PARTICIPANT CONSENT**

I am Gevao Philip, a final year student of the School of Public Health, University of Ghana. The administration of this questionnaire is to solicit your response in order to assist the establishment of facts relating to the assessment of risk factors for breast cancer among women in Freetown, Sierra Leone. All the information is strictly for academic purposes and will be highly treated with the greatest level of confidentiality. Thank you.

**Participants consent:** Yes[   ]  No[   ], If No, end of interview

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**University of Ghana  http://ugspace.ug.edu.gh**
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<tr>
<td>1</td>
<td>Age of respondents</td>
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<td><strong>SECTION B: Family history of breast cancer</strong></td>
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<td></td>
<td>At what age were you</td>
<td>.................years</td>
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<td>diagnosed with breast cancer?</td>
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<td>6</td>
<td>Does any relative of yours have a breast cancer?</td>
<td>Yes……………………1 No……………………2</td>
<td>IF YES Q7</td>
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<td>Which close relative of yours have breast cancer?</td>
<td>Grandmother……………1 Mother…………………2 Mothers sister…………3 Sister…………………4 Daughter………………5 Fathers sister………6</td>
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<td>8</td>
<td>Does any distant relative of yours have breast cancer?</td>
<td>Yes……………………1 No……………………2</td>
<td>If Yes Q9</td>
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<td>9</td>
<td>Which distance relative of yours have breast cancer?</td>
<td>Maternal………………1 Paternal………………2</td>
<td>BC_DISTANCE RELATIVE</td>
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**Section C: Reproductive risk factors of breast cancer**

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<tbody>
<tr>
<td>10</td>
<td>At what age did your menstrual cycle begin?</td>
<td>Before 13 years(Early Menarche…………1 After 13 years(Late Menarche…………2</td>
<td>AGE_MENARC HE</td>
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<td>11</td>
<td>Are you menopausal?</td>
<td>No………………1 Just started………………2 Post-menopausal…………3</td>
<td>MENOPAUSAL</td>
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<td>12</td>
<td>If no how old are you If just started at what age If post-menopausal at what age</td>
<td>.....................yrs .....................yrs .....................yrs</td>
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<td>13</td>
<td>Do you have children?</td>
<td>Yes……………………1 No……………………2</td>
<td>If yes Q14</td>
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<tr>
<td>14</td>
<td>How many children do you have?</td>
<td></td>
<td>N_CHILDREN</td>
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<td>15</td>
<td>At what age did you have your</td>
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<td>FTP_AGE</td>
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<td>Question</td>
<td>Action</td>
<td>Answer Options</td>
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<tr>
<td>16</td>
<td>Have you breastfed before?</td>
<td>Yes……………………1 No……………………2</td>
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<tr>
<td>17</td>
<td>How many months all together did you breast feed your child or children?</td>
<td>Less than 18months……1 18 months and above…..2</td>
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**Section D: Physical activity**

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<tr>
<td>18</td>
<td>Does your work involve vigorous or moderate intensity activity that causes small increase in breathing or heart rate such as brisk walking for at least 10 minutes continuously?</td>
<td>Yes………. …….1 No………. …….2</td>
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<tr>
<td>19</td>
<td>In a typical week, on how many days do you do vigorous or moderate-intensity activities as part of your work?</td>
<td>……. ……. ..</td>
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<tr>
<td>20</td>
<td>How much time do you spend doing vigorous or moderate intensity activities at work on aday</td>
<td>VA_TIME</td>
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<td>21</td>
<td>Do you do any vigorous -intensity sports, fitness or recreational activities that causes large increase in breathing or heart rate like skipping for at least 10 minutes continuously</td>
<td>Yes……………………1 No……………………2</td>
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<tr>
<td>22</td>
<td>How much time do you spend doing vigorous-intensity sports fitness or recreational activities on a typical day?</td>
<td>……. ……. hrs</td>
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### Section D: Lifestyle risk factors of breast cancer

<table>
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<tr>
<th>Question</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Notes</th>
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| 23 Did you ever consume alcoholic drink such as beer, wine, dry gin before your diagnosis of breast cancer? | Yes…………………….1  
No.……………………..2     | If yes Q24                           |        |
| 24 What type of alcohol did you usually take?                            | Beer……………………1   
Wine……………………2  
Liquor/Spirits………….3 | ALCOHOL TYPE                   |        |
| 25 What was the largest number of standard alcohol drinks you had on a single occasion, counting all types of alcoholic drinks together? | ………………………..u  
units | ALCOHOL VOLUME                 |        |
| 26 How often in a week do you consume alcohol?                          | ………………………..d  
ays |                                    |        |
| 27 How long did you consume alcohol before your diagnosis?               | ……………….months/yrs             |                                    |        |
| 28 Do you smoke/have you ever smoked tobacco products?                  | Yes…………………….1  
No.……………………..2     | If yes Q28                           | EVER_SMOK ED     |
| 29 How long have you been smoking/did you smoke/                        | ………..weeks/  
months/yrs |                                    |        |
| 30 How many cigarettes sticks do/did you smoke in a week                | ……………………pac  
ks |                                    |        |

### Section E: Anthropometric information

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<td>……………………cm</td>
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<td>33 BMI</td>
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