SCHOOL OF PUBLIC HEALTH
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RISK FACTORS FOR BREAST CANCER AMONG PATIENTS IN KORLE-BU TEACHING HOSPITAL: A CASE-CONTROL STUDY

BY

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DECLARATION

I hereby declare that with the exception of cited references to other people's work which has been duly acknowledged, this work is the result of my own research work done under supervision and has neither been presented elsewhere either in part or whole for another degree.

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DEDICATION

This work is dedicated to my father, James Ohene Bampoe Addo and my children Andrew, Delisa and Laureen for their sacrifice, support and care.

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ABSTRACT

Background: Breast cancer is the most common type of cancer among women in both high-resource and low-resource countries. According to WHO Global Burden of Disease, 2004, breast cancer accounts for 16% of all female cancers with majority (69%) of breast cancer deaths occurring in developing countries. Although breast cancer incidence rate is said to be increasing worldwide, little is known about the determinants of the disease in Africa and currently, there is no data available on breast cancer risk factors in Ghana. There is therefore the need to identify potential risk factors for breast cancer among Ghanaian women so as to tackle this public health burden with effective preventive strategies.

Objectives: The goal of this study was to identify risk factors that contribute to breast cancer among women in Accra, Ghana; specifically to determine reproductive, hormonal and behavioural factors contribution to breast cancer among a subgroup of women in Ghana.

Methods: An unmatched case control study was conducted among breast cancer patients at the Korle Bu Teaching Hospital from May to July, 2010. Using a systematic random sampling, a total of 126 incident breast cancer patients were selected from the hospital attendance register at the Korle Bu Teaching Hospital Breast Clinic. Controls were relatives of the cases. Open and close-ended, self-administered questionnaires were used to collect information on demographic, reproductive, hormonal, behavioural and anthropometric factors.

Results: This study has contributed to new knowledge of breast cancer epidemiology in Ghanaian women. Educational status, family history of breast cancer and smoking habits were identified as the most significant risk factors among breast cancer patients. This study found no statistically significant associations between hormonal risk factors and breast cancer.

Conclusions and recommendations: This study revealed that the potential risk factors for breast cancer among Ghanaian women include educational status, family history of breast cancer as well as smoking habits. Further investigations are recommended, probably a population based study, to identify and establish the true contribution of each possible risk factor that may be particularly important in the development of breast cancer in this and other populations of African origin.

Keywords: breast cancer, reproductive risk factors, hormonal risk factors, behavioural risk factors

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LIST OF ABBREVIATIONS

BC	Breast Cancer
BMI	Body Mass Index
CI	Confidence Interval
GDHS	Ghana Demographic Health Survey
GHS	Ghana Health Service
IARC	International Agency for Research on Cancer
KBTH	Korle Bu Teaching Hospital
OR	Odds Ratio
PMHT	Post-menopausal Hormone Therapy
USA	United States of America
WHO	World Health Organisation
WHpR	Waist Hip Ratio

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

The female breast is considered a symbol of feminity, fertility and beauty; therefore, diseases related to the breast can be devastating. One of such diseases is breast cancer, a major health burden worldwide. Breast cancer has been estimated to be the most common cause of cancer among women in both developed and developing countries and accounts for 16% of all female cancers (WHO Global Burden of Disease, 2004). A diagnosis of breast cancer in a woman impacts severely not only on every aspect of her life and future, but also on that of those around her. Therefore, the socio-economic impact and psychological ramifications of this singular disease entity cannot be overemphasized. This study showed that although the disease has a much higher incidence and prevalence rate in the developed world, it has a much higher disproportionate mortality in developing nations, who account for over two thirds (69%) of all breast cancer deaths; in 2004, breast cancer accounted for over 519,000 deaths worldwide.

The recent surge in the incidence of the disease in hitherto low incidence areas of the developing world and the convergence of figures between developing and developed world is deemed to be attributable not only to the effect of better diagnostic techniques that have been introduced to the developing countries such as Mammography and Sonography, but also to an increase in life expectancy, increased urbanisation and adoption of western lifestyles, with changes in factors such as childbearing, dietary habits and exposure to exogenous oestrogen, factors which can all be attributable to globalization (Bray *et al.*, 2004).

Although the breast cancer burden is said to be increasing in developing countries, poor reporting and data unavailability and difficulty in estimating population denominators may underestimate the exact numbers; the average age of diagnosis may even be younger for women in developing countries than for women in developed countries (Newman, 2005).

There are differences in the breast cancer incidence and mortality rates in the different geographical areas of Africa (Parkin, 2001). In eastern Africa, it is estimated that the age standardised incidence rates (per 100,000 women) is 19.5, in western Africa it is 27.8, in middle Africa 16.5 and 33.4 in southern Africa (IARC, 2001). Available statistics from Ghana, by Quartey-Papafio and Anim, estimated the incidence of breast cancer at 35 cases/100,000 women in 1977 (Owiredu *et al.*,2009), and breast cancer was reported by Owiredu and Armah (2006) to form 11% of all cancers histologically diagnosed at the Pathology Department of Korle Bu Teaching Hospital in the period 1974-1978.

Data collected from the Radiotherapy Department at the Korle Bu Teaching Hospital indicates a steady increase in patients, from 160 to 249, for breast cancer treatment from 2008 to 2009. It is estimated that 70% of new cancer cases will occur in inhabitants of developing countries by the year 2020, a vast number of these cancers occurring in females will be of the breast (Jones, 1999).

To seriously tackle this menace at the clinical level will call for, intensive education, mammographic screening for early detection and surveillance as well as excellent pathology services and a multimodal therapy consisting of surgery, radiotherapy and chemotherapy with or without breast reconstruction. To implement a scheme of this nature successfully will require pooling of scant resources into the health budget. This, therefore, means that another strategy to tackle this issue is critically important.

The pre-clinical stage of breast cancer is very important in preventing or to a large extent ameliorating the effect of the disease. In order to do this it is vital to determine the risk factors causing the disease. This case-control study therefore aimed at identifying risk factors that contribute to breast cancer among breast cancer patients at the Korle Bu Teaching Hospital, Accra.

1.2 STATEMENT OF THE PROBLEM

Breast cancer burden is increasing in developing countries. It is said to be the leading malignancy in Ghana, accounting for 15.4% of all malignancies (Badoe, 2000). The cause of breast cancer is not yet known, but has been attributed to certain reproductive, environmental, hormonal and behavioural factors. Currently, the only programme available on breast cancer is on awareness of early presentation of breast cancer but this has not produced the desired results yet (Clegg-Lamptey and Hodasi, 2007). Creating awareness on early presentation is useful, being one of many strategies that can be implemented to curb the ever rising incidence of and mortality due to breast cancer in Ghana; another important strategy, where possible, will be preventing the disease from occurring.

To address this challenge, there is the need to identify potential risk factors, to enable officials and programme managers design tailor-made preventive strategies that will reduce the public health burden of this disease.

1.3 JUSTIFICATION

Based on knowledge of possible risk factors for breast cancer among their female population, most high resourced countries have developed preventive strategies for breast cancer; some of which include intensive education, mammographic screening for early detection and surveillance.

In Africa there are very few studies on possible risk factors for breast cancer and inadequate implementation of preventive strategies. This could be attributed to financial constraints and low levels of literacy. However with the increasing incidence rates of breast cancer worldwide and its associated effect on patients and their families, there is need to ensure universal access to preventive measures for breast cancer. To start implementation of preventive strategies, there must be data available on possible risk factors for breast cancer for women in that particular geographical location. Such data is unavailable in Ghana, hence this study.

It is hoped that this study will provide information on associations between reproductive, hormonal and behavioural factors and breast cancer among breast cancer patients at the Korle Bu Teaching Hospital and provide important clues to the underlying causes of the disease among Ghanaian women.

The results of this study will then serve as a guideline for public policy and education on preventive strategies that will positively alter risk factors causing the disease in Ghanaian women.

1.4 RESEARCH QUESTIONS AND OBJECTIVES

1.4.1 Research Questions

1. Which reproductive factors contribute to breast cancer among breast cancer patients at Korle Bu Teaching Hospital?

2. Which hormonal factors contribute to breast cancer among breast cancer patients at Korle Bu Teaching Hospital?

3. Which behavioural factors contribute to breast cancer among breast cancer patients at Korle Bu Teaching Hospital?

1.4.2 General Objective

To identify risk factors contributing to breast cancer among breast cancer patients at the Korle-Bu Teaching Hospital, Ghana, 2010

1.4.3 Specific Objectives

a. To determine reproductive factors contributing to breast cancer among breast cancer patients at Korle Bu Teaching Hospital

b. To determine hormonal factors contributing to breast cancer among breast cancer patients at Korle Bu Teaching Hospital

c. To determine behavioural factors contributing to breast cancer among breast cancer patients at Korle Bu Teaching Hospital

1.5 VARIABLES

1.5.1 Reproductive Factors

Age

Family History

Menstrual History

Parity

Age at first full-term pregnancy

Breastfeeding

Abortions – Induced, Spontaneous

1.5.2 Hormonal Factors

Oral contraceptive usage

Post menopausal hormonal therapy

1.5.3 Behavioural Factors

Smoking habit

Alcohol consumption

Physical activity

1.5.4 Physical Measurements

Body mass index

Waist hip ratio

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Though not yet exactly known, the cause of breast cancer has been attributed to certain factors that influence the development of the human being such as genetic, reproductive, hormonal, socio-economic and behavioural factors; these factors apply in both developing and developed countries.

There are constitutional or intrinsic and non-modifiable risk factors as well as superimposed or extrinsic and modifiable risk factors for breast cancer. A person's sex, age, race, family and personal history cannot be influenced or changed while others linked to cancer-causing factors in the environment or related to a person's socio-economic status or personal behaviours, such as smoking, drinking, and diet, can be influenced or changed.

Ideally, insight into the risk factors for breast cancer of African populations should be gained by studying risk factors for breast cancer in Africans. These data, however, have been relatively unavailable and inadequate. Data from the United States have revealed several provocative parallels between African American and native African breast cancer patients, who share a common ancestry; both having descended from the very select subgroup who survived the long ocean voyage from West Africa during the Diaspora (Ijaduola and Smith, 1998, Newman, 2005); most environmental and social factors however may differ.

2.2 REPRODUCTIVE RISK FACTORS

There are multiple reproductive risk factors mentioned in literature that are thought to play major key roles in the development of breast cancer.

2.2.1 Age

The risk of developing breast cancer is known to increase as a function of age and occurs predominantly in older premenopausal and postmenopausal women. However, a much greater incidence of breast cancer has been reported in premenopausal African American women, compared to Caucasian Americans, (Newman, 2005). Studies done in Nigeria found a peak age incidence among most West Africans to be between 36 and 45years, and another smaller peak incidence occurring between 56 and 65 years of age (Ijaduola and Smith, 1998). Another study done at the Korle Bu Teaching Hospital showed that breast cancer continues to affect a young population, mostly between the ages of 40 to 49 years (Clegg-Lamptey and Hodasi, 2007).

2.2.2 Family History of Breast Cancer

A family history of breast cancer reflects shared cultural factors, genetic predisposition or both in different populations. Breast cancer risk is said to be higher among women whose close blood relatives have had breast cancer. Nemesure *et al.* (2009) reported an odds ratio of 3.74 for women whose parent had been diagnosed with breast cancer and 3.26 if a sibling had been diagnosed with breast cancer. Although the exact risk is not known, women with a family history of breast cancer in a father or brother also have an increased risk of breast cancer.

2.2.3 Age at Menarche

A case-control study of non-Hispanic subjects conducted in the USA, between 1980–1982, by Mayberry (1992) showed that younger women with menarche under the age of 12 years had a 50% less breast cancer risk than younger women with menarche at 14 years or older while older women with a family history of breast cancer or with menarche at 13 years and younger had a higher relative risk.

A similar study in Nigeria found age at menarche, ranging between 12 and 20 years, did not appear to be a risk factor; this factor therefore appears to be important only among African-American women for development of breast cancer prior to menopause (Ijaduola and Smith, 1998). A case-control study examining risk factors for breast cancer in African-American women also did not find the expected trend of an increasing risk for breast cancer with decreasing age at menarche (Laing *et al*., 1993).

2.2.4 Parity

Multiparity increases breast cancer risk prior to 45 years among young African-American women, but becomes protective against breast cancer after 45 years (Newman, 2005); this same view was expressed by Palmer *et al*. (2003). Older age at first full-term pregnancy is also said to be associated with a slightly higher breast cancer risk (Nemesure *et al*., 2009).

2.2.5 Breastfeeding

A population-based Cancer and Steroid Hormone case-control study by Mayberry (1994) of African American women aged between 20 to 54 years showed that the risk of breast cancer may be slightly lowered by breastfeeding, especially if continued for 1½ to 2 years while there was increased risk of breast cancer found with lack of breastfeeding, under the age of 25 years. The long-standing hypothesis by Lane-Claypon (1926) that breastfeeding of longer duration is protective was affirmed by a study done by Beral (Woodman, 2002).

2.2.6 Abortion

Rookus and van Leeuwen (1996) in the Netherlands undertook a case-control study in 1996 among 918 women, who were already in a population-based, case-control study investigating oral contraceptive use and breast cancer risk. They found a 90% increased risk for breast cancer among parous women with a history of induced abortion and no association between induced abortion and breast cancer among nulliparous women, also no association between spontaneous abortion and the risk for breast cancer was found in both nulliparous and parous women. Contrary to this, other studies have reported inconclusive results to induced abortion. Brewster *et al.* (2005) did not support the hypothesis that either miscarriage or induced abortion represented substantive risk factors for the future development of breast cancer. A Collaborative Group on Hormonal Factors in Breast Cancer by Beral *et al*. (2004) has brought together the worldwide epidemiological evidence on the possible relation between breast cancer and previous spontaneous and induced abortions by reanalysing data from 53 epidemiological studies undertaken in 16 countries. The results of the study

showed that pregnancies that end as a spontaneous or induced abortion do not increase a woman's risk of developing breast cancer.

2.3 HORMONAL RISK FACTORS

Current use of post menopausal hormone-replacement therapy is associated with an increased risk of incident and fatal breast cancer; the effect is substantially greater for oestrogen-progesterone combinations than for other types of Hormone replacement therapy (Beral, 2003). The Barbados National Cancer Study, a nationwide case-control study investigating environmental and genetic factors for breast cancer in a predominantly African-origin population with similar ancestry as African-Americans found out that the use of exogenous hormones, which is infrequent in post-menopausal African-Barbadians, was not a significant predictor (Nemesure *et al*., 2009).

A study conducted by Mayberry (1994), found a nearly three-fold increase in the risk of breast cancer among black women younger than 40 years, who used oral contraceptive for more than 10 years relative to non-users. According to Moorman *et al.*,(2001), there was little evidence that breast cancer was associated with oral contraceptive use among older women above 50 years of both white and black race, however a modest, but non-significant, increase in risk was associated with ever use of oral contraceptive for both younger African-American and white women. There was a trend of increasing risks with more recent use among African-American women, whereas no such trend was apparent for white women. This could be attributed to the promotion of oestrogen receptor cancer cells by the additional hormones introduced into the woman's body.

2.4 BEHAVIOURAL RISK FACTORS

2.4.1 Alcohol Consumption

Alcohol and tobacco consumption, which are uncommon among Ghanaian women, are closely correlated and published results on their association with breast cancer have not always been consistent. While a study by Steinberg and Goodwin (1991) concluded that insufficient evidence exists to support a causal association of alcohol consumption with breast cancer risk, a recent re-analysis of 53 studies indicate that excessive alcohol intake seems to increase risk of breast cancer; about 4% of breast cancers in developed countries may be attributable to alcohol consumption (Hamajima *et al*., 2002).

2.4.2 Smoking Habits

Most studies have found no link between cigarette smoking and breast cancer. Collaborative reanalysis of individual data from 53 epidemiological studies, including 58 515 women with breast cancer and 95 067 women without the disease, found out that smoking has little or no independent effect on the risk of developing breast cancer (Hamajima *et al*., 2002).

Croghan *et al.* (2009) from the Mayo Clinic have reported that women who have smoked 100 or more cigarettes in their life have a significantly increased risk of 25% for developing breast cancer; however this remains controversial. An active focus of research is whether passive smoking increases the risk of breast cancer.

2.4.3 Obesity

Overweight and obesity, as measured by high body mass index (BMI), moderately increases the risk of post-menopausal breast cancer. Post menopausal obesity is an established risk factor for breast cancer (Flegal *et al.*, 2002). Before menopause the ovaries produce most of the oestrogen in the body, and fat tissue produces a small amount of oestrogen. After menopause, when the ovaries stop making oestrogen, most of a woman's oestrogen comes from fat tissue. Having more fat tissue after menopause increases a woman's chance of getting breast cancer. A case-control study conducted by Mayberry (1994) showed a more than four times greater breast cancer risk for severely obese women (BMI $\geq$ 32.3 kg/m^2) relative to those whose BMI were less than 24.90 kg/m^2. Another study conducted by Smith-Warner *et al.* (2001) also did not show particularly strong or consistent association between high body mass index and obesity for breast cancer. While body mass index and obesity were found to be associated with an increased risk of occurrence of breast cancer among African-American women, a study by Ijaduola and Smith (1998) among West-African women did not show any statistical difference from that of the rest of the population matched for age and sex.

2.4.4 Physical Activity

A systematic review of literature by Monninkhof *et al.* (2007) showed strong evidence for an inverse association between physical activity and postmenopausal breast cancer with risk reductions ranging from 20% to 80%. Although some epidemiologic studies have found an association between physical activity and breast cancer risk, this has not

been a consistent finding. For premenopausal breast cancer, however, the evidence was much weaker. A study among Hispanic and non Hispanic white women by Gilliland *et al*. (2001) showed decreasing breast cancer risk with increasing level of physical activity for pre- and postmenopausal Hispanic women while physical activity was protective only among postmenopausal non-Hispanic White women. Another study done in Germany by Steindorf *et al*. (2003) also did not show any association between total physical activity and premenopausal breast cancer.

CHAPTER THREE

METHODS

3.1 STUDY SITE

The study was carried out at the Korle Bu Teaching Hospital. It is a tertiary teaching hospital and a referral center. The hospital is located in the Ablekuma South Submetro within Accra Metropolitan Area which has a population of about 3 million people.

It has an average daily attendance of 1,000 patients and about 120 patients are admitted daily. Most cancer cases in the country, amongst which are patients with breast cancer, are referred daily to the Department of Surgery at the Korle Bu Teaching hospital for treatment and management, partly because the hospital has a Radiotherapy Department.

The Korle Bu Teaching Hospital Breast Cancer Clinic was established at the Radiotherapy Department in 2002 by Surgeons and Oncologists to address the need for proper information, consultation, treatment, follow up and further education on breast cancer and its management. Breast cancer patients, who are seen and treated by Surgeons in the four Surgical Department of the hospital and referrals from other West African countries, are also followed up at the Breast Clinic. The Radiotherapy Department has been keeping a database on all patients since 2007.

Data collected from the Radiotherapy Unit at the Korle Bu Teaching Hospital indicates an increase in patients for breast cancer treatment from 160 to 249, from 2008 to 2009. Between May, 2009 and June, 2010, 288 breast cancer incident cases were seen at the Radiotherapy Department; a little over 70% were Ghanaians.

3.2 STUDY DESIGN

The study design was an unmatched case-control, conducted between May and July, 2010 using quantitative methods of data collection and anthropometric measurements; none of the variables were matched.

3.3 STUDY POPULATION

The study population was confirmed incident female breast cancer patients attending the Korle Bu Teaching Hospital Breast Cancer Clinic and their female family members as controls.

3.3.1 Cases

Inclusion Criteria:

- All women between 20 and 75 years with confirmed diagnosis of breast cancer between May, 2009 and June, 2010, attending clinic at the Korle Bu Teaching Hospital, who gave their consent.

Exclusion Criteria:

- Patients with other cancers or severe immuno-compromising diseases
- Female breast cancer patients below the age of 20 years (breast cancer among women below 20 years is uncommon)
- Patients diagnosed before May, 2009, to avoid recall bias

3.3.2 Controls

Inclusion Criteria:

- Female relatives of patients between 20 and 75 years with no known history of breast cancer

Exclusion Criteria:

- Female relatives of cases below the age of 20 years,
- Female relatives of cases suspected of breast cancer

3.4 SAMPLE SIZE

Using Epi Info Version 3.3.2, a sample size of 144 cases was calculated for the study. It was calculated to achieve a Confidence Interval (CI) of 95% at 5% level of significance and to have a power of 80%. This was to detect an Odds Ratio (OR) of at least 3.0, if 7.3% of the population is exposed to tobacco smoking (GDHS, 2008).

Taking into consideration possible low prevalence of smoking and alcohol consumption among women in Ghana and to make up for opting out, the recommended sample size was increased by approximately 10% for the purpose of this study so that the total number of respondents was 310. Since the prevalence of some of the documented risk factors of breast cancer, such as post menopausal hormone replacement therapy, were not available and prevalence of most risk factors for breast cancer has not been documented in Ghana, the figure used as the least exposure prevalence was smoking, which was derived from the Ghana Demographic Health Survey, 2008. Due to budgetary and time constraints, 126 cases and 126 controls were used in this study.

3.5 SAMPLING TECHNIQUE

Using the appointment book, which records names of breast cancer patients, who have to visit the Radiotherapy Department for chemotherapy, radiotherapy or follow up, all breast cancer patients that met the inclusion criteria were listed for each day during the study. The first case was selected daily by simple random sampling, a number between one (1) and three (3) was selected from a ballot box, after which the others were selected by systematic sampling with a sampling interval of two. Mondays and Tuesdays were consulting days for breast cancer patients, on these days up to 44 patients are seen, up to 10 of them incident cases. On the remaining days of the week, an average of 18 to 22 breast cancer patients were seen daily for treatment, chemo- and radiotherapy, of this number 4 to 8 were incident cases.

3.6 DATA COLLECTION TOOLS, TECHNIQUES AND PROTOCOL

3.6.1 Data Collection Techniques and Tools

A standardized questionnaire, partly adapted from the WHO Stepwise Approach to chronic disease risk factor surveillance (STEPS), was designed and used. Most of the questions were closed ended. The research assistants administered these structured questionnaires with information on demographic, reproductive, hormonal and behavioural factors to both cases and controls and took physical measurements of the weight, height, waist and hip circumference of respondents to calculate their body mass indices and waist hip ratios. Controls filled the same questionnaire, but were asked to omit question 5, which asked cases about time of breast cancer diagnosis.

3.6.2 Physical Measurements

Physical measurements were taken to calculate the level of obesity among respondents using BMI and WHpR.

3.6.2.1 Weight

An electronic scale was used to measure body weight of the respondents with an accuracy of + or – 0.1 kg. The scale was calibrated daily and set at 0.00 before subjects were weighed. Subjects were weighed without shoes and minimal clothes.

3.6.2.2 Height

Using a commercial stadiometer "microtoy", height was measured without shoes to the nearest 0.1cm with respondents' shoulders in a relaxed position and arms hanging freely.

3.6.2.3 Body Mass Index (BMI)

BMI was calculated as body weight in kilograms (kg) divided by the square of the height in meters (m^2). Using the WHO International Classification of adult underweight, overweight and obesity according to BMI, participants were classified as being overweight if they have a BMI more or equal to 25 kg/m^2, but less than 30. Severely obese respondents were defined as those who have a BMI more or equal to 30 kg/m^2.

3.6.2.4 Waist and Hip Ratio (WHpR)

Waist circumference was measured in the middle between the 12^{th} rib and the iliac crest at the level of the umbilicus, while the hip circumference was measured at the

fullest point of the buttocks. To obtain the WHpR, the ratio of the circumference of the waist to that of the hips was calculated. Using the WHO STEPs guideline, participants were classified as being overweight or obese if they have a WHpR more than 0.85.

3.6.3 Training of Research Assistants

Research assistants were trained before the pre-testing was done. This helped them give same interpretation to the questions, how to administer the questionnaire and how to collect and examine them for inconsistencies and completeness. Guidelines for physical measurements were discussed to ensure uniform and correct techniques.

3.6.4 Pre-Testing

Pre-testing of questionnaire and equipments was done at the Surgical Department of the 37 Military Hospital prior to commencement of the study to enable modification and corrections of the procedure. The following were also evaluated during the pretesting:

- Reliability of questionnaire
- Average time needed to administer questionnaire
- Sequence of questions and their clarity
- Evaluating the success of training of research assistants

3.6.5 Quality Control

To check for quality control, 25 (10%) of the completed questionnaires were selected at random by the principal investigator and the respondents re-interviewed.

3.6.6 Data Processing and Analysis

Data was entered and analyzed in SPSS16.0 and Microsoft excel. Data collected from all 252 respondents were cleaned and included in the analysis. Where appropriate, results were presented as means ± standard deviation. Univariate analysis (Odds ratio) was performed for all variables; those that were statistically significant (p-value<0.05) were run in a multiple logistic regression model (multivariate analysis) with breast cancer as the outcome, to identify risk factors that are strongly associated with breast cancer (p-value<0.05).

In interpreting the results, an odds ratio (OR) less than one (1) means the variable is not a risk factor for breast cancer, but may be protective. An OR of one (1) means there is no association between the variable and breast cancer whiles an OR greater than 1 means that the variable increases the risk of breast cancer.

3.6.7 Ethical Consideration

Ethical approval was sought and received from the Research and Development Division, GHS. In addition, permission to conduct the study was sought from the Administration and the Radiotherapy Department of the Korle Bu Teaching Hospital. Written and verbal consent was obtained from each participant in the desired age-bracket who volunteered to participate in the study. The study objectives and protocol were explained to every respondent and they were given the opportunity to ask questions and seek clarification on the information given, before obtaining their signature or thumbprint as proof of consent.

3.6.8 Limitations of the study

- Recall bias: Women who had developed breast cancer were, on average, more likely than other women to disclose previous induced abortions.
- The respondents being unable to recall events that occurred more than 20 years ago, such as age at menarche, to enable them answer correctly.
- Missing data on physical measurements by uncooperative study participants.
- Sample size: Due to financial and time constraints, limited number of cases and controls were used in the study.

CHAPTER FOUR

RESULTS AND FINDINGS

4.1 DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

The study included 126 female incident cases and 126 female controls. Data from all two hundred and fifty two respondents were included in the analyses, after data cleaning. The data showed no outliers and was normally distributed.

4.1.1 Age Group Distribution Cases and Controls

The mean age of the entire study population was 46.3 ± 10.1 and mean ages of cases and controls were 47.7 ± 9.3 and 44.8 ± 10.6 respectively. The age distribution of cases and controls is shown in Figure 4.1below:

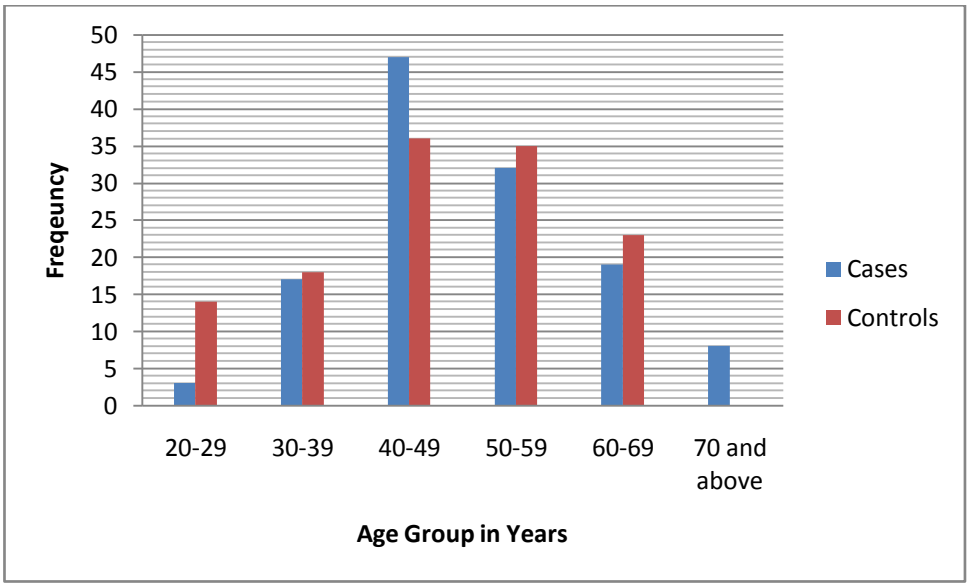

Figure 4.1 Showing Age Distribution of Cases and Controls

From Figure 4.1, breast cancer incident rates were highest among cases in the modal group, 40 to 49 years (37.3%) and in the age bracket 50 to 59 years (25.4%). Put together the two age groups represented almost two-thirds of cases (62.7%). The remaining 37.3% was distributed between the other 4 age groups: 20 to 29years (2.4%), 30 to 39 years (13.5%), 60 to 69 years (15.1%) and 70 years and above (6.3%). The age group distribution of controls

was similar to that of cases with a greater proportion of controls found in the modal group 40 to 49 years (28.6%) and age bracket 50 to 59 years (27.8%). This represents more than half (56.4%) of control subjects. The remaining 43.6% was distributed between the other 4 age groups: 20 to 29years (11.1%), 30 to 39 years (14.3%) and 60 to 69 years (18.3%). There was no control subject within the 70 to 79 years age bracket.

TABLE 4.1 Showing Demographic Characteristics of Cases and Controls (Univariate Analysis)

		STATUS					
		Case		Control			
		Frequency	%	Frequency	%	OR (95%CI)	p-value
age group	Premenopausal (< 45 years)	48	38.1	54	42.9	1.42(0.57,3.50)	0.45
	Postmenopausal (≥ 45 years)	78	61.9	72	57.1		
educational status	no formal education	55	43.7	12	9.5	12.86(4.14,39.97)	0.0
	some formal education	71	56.3	114	90.5		
marital status	single	54	42.9	65	51.6	0.32(0.11,0.91)	0.03
	married	72	57.1	61	48.4		
employment status	not employed	23	18.3	21	167.0	0.81(0.27,2.48)	0.72
	employed	103	81.7	105	83.3		

4.1.2 Menopausal Status

Most of the women included in this study were postmenopausal, 45 years and above: 61.9% cases and 57.1% controls. Although not statistically significant, premenopausal women had 1.42 times higher risk of developing breast cancer ($CI_{95\%}$ 0.57, 3.50).

4.1.3 Educational Status

From table 4.1, 43.6% of cases and 9.5% of controls had no formal education. These women with no formal education had an increased risk of developing breast cancer, OR=12.86 ($CI_{95\%}$ 4.14, 39.97); this result was statistically significant. Cases were 12 times more likely to have no formal education than controls.

When educational status was further examined by menopausal status, 61.8% of the 55 cases and 83.3% of 12 controls who have no formal education, were 45 years and above (postmenopausal).

4.1.4 Marital Status

Marital status was classified as single or married with respondents who are single, separated or divorced grouped as single. Ceremonial marriage and respondents living together with their partners were classified as married. Out of a total of 252 women, 54 cases were single and 72 married while 65 controls were single and 61 married. Being single was not a risk factor for developing breast cancer, this finding was statistically significant, OR=0.32($CI_{95\%}$ 0.11, 0.91).

4.1.5 Employment Status

A woman was classified as employed if she was engaged in either skilled or unskilled labour. Majority of the 126 respondents in each group (103 cases and 105 controls) were currently

employed while 23 cases and 21 controls were unemployed. A comparison between the two groups, those employed and unemployed, showed that employment was not a risk factor for breast cancer OR= 0.81($CI_{95\%}$ 0.27, 2.48) though this finding was not statistically significant.

4.2 REPRODUCTIVE RISK FACTORS FOR BREAST CANCER

Reproductive risk factors were compared between cases and controls as shown in Table 4.2 below:

TABLE 4.2 Showing Reproductive Risk Factors for Breast Cancer by Cases and Controls

(Univariate Analysis)

		STATUS					
		Case		Control			
		Count	%	Count	%	OR (95%CI)	p-value
family history of breast cancer	Yes	67	53.2	51	40.5	4.29(1.63,11.28)	0.00
	No	22	17.5	45	35.7		
age at menarche	< 13 years	74	58.7	68	54	1.75(0.67, 4.57)	0.25
	≥13 years	46	36.5	50	39.7		
parity	nulliparous	15	11.9	13	10.3	0.00	1.00
	children	111	88.1	113	89.7		
age at first full term pregnancy	15-25 years	83	65.9	84	66.7	0.45(0.15, 1.36)	0.16
	≥ 26 years	28	22.2	28	22.2		
breast fed before	ever	103	81.7	108	85.7	0.20(0.02, 1.71)	0.14
	never	23	18.3	18	14.3		
induced abortion	ever	62	49.2	57	45.2	1.87(0.77, 4.57)	0.17
	never	64	50.8	69	54.8		
miscarriage	ever	52	41.3	36	28.6	1.38(0.54, 3.52)	0.50
	never	74	58.7	90	71.4		

4.2.1 Family History of Breast Cancer

Out of 126 cases and controls, 29.3% cases and 23.8% controls did not know the history of breast cancer in their families. Of the women who knew the history of breast cancer, 53.2% cases and 40.5% controls had a positive family history of breast cancer while 17.5% cases and 35.7% controls had no family history of breast cancer. Positive family history of breast cancer included both first and second degree

relatives. First-degree female relatives were grandmothers, parents or sisters and second degree relatives were maternal or paternal. A family history of breast cancer in one relative conferred a significant increase in the risk of developing breast cancer, OR=4.29 ($CI_{95\%}$ 1.63, 11.28).

4.2.2 Age at Menarche

There were 14 values missing from 8 cases and 6 controls. These women, who were above the age of 50 years, did not remember their age at menarche. Comparison was therefore made between 118 cases and 120 controls. Age at menarche was grouped into: before 13 years (early menarche) and 13 years and above (late menarche). The data shows relatively younger ages at menarche, 74 cases and 68 controls experienced early menarche while 46 cases and 50 controls experienced late menarche. Although not statistically significant, women who experienced early menarche had a 1.75 higher risk of breast cancer ($CI_{95\%}$ 0.67, 4.57).

4.2.3 Parity

From table 4.2, the risk of breast cancer for nulliparous women compared to women who had children could not be established, OR=0.00. Thirteen case subjects and fifteen control subjects had never been pregnant; most of these women were between the ages of 20 to 29 years and single. One hundred and eleven (111) cases and one hundred and thirteen (113) controls had children. Of these parous women, 49.2% cases and 52.4% controls had one to three children, while 38.9% cases and 37.3% controls had four or more children. No statistically significant association was found between a woman having children and breast cancer, p-value=1.00.

4.2.4 Age at First Full Term Pregnancy

Age at first full term pregnancy ranged between 15 to 35 years with the mean age at 22.87±4.59 years for the entire study population. The mean age for cases was 23.05±4.9 years and that for controls 22.7±4.29 years. Age at first full term pregnancy was considered for 15 to 25 years and 26 years and above. Thirteen cases and fifteen controls had never been pregnant; most of these women were between the ages of 20 to 29 years.

Almost the same number of cases and controls, 65.9% and 66.7% respectively, had their first full term pregnancy between 15 to 25 years, while 23.8% cases and 21.4% controls were 26 years or older at their first full term pregnancy. Although early age at full term pregnancy, between 15 to 25 years, showed a decrease in the risk of breast cancer by 0.45($CI_{95\%}$ 0.15, 1.36), it was not statistically significant.

4.2.5 Breastfeeding

Out of 252 respondents, 110 cases and 103 controls had breastfed in their lifetime. Two (2) cases and eight (8) controls with children had never breastfed due to postpartum complications. Fourteen (14) of the 23 cases and 15 of the 18 controls who had never breastfed were between the ages of 20 and 27 years.

Duration of breastfeeding was examined among parous women in the two groups by adding up the number of months each respondent had ever breastfed; this was grouped into less than 18 months and 18 months or more. Although not statistically significant, the results showed that breastfeeding was a protective factor against breast cancer, OR=0.20($CI_{95\%}$ 0.02, 1.71).

When breastfeeding habits was further examined by duration of lactation, the results showed that 60.0% cases and 41.0% controls had breastfed for less than 18 months while 40.0% cases and 59% controls had breastfed for 18 months or more.

Although lactation was practiced frequently among both case and control groups, controls breastfed for longer duration than cases (Table 4.2). Breastfeeding for 18

months or more, was found to be protective compared to breastfeeding for less than 18 months, OR=0.43 ($CI_{95\%}$ 0.25, 0.75).

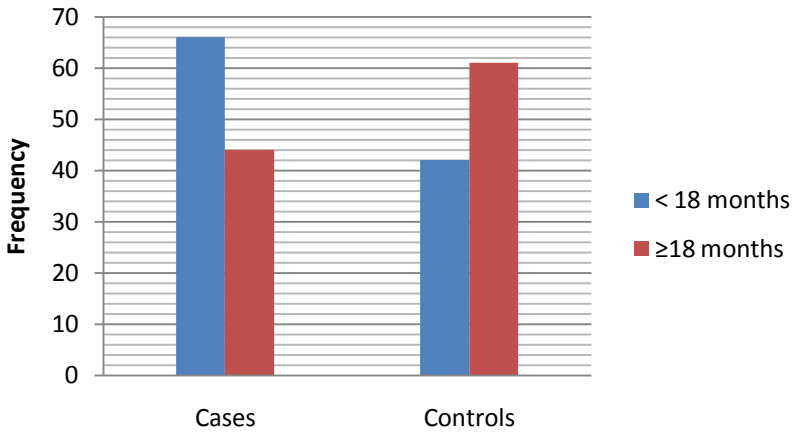

Figure 4.2 Showing Breastfeeding Habits among Cases and Controls

4.2.6 Induced Abortion

Sixty four (64) of the 126 cases and 69 of the 126 controls had never had an induced abortion while 62 cases and 57 controls had induced an abortion in their lifetime. Women with at least one induced abortion had a risk of 1.87 relative to those who had none, although this was not statistically significant ($CI_{95\%}$ 0.77, 4.57).

4.2.7 Miscarriages

Over 58.0% cases and 71.0% controls had never experienced a miscarriage, while about 42.0% cases and 29.0% controls had experienced at least one miscarriage in their lifetime. The risk of developing breast cancer among women who had experienced a miscarriage before was 1.38 compared to women who had never experienced a miscarriage ($CI_{95\%}$ 0.54, 3.52). The rate of miscarriages increased significantly with age among cases but varied less among the controls (Table 4.2). This association was however not statistically significant.

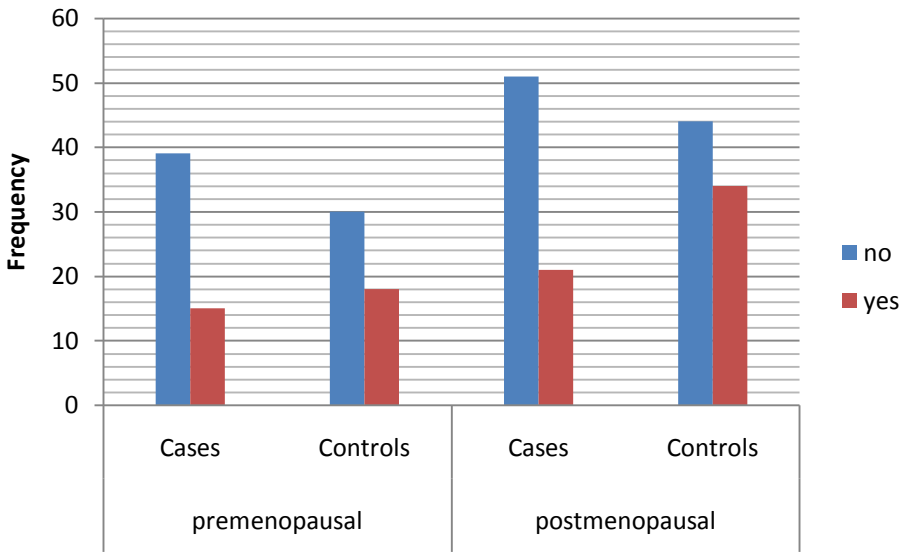

Figure 4.3 Showing Miscarriages among Cases and Controls by Menopausal Status

4.3 HORMONAL RISK FACTORS FOR BREAST CANCER

Hormonal risk factors were compared between cases and controls as shown in Table 4.3 below:

TABLE 4.3 Showing Hormonal Risk Factors for Breast Cancer by Cases and Controls (Univariate Analysis)

		STATUS					
		Case		Control			
		Count	%	Count	%	OR (95%CI)	p-value
Birth control pills	ever	42	33.3	40	31.7	0.85(0.34,2.10)	0.72
	never	84	66.7	86	68.3		
Post menopausal therapy	ever	3	2.4	2	1.6		
	never	123	97.6	124	98.4		

4.3.1 Oral Contraceptive Usage

Out of 252 respondents, 66.7% cases and 68.3% controls had never used oral contraceptives while 33.3% cases 31.7% controls had used oral contraceptive for a minimum of 4 to 6 months. The use of oral contraceptives is not a risk factor for breast cancer, OR=0.85($CI_{95\%}$ 0.34, 2.10), however this association was not statistically significant.

4.3.2 Post Menopausal Hormonal Replacement Therapy

Of the 78 cases and 72 controls postmenopausal women, only 3 cases and 2 controls had ever used post menopausal hormonal replacement therapy. Since this figure was very small and insignificant (p-value=0.35), an independent association with post menopausal hormonal replacement therapy was not included.

4.4 BEHAVIOURAL RISK FACTORS FOR BREAST CANCER

Lifestyle risk factors were compared between cases and controls as shown in table 4.4 below:

TABLE 4.4 Showing Behavioural Risk Factors for Breast Cancer (Univariate Analysis)

		STATUS					
		Case		Control			
		Count	%	Count	%	OR (95%CI)	p-value
physical activity in last 6 months	yes	65	51.6	45	35.7	4.65(1.85,11.66)	0.01
	no	61	48.4	81	64.3		
alcohol consumption	ever	42	33.3	57	45.2	0.54(0.22, 1.31)	0.17
	never	84	66.7	69	54.8		
smoked tobacco product	ever	26	4.8	6	20.6	7.94(1.91,33.05)	0.00
	never	100	95.2	120	79.4		

4.4.1 Physical Activity

Physical activity in this study is defined as work involving vigorous or moderate-intensity activity or vigorous-intensity sports, fitness or recreational activities that cause increases in breathing or heart rate in the last 6 months such as brisk walking or skipping. Out of a total of 252 women in this study, 51.6% cases and 35.7% controls had been actively engaged in various kinds of physical activities in the last 6 months while 48.4% cases and 64.3% controls had not engaged in any form of physical activity in the last 6 months. Women who actively engaged in physical activity had 4.65 higher risk of breast cancer than those who did not ($CI_{95\%}$ 1.85, 11.66).

4.4.2 Alcohol Consumption

Interestingly, 66.7% of cases and 54.8% of controls had never drunk an alcoholic beverage, not even communion wine. Of the 252 women 33.3% cases and 45.3% controls had drank an alcoholic beverage in their lifetime. Almost all cases claimed to have stopped drinking alcohol after their diagnosis of breast cancer. Although not statistically significant, drinking alcoholic beverages was not a risk factor for breast cancer, OR=0.54($CI_{95\%}$ 0.22, 1.31).

4.4.3 Smoking

Out of a total of 252 respondents, 26 cases and 6 controls had smoked at least a minimum of one stick of cigarette for three months. There was a 7.94 higher risk for breast cancer among women who smoked ($CI_{95\%}$1.91, 33.05). This result was significant. When smoking was further examined separately by menopausal status, the significance was established among the postmenopausal cases group (p-value= 0.00) where18 of the 26 cases had smoked compared with 3 out of 6 controls.

4.4.4 Obesity

As indicators for obesity, the mean of anthropometric measurements of study participants were calculated for BMI and WHpR. Measurements of 18 women were missing as a result of uncooperative study participants.

4.4.4.1 Body Mass Index (BMI)

BMI was compared between cases and controls as shown in table 4.5 below:

TABLE 4.5 Showing Anthropometric Measurements for BMI

	STATUS				
	Entire study population	n = 120 Cases	n = 122 Controls		
	Mean values of the anthropometric measurements for BMI (kg/m^2)			OR (95%CI)	p-value
weight	74.31±16.46	71.38±16.99	77.24±15.43	1.04(0.96,1.12)	0.38
height	161.74±13.07	158.32±14.96	165.16±9.79	1.04(0.95, 1.14)	0.43
BMI	28.01±11.77	29.85±13.61	26.31±9.52	0.97(0.81, 1.16)	0.76

Although height differences between cases and controls were not of statistical significance, OR = 1.04 ($CI_{95\%}$0.95, 1.14), cases tended to be shorter. Cases and controls showed no significant differences in weight, although cases weighed less than controls in this study.

The average BMI for both groups and the entire study population showed each group was overweight or obese ($25kg/m^2$<BMI<$30.0kg/m^2$) although cases showed a higher BMI value than controls. None of the measurements, weight, height or BMI, were statistically significant (p-values of 0.38, 0.43 and 0.76 respectively).

4.4.4.2 Waist-Hip Ratio

WHpR was compared between cases and controls as shown in Table 4.6 below:

TABLE 4.6 Showing Anthropometric Measurements for WHpR

	STATUS				
	Entire study population	n = 121 Cases	n = 123 Controls		
	Mean values of the anthropometric measurements for WHpR			OR (95%CI)	p-value
waist circumference	89.21±16.65	90.30±18.25	88.09±14.84	0.95(0.71.1.27)	0.72
hip circumference	107.30±18.73	109.84±19.51	104.71±17.62	1.02(0.80,1.29)	0.89
WHpR	1.90±5.91	0.82±0,06	2.93±8.13	4105.4(0.0,0.0)	0.61

The WHpR for the cases is within the norm (0.85) while that of the entire study population and controls show twofold and threefold values respectively. These results were however not statistically significant (p-values of 0.72, 0.89 and 0.61 for weight circumference, hip circumference and WHpR respectively).

4.5 MULTIVARIATE LOGISTIC REGRESSION RESULTS FOR ASSOCIATIONS OF BREAST CANCER AMONG CASES

Multivariate logistic regression was run on all risk factors that were statistically significant, with p-values less than or equal to 0.05 and 0.10, to test for associations of breast cancer among cases. Both p-values gave the same results. The results of associations of breast cancer among cases are shown in Table 4.7 below:

Table 4.7 Showing Multivariate Logistic Regression Results for Associations of Breast Cancer among Cases

		STATUS					
		Case		Control			
		Count	%	Count	%	OR (95%CI)	p-value
Family history of breast cancer	Yes	67	53.2	51	40.5	2.63(1.26,5.48)	0.01
	No	22	17.5	45	35.7		
Marital status	Single	54	42.9	65	51.6	0.60(0.29,1.22)	0.16
	married	72	57.1	61	48.4		
Educational status	no formal education	55	43.7	12	9.5	9.37(3.86,22.70)	0.00
	some formal education	71	56.3	114	90.5		
smoked tobacco product	Ever	26	20.6	6	4.8	4.24 (1.38,12.98)	0.01
	Never	100	79.4	120	95.2		
Physical activity in the last 6 months	Yes	65	51.6	45	35.7	2.92 (1.44,5.89)	0.00
	No	61	48.4	81	64.3		

The results of univariate analysis showed that educational status, family history of breast cancer, smoking habits, physical activity in the last six months and marital status were the only statistically significant risk factors for breast cancer.

A multivariate logistic regression was run on these risk factors, and four out of the five initially significant risk factors from the univariate analysis, were found to be strongly associated with breast cancer in this study; these were educational status, family history of

breast cancer, smoking habits and physical activity in the last six months (OR of 9.37, 2.63, 4.24, 2.92 respectively).

CHAPTER FIVE

DISCUSSION

This case-control study was designed to determine reproductive, hormonal and lifestyle risk factors for breast cancer among breast cancer patients at the Korle Bu Teaching Hospital. Although breast cancer is said to be the leading malignancy, accounting for 15.4% of all malignancies in Ghana and is on the increase (Badoe, 2000) there is currently no information available on breast cancer risk factors among Ghanaian women to guide preventive strategies and reduce the public health burden of the disease.

There are several theories suggesting possible risk factors for breast cancer. Most of them point to reproductive, hormonal and behavioural patterns and or other factors such as genetic influences, tumour biology, socioeconomic status and access to health care as possible risk factors for breast cancer. The results of this study showed statistically significant associations between breast cancer and educational status, family history of breast cancer, smoking habits and physical activity in last six months. No significant association was found between hormonal risk factors and breast cancer.

Women with no formal education in this study population had a significantly higher risk of developing breast cancer (OR of 12.86 in the univariate analysis and 9.37 in the multivariate analysis). This is contrary to findings from a study conducted in the USA, where educational attainment of 60% was the strongest risk factor observed (McCullough *et al.*, 2005). The present finding could be due to lack of education; women may be unaware of the preventive measures that may be available against breast cancer. Again, most of the women with no formal education were 45 years and above. This difference between the educational status of younger and older age groups may be attributed to low patronage of girl-child education in the past.

Family history of breast cancer was one of the most significant risk factors for breast cancer in both univariate and multivariate analyses, OR of 4.29 and 2.63 respectively. More than two-thirds of cases and half of the controls reported a family history of breast cancer and the percentage of cases reporting a mother with breast cancer was more than 2 times the percentage reported by controls. This reflects shared cultural factors, genetic predisposition or both. Other studies, such as that by Nemesure *et al.* (2009) also reported statistically significant associations between a family history of breast cancer and the risk of developing breast cancer.

Smoking is not common practice among indigenous women and only 32 women in this study reported they had ever smoked cigarettes; the number of women with breast cancer who had ever smoked was four times that of women who did not have breast cancer. Similar findings have been reported by Croghan *et al*. (2009); this study showed that women who had smoked 100 or more cigarettes in their life had a significant increased risk of 25% of developing breast cancer. However, Hamajima *et al.* (2002) found no significant effect of smoking on breast cancer. Unfortunately there is no known study in Ghana or Africa on the effect of passive smoking and household smoke during cooking using firewood or fuel.

Women who did some form of physical activity in the last six months were at a higher risk of breast cancer compared to those who did no physical activity (OR= 4.65 in univariate analysis and 2.92 in the multivariate analysis). The present finding seemed unusual and tends to suggest that no physical activity is protective. This result could be due to the sample size used. Another explanation may be that more cases have started exercising with the hope of influencing the outcome of their disease. The

results of this study is contrary to findings by Monninkhoh *et al*. (2007), who reported strong evidence for an inverse association between physical activity and postmenopausal breast cancer and a much weaker association for premenopausal breast cancer.

When grouped into intervals of 10 years, the study showed breast cancer incident rates were higher among cases that were between the ages of 40 to 49 years and 50 to 59 years. This result is similar to findings of a study conducted at the Korle Bu Teaching Hospital, which showed that breast cancer continues to affect women, mostly between the ages of 40 and 49 years (Clegg-Lamptey and Hodasi, 2007). Another study conducted in Nigeria showed breast cancer patients were more likely to be premenopausal at diagnosis and another smaller peak incidence occurring between 56 and 65 years of age (Ijaduola and Smith, 1998).

Risk factors such as early menarche, nulliparity and late age at first full term pregnancy have been listed among potential risk factors in African-American women (Newman, 2005). These factors would normally lead to an increase in higher endogenous oestrogen levels over a woman's lifetime, thereby increasing breast cancer risk. Laing *et al*. (1993) did not find the expected trend of an increasing risk for breast cancer with decreasing age at menarche among African Americans and another study by Ijaduola and Smith (1998) among West-African women showed that age at menarche, ranging between 12 and 20 years did not appear to be a risk factor. Similarly, the results of this study did not establish age at menarche as a predictor of breast cancer.

An association between parity and breast cancer could not be established in the univariate analysis. This is contrary to the Black Women's Health Study by Palmer *et al.* (2003) and a study conducted by Newman (2005) which reported an increased risk for breast cancer for women younger than 45 years, who had two or more children, and a decreased risk among women aged 45 years and older.

Although findings from a study conducted by Nemesure *et al*. (2009) have reported older age at first full-term pregnancy being associated with a slightly higher breast cancer risk compared to younger ages, this study showed no significant association between age at first full term pregnancy and breast cancer. This could be explained by earlier age at first full-term pregnancy among most African women.

Contrary to studies conducted in the United Kingdom (Woodman, 2002) and in the USA (Mayberry, 1994), breastfeeding was not significantly associated with breast cancer in this study. Breastfeeding for longer periods is said to be protective against breast cancer (Lane-Craypon, 1926, Mayberry, 1994) and most study participants who had ever breastfed had done so for at least twelve (12) months. There was also no significant association found between abortion, both induced and spontaneous and breast cancer. Most studies that have been done, have also not shown an association between induced or spontaneous abortion and breast cancer (Brewster *et al*., 2005, Beral *et al*., 2004), although Rookus *et al.* (1996) reported a 90% increase in breast cancer risk for parous women with a history of induced abortion in their study.

Although not statistically significant, the present study showed that oral contraceptive usage may likely be influencing a lower incidence of breast cancer. Post menopausal hormone-replacement therapy does not appear to be an issue because very few of the indigenous women, only 5 women (3 cases and 2 controls) in this study, had ever

used them. Nemesure *et al*. (2009) also found that the use of exogenous hormones was not a significant predictor of breast cancer among women of African descent. Contrary to these findings, other studies have found exposure to exogenous hormones such as oral contraceptives and post menopausal hormone-replacement therapy to result in an increase in the risk of breast cancer among both African-Americans and whites (Moorman *et al*., 2001, Mayberry, 1994, Beral, 2003).

Similar to findings of Steinberg and Goodwin (1991), this study found no causal association between alcohol consumption and breast cancer. However, a study by Hamajima et al. revealed that about 4% of breast cancers in developed countries may be attributable to alcohol consumption.

This study did not show any causal relationship between obesity and breast cancer. A study conducted by Ijaduola and Smith (1998) among West-African women in Nigeria also found that obesity among women with breast cancer was not statistically different from that of the rest of the population matched for age and sex.

Interestingly, about a quarter of the cases did not know of a family history of breast cancer. This could be attributed to the fact that some people in Ghana do not stay with their biological parents, but with relatives, or lose their parents at early ages without knowledge of their cause of death. Also post mortem may not have been performed to establish the cause of death of these relatives. Again due to the extended family system, some controls who accompanied the breast cancer patients to the Radiotherapy Unit of the Korle Bu Teaching Hospital were not necessarily close relatives.

Although not a part of this study, it was interesting to note that breast cancer patients, who were employed, were not subsidised by the government. Some patients admitted they withheld information about their employment status, in order to avoid payment of the expensive chemo- and radiotherapy treatment. The National Health Insurance Scheme does not pay for cancer treatment.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

In summary, the results of this study showed that there are causal relationships between family history of breast cancer, educational status, smoking habits among Ghanaian women and the risk of breast cancer.

Out of the 16 potential risk factors analyzed, only three (3) were strongly associated with the risk of breast cancer among the subgroup of Ghanaian women studied. Although other studies had shown some associations between the remaining 13 risk factors, this study did not show these factors as predictors of breast cancer. This may have been due to the sample size.

RECOMMENDATIONS

Although breast cancer is said to be on the increase globally, there is currently no data available to guide preventive measures in Ghana. The only available programme in the country is on awareness of early presentation of breast cancer. Since most patients visit the hospital with late presentation, this effort has not produced the desired results so far (Clegg-Lamptey and Hodasi, 2007), leading to earlier mortality than expected. There is therefore the need for early detection to reduce the public health burden of this disease. Based on the findings of this study the following are recommended:

a. Important policies be made and implemented by the Ministry of Health and Ghana Health Service under the non-communicable disease programme to screen women above the age of 40 years, particularly those with a family history of breast cancer. An educational programme should also be started at the Korle Bu Teaching Hospital on the need for screening of relatives of breast cancer patients.

b. Girl-child education should be intensified by the Ghana Education Service. In so doing, women will be able to read and acquire more information on preventive measures against breast cancer.

c. There is the need to educate all Ghanaians, if possible through the media, on the health implications of smoking, which is a risk factor for a lot of diseases including breast cancer. The Ministry of Health should intensify education on the health implications of smoking among school children through the School Health Education Programme (SHEP).

d. It is generally accepted that breast cancer is a complex multifactorial disease; likely the result of interacting genetic and environmental factors. Further investigations are therefore required with larger sample sizes, to identify and establish the true contribution of each statistically “non-significant” risk factor in

this study, which may be particularly important in the development of breast cancer in this and other populations of African origin.

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APPENDICES

1. INFORMED CONSENT FORM

Project Title

Risk factors for Breast Cancer among patients in the Korle Bu Teaching Hospital: A Case-Control study

Institutional affiliation

Department of Epidemiology, School of Public Health, College of Health Sciences, University of Ghana, Legon

Background

My name is Janet Tackie, a student from the School of Public Health, University of Ghana. I am conducting a study on possible factors causing breast cancer among women in Ghana. Breast cancer affects many women in Ghana but the factors causing this illness are unknown. It will therefore be helpful to know what factors may be causing breast cancer among women in Ghana. The study may also show what protects women from breast cancer. This is purely an academic research which forms part of my work for the award of a MPH Degree.

Procedures

You will be asked some questions about your family background, reproductive health, medication you take and your life style. In addition, measurements of your height, weight, waist and hip circumference will be taken.

Risks and Benefits

The study does not involve any risks. However, you may feel uneasy with some of the questions we will be asking you. Your responses will be very helpful to the study. The information you provide will contribute to knowledge on possible factors causing breast cancer. The findings of the study will inform the Regional Health Directorate about what behaviours to promote among women against breast cancer or inform them on preventive strategies to undertake to reduce the increasing numbers of breast cancer among women.

Right to refuse

Participation in this study is voluntary and you can choose not to answer any individual question or all the questions. You can also choose not to have your measurements taken. You are at liberty to withdraw from the study any time. However, I will encourage you to participate and complete the questions since your opinions are important to help design strategies to reduce breast cancer in Ghana.

Anonymity and Confidentiality

I would like to assure you that whatever information you will provide will be handled with strict confidentiality and will be used purely for research purposes. Your responses will not be shared with anybody who is not part of the study team. Data analysis will be done at the aggregate level to ensure anonymity.

The questionnaire will take 20 minutes. I will ask you the questions from the papers I am holding and mark your responses.

Dissemination of Results

The results of this study will be sent to you, if you provide us with your address below.

Before taking consent

Do you have any questions you wish to ask about the study? Yes ☐ No ☐

(If yes, questions to be noted below)

_____

_____

_____

If you have questions later, you may contact **Dr. Janet Tackie on 0244 807723**

Consent

I _____, declare that the purpose, procedures as well as risks and benefits of the study have been thoroughly explained to me in English/Ga/Akan language and I have understood. I ☐reby [agre☐ disagree] to participate in the study.

Signature/Thumbprint of Participant _____

Date: _____/_____/_____

Address:

_____

Interviewer's statement:

I, the undersigned, have explained this consent form to the subject in the English/Ga/Akan language. She understands the purpose of the study, procedures to be followed, as well as the risks and benefits involved. The subject has freely agreed to participate in the study.

Signature of Interviewer _____ Date: _____/_____/_____

2. SAMPLE OF QUESTIONNAIRE

RISK FACTORS FOR BREAST CANCER AMONG PATIENTS IN KORLE BU TEACHING HOSPITAL: A CASE-CONTROL STUDY

Form type ☐☐☐ Interviewer ID ☐☐☐ Participant ID ☐☐☐☐

Language of communication ☐☐☐☐☐☐☐ Date of Interview ☐☐ ☐☐ ☐☐

No.	QUESTIONS	VARIABLE NAME
	BACKGROUND OF RESPONDENTS	
01	What is your date of birth? ☐☐ ☐☐ ☐☐☐☐ Don't know 77 77 7777	Q1AGE
02	What is the highest level of education you have completed? No formal schooling ☐ Primary school completed ☐ Secondary school completed ☐ University completed ☐ Refused ☐	Q2EDUCTN

03	What is your marital status? Single ☐ Married ☐ Divorced ☐ a) before diagnosis ☐ b) after diagnosis ☐ Refused ☐	Q3MARIST
04	Which of the following best describes your main work status over the past 12 months? Government employee ☐ Non-government employee ☐ Self-employed ☐ Student ☐ Homemaker ☐ Retired ☐ Unemployed ☐	Q4EMPLY
05	At what age were you diagnosed with breast cancer? Years ☐☐	Q5AGDGN
06	Does any close relative of yours have breast cancer? No ☐ Yes ☐	Q6CLRLT, if no, please skip to Q8
07	Which close relative of yours has breast cancer? Grandmother ☐ Mother ☐ Mother's sister ☐ Sister ☐ Daughter ☐ Father's sister ☐	Q7WHRLT
08	Does any distant relative of yours have breast cancer? No ☐ Yes ☐	Q8DSRLT, if no, please skip to Q10
9	Which distant relative of yours has breast cancer? Maternal ☐ Paternal ☐	Q9WHDRL

10	At what age did your menstrual cycles begin? ☐☐ Years	Q10MENRC
11	Are you menopausal? ☐ No how old are you now? ☐☐ Years ☐ Just started, at what age? ☐☐ Years ☐ Postmenopausal, at what age? ☐☐ Years	Q11AGMEN
12	Do you have children? No☐ Yes☐	Q12CHLDR If no, please skip to Q17
13	How many children do you have? ☐☐	Q13NRCHD
14	At what age did you have your first full term pregnancy? Years ☐☐	Q14FFTPG
15	Have you breast fed before? No☐ Yes☐	Q15BSTFD
16	How many months all together did you breast feed your child(ren)? ☐☐☐	Q16DBRST
17	Have you ever had induced abortion? No☐ Yes☐	Q17INDAB
18	Have you experienced a spontaneous abortion? No☐ Yes☐	Q18SPNAB
19	Did you use birth control pills before your diagnosis? No☐ Yes☐	Q19BCP, if no, please skip to 21

20	For how long? ☐☐ Months/ Years	Q20BCPLT
21	Have you been/Were you on any post menopausal hormonal therapy before diagnosis? No ☐ Yes ☐	Q21PMHT, if no, please skip to 24
22	For how long? ☐☐ Months/ Years	Q22HTDUR
23	Does your work involve vigorous or moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking (or carrying light loads) for at least 10 minutes continuously? No ☐ Yes ☐	Q23WKEX, if no, please skip to 26
24	In a typical week, on how many days do you do vigorous or moderate-intensity activities as part of your work? ☐☐	Q24WDEX
25	How much time do you spend doing vigorous or moderate-intensity activities at work on a typical day? ☐☐	Q25WTEX
26	Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like skipping for at least 10 minutes continuously? No ☐ Yes ☐	Q26SPEX, if no, please skip to 50
27	In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities? ☐	Q27SDEX
28	How much time do you spend doing vigorous-intensity sports, fitness or recreational (leisure) activities on a typical day? ☐☐	Q28STEX

29	Did you ever consumed an alcoholic drink such as beer, wine, spirits (including akpeteshie) before your diagnosis of breast cancer? No ☐ Yes ☐	Q29ALCHL If no, skip to Q35
30	What type of alcohol did you usually take? Beer ☐ Wine ☐ Liquor and Spirit ☐	Q30TYDRK
31	When you drank alcohol, on average, how many standard alcoholic drinks did you have during one drinking occasion? ☐☐	Q31NALDR
32	What was the largest number of standard alcoholic drinks you had on a single occasion, counting all types of alcoholic drinks together? ☐☐	Q32LNALC
33	How often in a week did you consume alcohol ? ☐☐	Q33OFALC
34	How long did you consume alcohol before your diagnosis? ☐☐ Months/ Years	Q34DALC
35	Do you smoke/ have you ever smoked tobacco products? No ☐ Yes ☐	Q35ASMOK
36	How long have you been smoking/did you smoke? Months/ Years ☐☐	Q36BSMKD
37	How many cigarette sticks do/did you smoke in a week? ☐☐	Q37CSTKS

	PHYSICAL MEASUREMENTS	
M1	Device ID for weight ☐☐☐☐☐☐	M1SCL
M2	Weight ☐☐☐ Kg	M2WGHT
M3	Device ID for height ☐☐☐☐☐☐	M3MTP1
M4	Height ☐☐☐ m	M4HGHT
M5	Device ID for hip and waist ☐☐☐☐☐☐	M5MTP2
M6	Hip circumference ☐☐☐ cm	M6HIP
M7	Waist circumference ☐☐☐ cm	M7WAIST

You have finished answering the Questionnaire. Thank you