LYMPHEDEMA, POST BREAST CANCER TREATMENT AT KOMFO ANOKYE TEACHING HOSPITAL, KUMASI, GHANA

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LYMPHEDEMA, POST BREAST CANCER TREATMENT AT KOMFO ANOKYE TEACHING HOSPITAL, KUMASI, GHANA

by

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Bellville

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DECLARATION

I, **Miriam Owusu Sekyere,** declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology, Cape Town, South Africa.

Signed ..... Date August, 2011.....

ABSTRACT

To determine the incidence, risk factors and the treatment of lymphedema after breast cancer treatment at the oncology unit of KATH, Kumasi, Ghana from 01 January 2005 to 31 December 2008.

Descriptive retrospective survey was used. Using a data capture sheet, data was collected from the medical records of the breast cancer patients. Breast cancer and lymphedema-related variables were collected. Data was analyzed as descriptive statistics. Chi-square test was applied to determine whether or not two variables are independent variables.

Among 313 patients treated for breast cancer between 2005 and 2008, 31 (9.9%) developed lymphedema after treatment. A chi-square test showed that axillary lymph node dissection was statistically a significant risk factor of lymphedema (Chi-square test value=7.055, P value=0.008).

Radiation and late stage of breast cancer diagnosis may have contributed in development of lymphedema despite having P value > 0.05. Age, body mass index (BMI) and hypertension were also not associated with lymphedema.

Arm swelling, numbness, pain, stiffness and heaviness of the affected arm were found to be associated with lymphedema in this study.

Manual lymph drainage, compression garments and patient education on self management were the forms of treatment given to only 32.3% of the lymphedema

patients. Compression garments, pneumatic pumps and drugs were not used for treating lymphedema in this study.

This study provides evidence that the incidence of lymphedema was 9.9% with axillary lymph node dissection as the only statistically significant risk factor of lymphedema. Manual lymph drainage, compression bandage and patient education were used at KATH in treating lymphedema.

With majority of breast cancer patients presenting with late stage disease and also undergoing axillary lymph node dissection, lymphedema will continue to be a problem in Ghana. Knowing the incidence, risk factors, early signs and symptoms and the various treatment of lymphedema, not only helps in the early detection and effective treatment of lymphedema but also provides a base-line data for further research on lymphedema in Ghana.

Keywords: Breast cancer; surgery; axillary lymph node dissection; radiation; lymphedema; incidence; risk factors.

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To all friends and loved ones, I say, God bless you all.

The financial assistance of the National Research Foundation towards this research is acknowledged. Opinions expressed in this thesis and the conclusions arrived at, are those of the author, and are not necessarily to be attributed to the National Research Foundation.

DEDICATION

This thesis is dedicated to the blessed memory of Mrs. Ilona De Haas. An angel and a friend I met in Cape Town, who developed lymphedema after breast cancer treatment.

I was inspired by Ilona's battle with breast cancer-related lymphedema and therefore conducted this study in Ghana.

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LIST OF ABBREVIATION

AXLD: Axillary lymph node dissection

cGray: Centigray (unit of radiation)

Df: Degree of freedom, is equal to the number of subjects in the two groups, minus 2 (Polit &. Hungler, 1999:481).

CDT: Complete decongestive therapy

KATH: Komfo Anokye Teaching hospital

NLN: National lymphedema network

SNL: Sentinel lymph node

SNLB: Sentinel lymph node biopsy

TNM: Tumour-Node-Metastases

CHAPTER 1

1.1 OVERVIEW OF THE STUDY

Breast cancer-related lymphedema (hereafter referred to as lymphedema) is one of the most significant complications following breast cancer treatment (Helyer, Vanic, Le, Leong & McCready, 2010:48-54; Paskett, 2008:5666). It is presumed to occur due to the body's inability to drain lymph fluid from the tissues due to damage to the lymphatic system after axillary surgery and radiation (Lawenda, Mondry & Johnstone, 2009:11). The disruption in the lymphatic system decreases the transport capacity resulting in accumulation of protein rich fluid in the tissues which causes swelling, discomfort and pain of the affected body part (Poage, Singer, Armer, Pounall & Shellaberger, 2008: 951-964; Sakorafas, Peros, Cataliotti, Luigi & Vlastos, 2006:153-165). Once lymphedema occurs, it cannot be cured but it can be treated effectively.

Lymphedema is an under-studied worldwide condition which has resulted in inconsistencies occurring in the recorded incidence rate, the risk factors, the methods of defining lymphedema and its management (Paskett, 2008:5666).

This chapter describes the study setting, the problem statement, and the significance of the study. The aim and objectives of the study together with the research methods are described. The chapter concludes with a list of definitions and terms as they apply in this study and an overview of the succeeding chapters.

1.2 STUDY SETTING

A description of the setting of this study follows.

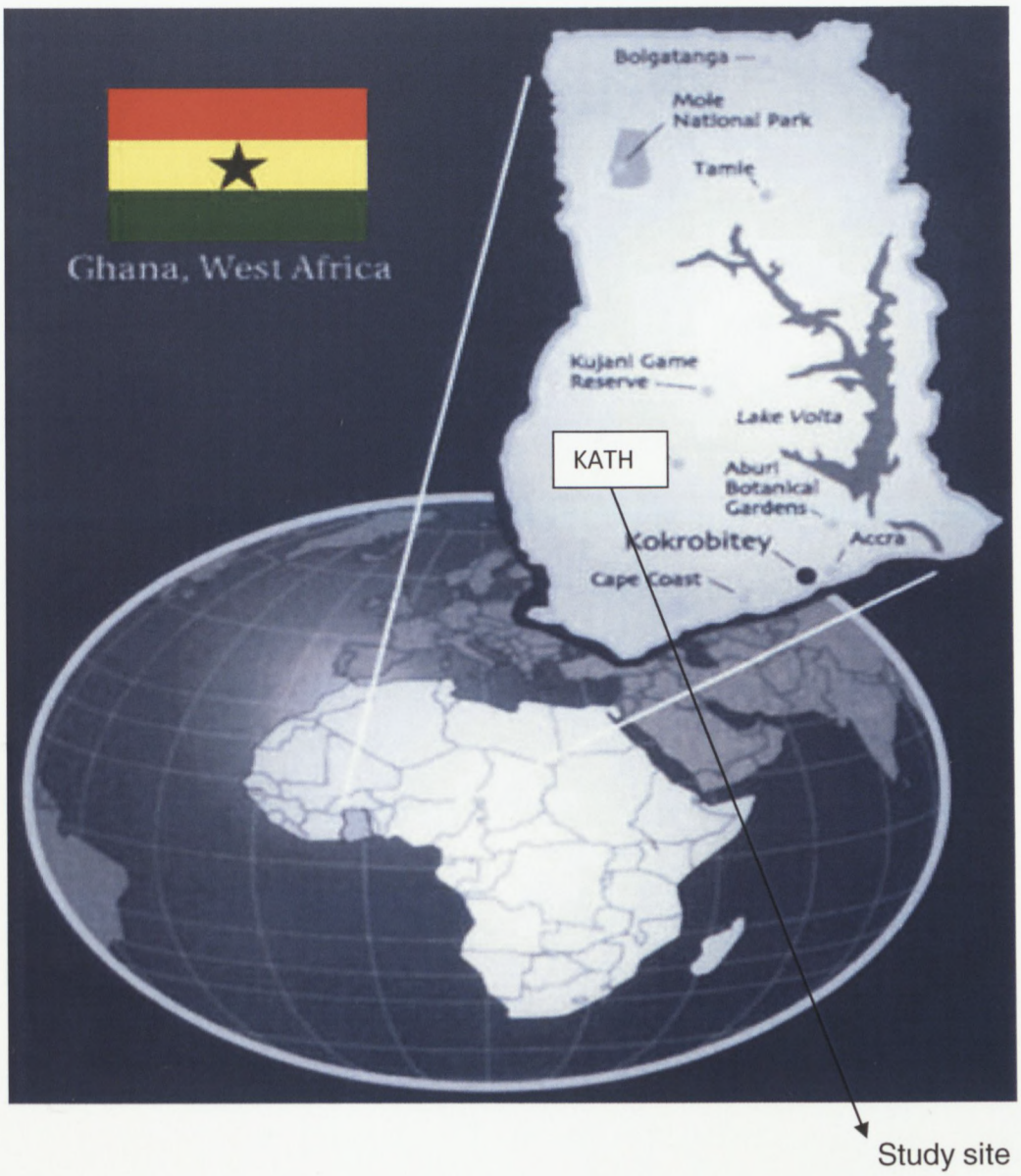

Figure 1.1 shows the study site (CIA World Factbook, 2011).

The oncology directorate (The National Centre for Radiotherapy and Nuclear Medicine) situated in the Komfo Anokye Teaching Hospital (KATH) in Kumasi, Ghana is the

setting for this study. Kumasi is the second largest city in Ghana with a population of 1,661,400 million people (CIA World Factbook, 2011).

KATH is a 1000-bed academic hospital and the most accessible tertiary hospital in the country due its location in the leading commercial area in Ghana. As a result, it receives referrals from eight out of the 10 regions of Ghana as well as from neighbouring countries such as Burkina Faso and Cote D'voire. KATH has a catchment area with a population of about 10 million people (KATH, 2010). This over burdens the health care professionals as well as the facility.

KATH is a teaching hospital for doctors, medical students, anaesthetists, nurses and other health professionals. The hospital registers over 450,000 outpatient department attendances and 43,000 admissions annually (KATH, 2010).

The oncology directorate is one of the clinical directorates of KATH where radiotherapy and chemotherapy treatments are offered to cancer patients (KATH, 2010).The oncology directorate receives referrals from the other directorates such as the surgical directorate and also makes referrals to the other directorates of the hospital.

1.2.1 Breast cancer situation at Komfo Anokye Teaching Hospital, Oncology.

The cancer report at KATH shows that breast cancer forms 20.9% of all cancers seen at the unit of which the majority (20.3%) are females and 0.6% males (KATH cancer report, 2007). As shown in figure 1.2, 60% of breast cancer patients referred to KATH oncology unit present with late stage breast cancer disease at a mean age of 50 years (KATH cancer report, 2007; Oncology directorate report, 2010). The factors contributing to late stage breast cancer include, lack of awareness about cancer prevention,

screening, early detection and treatment, together with poverty, limited access to medical care and the use of traditional medicine (KATH cancer report, 2007: Gullate, 2010:2).

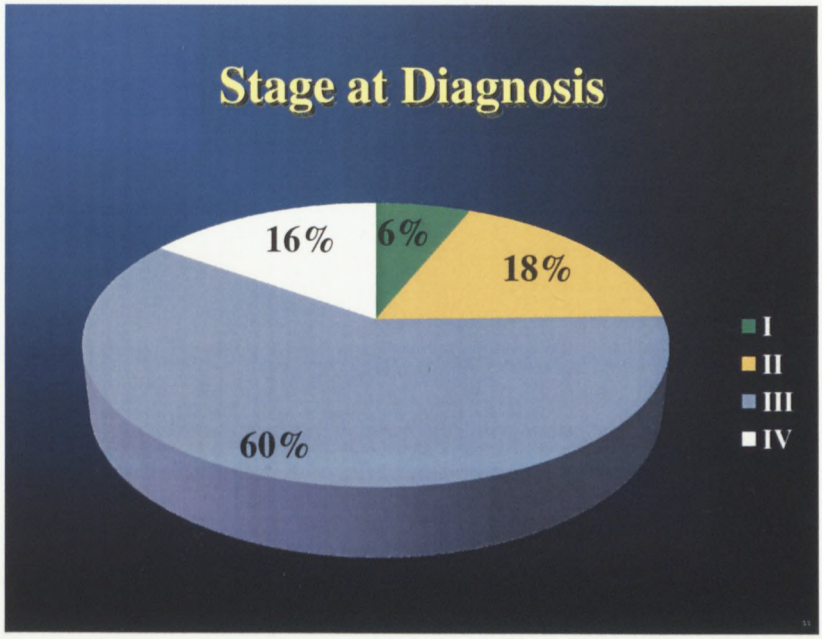

Figure 1.2 Stages of breast cancer at KATH oncology (Oncology directorate report, 2010).

1.3 PROBLEM STATEMENT

Studies have shown that all breast cancer patients are at risk of developing lymphedema as a complication of breast cancer surgery and radiation. The incidence of breast cancer related lymphedema ranges from 5% to 60% (Poage *et al*, 2008: 951-964).

Studies indicate that there is an increased lymphedema risk associated with late stage breast cancer with lymph nodes involvement (Kocak & Overgaard, 2000:389-392; Park, Lee & Chung, 2008:1450-1459; Swenson, Nissen, Leach, & Post-White, 2009:185-194;

Schunnemann & Willich, 1997:536-541). Late stage disease with nodal involvement necessitates the use of more aggressive axillary surgery along with radiation to the axilla which predisposes the patient to developing lymphedema.

Previous studies show that more than 50% of breast cancer cases that come to the hospital present with late stage breast cancer (Archampong, 1977:63; Asumanu, Vomotor & Naaeder, 2000:206-209; Clegg-Lamptey & Hodasi, 2007:75; Gullate, 2010:2; Oncology directorate report, 2010). Therefore, KATH should experience a high incidence of lymphedema, however, there is no available data to support this.

The researcher, who is an oncology nurse at KATH observed, during clinical practice, that, some patients who develop lymphedema after breast cancer treatment were not effectively treated.

To address the research problem, the following research question has been formulated:

- What is the incidence of lymphedema at KATH?
- What are the risk factors associated with lymphedema at KATH?
- How are lymphedema patients treated at KATH?

1.4 SIGNIFICANCE OF THE STUDY

Although studies have been conducted on breast cancer related lymphedema in many countries (Armer & Fu, 2005:200-207; Blanchard & Donohue, 2003:482-487; Clark, Sitzia, & Harlow, 2005:343-348; Golshan , Martin & Dowlatshahi, 2003:209-211; Helyer, *et al*, 2010:48-54; Loudon & Petrek, 2000:65-71; Paskett, 2008:5666; Poage *et al*, 2008:951-964; Sakorafas *et al*, 2006:153-165; Schijven, Vingerhoets & Rutten,

2003:341-350), an intensive literature search did not find any publication on lymphedema that is related to Ghana.

The paucity of publications on lymphedema limit its understanding, its impact on patients and the caregiver, as well as the development of effective intervention strategies to reduce the debilitating outcomes, making it a major health risk (Armer, 2008:78).

This study is significant as the findings would provide base-line data to help detect lymphedema early and improve the management of breast cancer related lymphedema at KATH and throughout Ghana.

1.5 AIM OF THE STUDY

The aim of the study is to determine the incidence, risk factors and treatment of lymphedema after breast cancer treatment at the oncology unit of KATH, Kumasi, Ghana from 01 January 2005 to 31 December 2008.

1.6 RESEARCH METHODS

1.6.1 Research approach

A quantitative research approach was used in this study.

1.6.2 Study design

A descriptive retrospective survey was used in this study.

1.6.3 Population

The study population was all breast cancer patients treated at KATH from 01 January 2005 to 31 December 2008.

1.6.4 Sampling

No sampling method was used in the study. Medical records of all breast cancer patients treated at KATH from 01 January 2005 to 31 December 2008 were all included in this study (N=313). The total population was used.

1.6.5 Data collection instrument and procedure

1.6.5.1 Data collection instrument

A data capture sheet (Appendix A) was carefully developed by the researcher and evaluated by a statistical expert. The data capture sheet is described more fully in Chapter 3.

1.6.5.2 Validity and Reliability of the data collection instrument

To ensure validity and reliability of the data capture sheet, a pilot study was conducted before the actual data collection. The purpose of the pilot study was to investigate possible problems in the data collection instrument.

1.6.5.3 Data Collection Procedure

Data was collected using the developed data capture sheet. The data capture sheet assessed variables related to breast cancer and lymphedema (See Chapter 3).

1.6.6 Data Analysis

The collected data was analyzed with the help of a statistician. The SPSS version 17.0 was used to analyze the data. The data was presented as descriptive statistics.

1.7 DEFINITION OF TERMS AND CONCEPTS

The following definitions of terms and concepts apply in this study:

- Body Mass Index (BMI): Is a number calculated from a person's weight and height. BMI provides a reliable indicator of fat content for most people and is used to screen for weight categories that may lead to health issues. Elevated BMI may affect a patient's risk for the development of lymphedema, following cancer treatment, and may also impact the progress and management of lymphedema (Centres for Disease Control and Prevention, 2008; Poage *et al,* 2008:954).

- Breast cancer surgery: Modified radical mastectomy or total mastectomy (with axillary node dissection). In this procedure, the entire breast is removed along with axillary lymph nodes and the lining over the pectoralis major muscle (Otto, 2001:132). Lumpectomy is another surgical procedure in which the tumour is removed remaining a major portion of the breast (Otto, 2001:133).

- Chemotherapy: Is a systemic treatment of breast cancer (Otto, 2001:13).

- Complete Decongestive Therapy (CDT) : Is the system of lymphedema treatment that includes manual lymph drainage (MLD), compression techniques, exercise,

skin care and self-care training (Lymphatic Research Foundation, 2011; Poage *et al*, 2008:954).

- Compression garment: Is a knitted, two-way stretch sleeve or stocking that is worn to assist in the control of swelling and to aid the movement of lymph from the affected area. A compression garment is worn only while the patient is awake and active (Lymphatic Research Foundation, 2006; Poage et al, 2008:954).

- Lymphedema is a progressive, chronic condition that may appear as swelling of one or more limbs due to the accumulation of fluid and other elements (e.g subcutaneous fat, protein) in the tissue because of an imbalance between interstitial fluid production and transport (NLN Medical Advisory Committee, 2011:1).

- Manual Lymph Drainage (MLD): Is a gentle massage technique that uses a series of rhythmic, light stroke to encourage fluid away from congested areas by increasing activity of normal lymphatics and bypassing ineffective or obliterated lymph vessels.(Lymphedema Framework, 2006).

- Radiation therapy to the axilla: Radiation is administered after breast surgery to achieve local control of breast cancer and reduce the risk of recurrence. When there is involvement of the lymph nodes, radiation to the axilla is given (Otto, 2001:138).

1.8 SEQUENCE OF THIS STUDY

The contents of the chapters is discussed below

Chapter 1

Outlines the problem statement and the significance of the study.

Chapter 2

The literature review of the study is discussed in Chapter 2. This chapter discusses lymphedema studies conducted in other countries under the headings: the lymphatic system, the time of onset of lymphedema, the incidence, risk factors, signs and symptoms of lymphedema. The stages of lymphedema, impact on the quality of life of the patient, methods of diagnosis and treatment of lymphedema are further discussed in this chapter.

Chapter 3

The research methods and ethical consideration of the study are discussed in chapter 3.

Chapter 4

This chapter describes the finding and the interpretation of the study.

Chapter 5

The conclusion and reflections on the entire study in terms of findings are discussed in this Chapter. Based on these, recommendations are made.

1.9 SUMMARY

In summary, lymphedema is a major complication after breast cancer treatment which when left untreated can affect the quality of life of the breast cancer patient. Knowing the incidence and addressing the risk factors associated with lymphedema can help in the effective treatment process of lymphedema. This will help to improve the quality of life of the cancer patient and also reduce the cost burden presented by lymphedema.

This study aims to address the lymphedema problem at KATH by determining the incidence rate, identifying the risk factors and by looking at how lymphedema patients were treated at KATH over the specified study period.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

Lymphedema is one of the most significant complications following breast cancer treatment. It occurs when there is a disruption in the lymphatic system resulting in accumulation of protein rich fluid in the tissues which causes swelling, discomfort and pain of the affected body part (Poage *et al*, 2008: 951-964; Sakorafas *et al*, 2006:153-165). All breast cancer survivors are at lifetime risk for developing lymphedema of the arm following treatment (American Cancer Society, 2006; Petrek, Pressman, & Smith, 2000:292-307).

This chapter discusses the lymphatic system and lymphedema. The incidence rate, the time of onset of lymphedema, the risk factors and the signs and symptoms of lymphedema as described in the literature are discussed as well as the stages of lymphedema, the impact of lymphedema on the quality of life of the patient, methods of diagnosis and treatment.

2.2 THE LYMPHATIC SYSTEM

The lymphatic system is part of the immune system and can be divided into three components, namely:

The lymphatic vessels: The lymphatic vessels are composed of superficial and deep lymphatic vessels that collect lymph from the skin, subcutaneous tissue, muscles, bones and other structures (Clancy & McVicar, 2002: 371-375; Harris, Hellman,

Henderson & Kinne, 1991:822; Morrell, Halyard, Schild, Ali, Gunderson & Pockaj, 2005:1480).

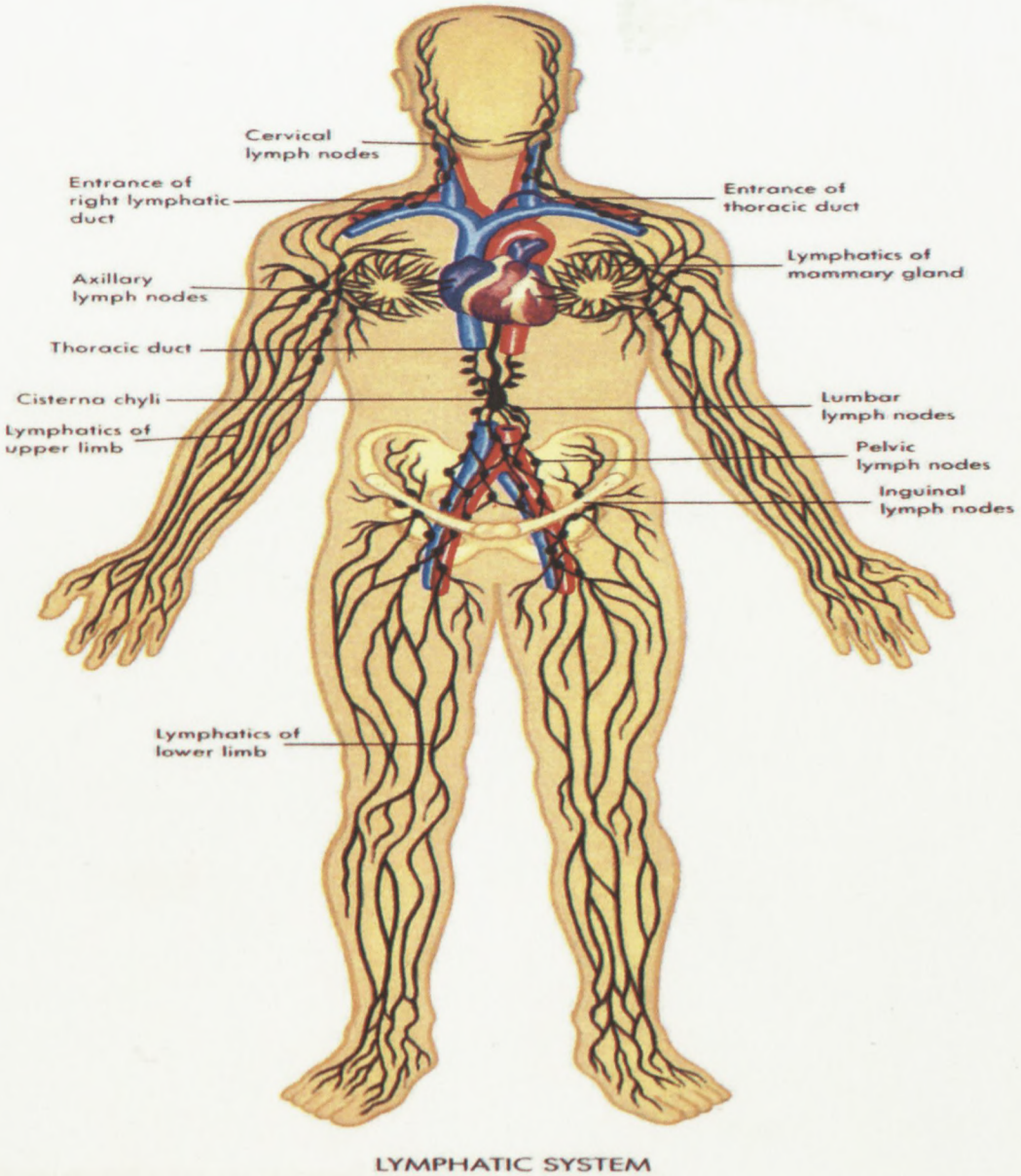

Figure 2.1 The lymphatic system (Lymphomation, 2010).

The lymphatic vessels from the lower part of the body join to form a larger vessel known as the thoracic duct (See Figure 2.1). The thoracic duct collects lymph from the lower abdomen, pelvis, lower limbs and the left half of the head, neck and chest (Longenbaker, 2008:276-277; Meyer, Meij & Meyer, 1997:14.19-14.20). The thoracic duct empties the collected lymph into the venous system near the junction between the left internal jugular vein and the left subclavian vein (Martini & Bartholomew, 2003:428-432).

The right lymphatic duct delivers lymph from the right side of the body above the diaphragm and empties into the right subclavian vein.

- **The lymph fluid**: The lymph fluid flows through the lymphatic vessels and contains low concentration of suspended proteins, water, fatty acids, salts, white blood cells, micro-organisms and foreign debris (Meyer, *et al*, 1997:14.20).

- **The lymphoid organs**: The lymphoid organs are connected to the lymphatic vessels and contain large numbers of lymphocytes. Lymph nodes, the spleen and the thymus are examples of lymphoid organs (Martini & Bartholomew, 2003:428-429).

  In this chapter, only the lymph nodes will be discussed. The spleen and the thymus do not play a role in this study.

2.2.1 Lymph nodes of the breast

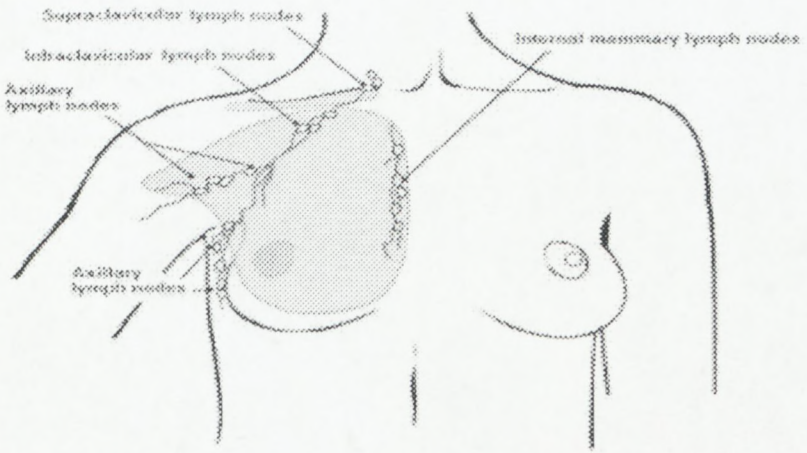

Figure 2.2 A network of lymph nodes of the breast (American Cancer Society, 2011).

Lymph nodes are small, oval lymphoid organs that contain lymphocytes (See Figure 2.2). They are located in regions where they can detect and eliminate harmful antigens before they reach vital organs of the body. They are distributed along the main lymphatic routes and are numerous in the axillary regions and the groin regions (See Figure 2.2). The lymph vessels deliver the lymph fluid to the lymph nodes not only to filter and purify it but also to maintain the protein content of the lymph before it reaches the venous system (Lacovara & Yoder, 2006:303; Martini & Bartholomew, 2003:432; Penzer, 2003; 45-49).

The sentinel lymph node is the first lymph node likely to receive lymphatic drainage from the primary tumour (Morrell *et al*, 2005:1481). During breast surgery, axillary lymph node dissection or sentinel lymph node biopsy is performed to determine the spread of cancer cells.

2.2.2 Function of the lymphatic system

The basic function of the lymphatic system is to remove lymph fluid from the interstitial tissue and return it to the venous circulation through a network of lymph nodes and lymph vessels (Longenbaker, 2008:277; Martini & Bartholomew, 2003:428-432; McGeown, 2002:73; Meyer, Meij & Meyer, 1997:14.19-14.20).

If there is complete obstruction or inadequacy of the lymphatic system after surgery, radiation therapy, tumour or infection in the lymph vessel draining a part of a body, protein accumulates in the interstitial spaces and lymphedema occurs (Bell, Emslie-Smith & Paterson, 1976:419-420; Guyton, 1986:366-368; Meyer, Meij & Meyer, 1997:14.20).

2.3 PATHOPHYSIOLOGY OF LYMPHEDEMA

Breast cancer cells have the potential to spread by breaking away from the original tumour and enter the bloodstream or lymphatic system. Primary lymph drainage of the breast is through the axilla (Morrell *et al*, 2005:1480-1481). If breast cancer cells are found in the lymph nodes, it indicates the spread of the cancer. This information is used to indicate the staging of the breast cancer as well as predicting a prognosis. In order to control the spread of cancer, breast cancer patients undergo surgery that includes the excision of lymph nodes and lymph vessels followed by radiotherapy.

The extent of the surgical axillary lymph node dissection and the fibrosis of the lymphatic vessels caused by the radiation change the flow of lymph fluid, making it difficult for the fluid to circulate to other parts of the body. However, if the remaining lymph vessels cannot sufficiently remove adequate fluid, the excess fluid remains in the interstitial spaces and progressively accumulates leading to lymphedema (See figure 2.3) which is associated with symptoms such as arm swelling and pain (Armer & Fu, 2005:200-207; Bani, Facshing, Lux & Rauh, Wilner & Eder, 2007:311-318; Poage, *et al*, 2008: 951-964).

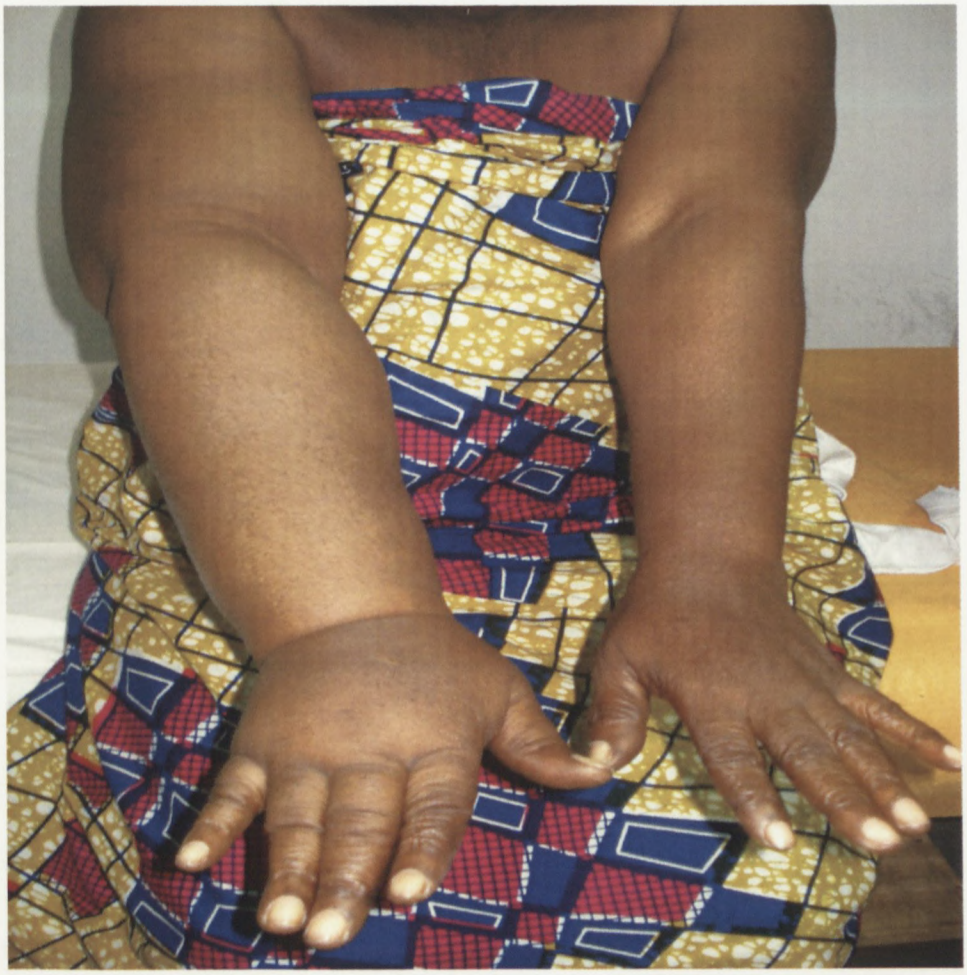

Figure 2.3 Lymphedema of the arm (Courtesy:Owusu Sekyere, 2011).

2.4 INCIDENCE OF LYMPHEDEMA

The incidence of lymphedema following breast cancer treatment ranges from five percent to 60%, with onset of symptoms ranging from immediately after treatment to 30 years after treatment (Clark, *et al*, 2005:343-348; Loudon & Petrek, 2000:65-71;Poage *et al*, 2008:951-964; Sakorafas *et al,* 2006:153-165).

According to, Bani *et al* (2007: 311-318) and Kocak & Overgaard, (2000:389-392), the reported incidence and severity of lymphedema depends on the type of surgery, the use of radiotherapy and the number of lymph nodes removed. The incidence of lymphedema also varies greatly depending on the extent of axillary treatment, the interval between axillary treatments and the methods used to define lymphedema (See section 2.4 and 2.8).

No scientific publication on the incidence of lymphedema after breast cancer treatment in Ghana could be found.

2.5 TIME OF ONSET OF LYMPHEDEMA

Several studies have shown that the onset of lymphedema can occur earlier or later post breast cancer treatment (Clark *et al*, 2005:343-348; Loudon & Petrek, 2000:65-71; Poage *et al*, 2008:951-964; Sakorafas, *et al*, 2006:153-165).

A study conducted by Edward, (2000: 412-418) showed the onset of lymphedema occurred in the first 18 months post breast cancer surgery while another study found 39 months as the median time interval for lymphedema development (Powell, Coen, Taghian, Kachnic & Assaad, 2003:1209-1215). According to Werner, McCorwick,

Petrek, Cox, Cirrincione, & Gray, (1991:177-184) the onset of lymphedema after treatment ranges between two and 92 months.

2.6 THE RISK FACTORS OF LYMPHEDEMA

A number of risk factors are associated with the development of lymphedema. These risk factors are categorized into four main groups, namely:

2.6.1Treatment-related factors of lymphedema

The treatment-related factors include the type of surgery and radiation applied for breast cancer treatment (Dixo, 2009:110-111; Harris, *et al*, 1991:822; Kocak & Overgaard, 2000:389-392).

2.6.1.1 Type of Surgery

Breast surgery is one of the leading causes of lymphedema. During surgery which involves mastectomy and lumpectomy, surgeons perform axillary lymph node dissection (AXLD) and sentinel lymph node biopsy (SNLB) to determine if the cancer has spread beyond the breast. In axillary lymph node dissection, surgeons remove as many lymph nodes as necessary in order to control the spread of cancer cells whiles in sentinel lymph node biopsy, fewer lymph nodes are removed.

The sentinel lymph node is the first lymph node which is likely to receive lymphatic drainage from the primary tumour (Morrell *et al*, 2005:1481). The sentinel lymph node biopsy involves identifying the sentinel lymph node and removing it. If the sentinel lymph node proves to be without any cancer cells in a pathological analysis, the remaining

regional lymph nodes might not be removed. Sentinel lymph node biopsy is less invasive than axillary lymph node dissection.

The removal of lymph nodes either through axillary lymph node dissection or sentinel lymph node biopsy changes the flow of the lymph fluid causing circulating problems for the lymph fluid to other parts of the body. However if the remaining lymph vessels cannot adequately remove all the lymph fluid, the excess fluid builds up and causes lymphedema of the arm.

The majority of research found a higher risk of lymphedema in patients with axillary lymph node dissection than in patients with sentinel lymph node biopsy (Blanchard & Donohue, Reynolds & Grant, 2003; Golshan, Martin & Dowlatshahi, 2003:209-211; Schijven *et al*, 2003:341-350). This can be attributed to the fact that with sentinel lymph node biopsy, fewer lymph nodes are removed and because no further axillary dissection is needed if sentinel lymph node biopsy findings are negative on pathological analysis (Morrell *et al*, 2005:1480-1484).

Studies have reported the extent of axillary surgery as a significant contributor to lymphedema following treatment for breast cancer with the rate ranging from 20.7% to 38% (Clark *et al*, 2005:343-348; Engel, Kerr, Schlesinger-Raab, Sauer & Holzel, 2003:47–57; Husen, Paaschburg & Flyger, 2006:620-628).

The previous studies have shown that, breast surgery, which involves either axillary lymph node dissection or sentinel lymph node biopsy carries a risk in lymphedema development.

2.6.1.2 Radiation

Radiation is another treatment used after breast cancer surgery. The addition of radiation therapy directed to the dissected axilla can, on its own, be a risk factor for developing lymphedema. This is because axillary radiation results in tissue fibrosis which can constrict lymphatic channels leading to lymphedema (Hanks, Doyle, Cherny & Calman, 2006:641; Harris, Lippman, Morrow & Osborne, 2000:734).

According to Bani *et al*, (2007:311-318) and Hinrichs, Watroba, Rezaishiraz, Giese, Hurd, & Fassl, (2004:573–580), radiotherapy is a significant risk for lymphedema after breast cancer treatment. Radiation factors such as total radiation dose, overlapping radiation techniques and posterior axillary boost are the significant risk factors associated with arm lymphedema, especially with high dose radiation greater than 5000 cGray {cGray=Unit of radiation dose} (Hinrichs *et al*, 2004:573–580; Yao, 2004:144). Although large doses of radiotherapy may not cause immediate change in the structure or function of peripheral lymphatic vessels, the irradiated lymph nodes begin to show fibrosis and later cause defects in the function of lymphatic vessels (Hanks, *et al*, 2006:641).

These factors show that radiotherapy to the axilla can cause damage to the lymphatic system leading to lymphedema.

2.6.2 Breast cancer Related Factors of lymphedema

The stage of diagnosis of breast cancer disease is associated with lymphedema (Kocak & Overgaard, 2000:389-392; Park, Lee & Chung, 2008:1450-1459).

2.6.2.1 Stage of diagnosis of breast cancer

Staging breast cancer disease describes the size of the tumour and the spread of cancer cells to the lymph nodes and other parts of the body. Breast cancer staging is done to help in the treatment planning for each patient and also predicts survival.

The Tumour-Node-Metastases (TNM) classification system is most frequently used for staging breast cancer. This system evaluates the tumour size (T), the involvement of regional lymph nodes (N) and the distant spread of the disease or metastases (M) (Hanks, *et al*, 2006:642; Otto, 2001:127).

Table 1.1 Stages of breast cancer according to the TNM system

STAGE	T-Tumour size	N-Lymph node involvement	M-Metastasis(Spread)
1	Less than 2 cm	No	No
2	Between 2-5 cm	Positive or negative lymph node	No
3	More than 5 cm	Positive lymph node	No
4	Any size	Node-Any status	Yes

Source: (Itano & Taoko, 2005:497-498; Otto, 2001:127; Stephen, 2011:1).

According to the TNM classification system, there are four stages of breast cancer (See table 1.1).

- **Stage 1:** In stage 1, the tumour size is less than 2 cm, there is no lymph node involvement and no evidence of metastases.

- **Stage 2:** The tumour size in stage 2 is between 2 cm and 5 cm, there is positive or negative lymph node involvement and no metastasis.
- **Stage 3:** In stage 3, the size of tumour is more than 5 cm, there is positive lymph node involvement and no metastasis.
- **Stage 4:** The last stage is metastatic breast cancer, which is defined as having any size of tumour, positive lymph nodes involvement and obvious metastases (Itano &Taoko, 2005:497-498; Stephen, 2011:1).

The later stages of breast cancer diseases with lymph node involvement are considered risk factors to the development of lymphedema. Studies indicate that there is an increased lymphedema risk associated with late staging of breast cancer disease with lymph nodes involvement (Park, Lee & Chung, 2008:1450-1459; Swenson *et al,* 2009:185-194; Schunnemann & Willich, 1997:536-541). This can be explained because, patients presenting with late stage disease with nodal involvement are likely to have more aggressive surgery along with radiation to the axilla.

In contrast, Werner *et al*, (1991:177-184) and Warmuth, Bowen, & Prosnitz, (1998:1362-1368), do not find any correlation between late stage breast cancer and lymphedema. More research is needed to establish whether or not late stage breast cancer is associated with developing lymphedema.

2.6.3 Patient related factors

Several patient related factors have been associated with lymphedema in breast cancer patients. These factors include

- patient age at diagnosis,
- body mass index (BMI),

- hypertension and
- history of infection (Harris, *et al*, 1991:822).

A discussion of these factors follows.

2.6.3.1 Patient age at diagnosis

The age of the patient at diagnosis of breast cancer has been reported as a significant contributing factor in the development of arm lymphedema. Armer, & Fu, (2005:200-207) explored the age variation in lymphedema occurrence and self-reported symptoms in post breast cancer lymphedema of 102 women. The research revealed that lymphedema occurrence was relatively higher (41.2%) in breast cancer survivors younger than 60 years than those older than 60 years (30.6 %). It was concluded that younger breast cancer survivors may have increased risk and may have reported lymphedema symptoms more often.

Even though age is identified as a risk factor of breast cancer-related lymphedema, its consistency has not been shown. Kiel & Rademacker, (1996:279-283) and Werner, *et al*, (1991:177-184) noted that the incidence of arm lymphedema at three years after treatment was 56% for women older than 55 years and 23% for women younger than 55 years.

2.6.3.2 Body mass Index

High body mass index is associated with contributing to the risk of developing lymphedema after breast cancer treatment (Helyer *et al*, 2010:48-54).

Among the patient related factors, high body mass index is the most significant risk factor of lymphedema in breast cancer patients. Studies have proved body mass index

greater than 26 kg/m^2 to be a significant risk of arm lymphedema in breast cancer patients (Clarke, *et al*, 2005:343-348; Park, *et al*, 2008:1450-1459 Werner, *et al*, 1991:177-184). A recent study conducted to identify risk factors for lymphedema after breast cancer surgery, showed that overweight was the only significant factor associated with lymphedema (Swenson *et al*, 2009:185-193).

This proves that high body mass index can be a significant risk factor for developing lymphedema after treatment for breast cancer.

2.6.3.3 Infection

Infection of the skin has been reported to influence the development of lymphedema after breast cancer treatment (Harris *et al*, 1991:822).

This can be explained because lymphedematous tissues are extremely sensitive to infection and any burns or puncture wounds can develop into generalized erysipelas which may produce further lymphatic destruction and blockages (Fernadez, Serin & Bauges, 1996:536-541; Kiel & Rademacker, 1996:279-283; Segerstrom, Bjerle, Graffman & Nystrom, 1992:223-227).

2.6.3.4 Hypertension

Kocak & Overgaard (2000:389-392), have noted hypertension to be another contributing risk factor of developing lymphedema in breast cancer patients.

A study conducted by Bohler, Rhomberg & Doringer (1992:344-349), showed the incidence of arm lymphedema in patients treated with both axillary surgery and radiation therapy to be 35% among patients with normal blood pressure versus 61% for patients with hypertension

Therefore, hypertension can influence the risk of developing lymphedema after breast cancer treatment.

2.7 SIGNS AND SYMPTOMS OF LYMPHEDEMA

Studies have shown that breast cancer and lymphedema patients may report pain, numbness, heaviness, limited mobility or burning sensation of the affected arm associated with the occurrence of lymphedema (Armer & Fu, 2005:200-207; Bani *et al*, 2007:311-318; Husen, Paaschburg & Flyger, 2006:620-628; Itano &Taoko, 2005:364; Thomas-Maclean, Miedema & Tatemichi, 2005:246-247).

Progression of the lymphedema results in skin thickening, tissue fibrosis and distortion of the shape of the affected arm (NLN Medical Advisory committee, 2011).

These physical symptoms affect the quality of life of the patients who are also faced with psychological problems such as depression, anxiety and body image disturbances.

2.8 STAGES OF LYMPHEDEMA

There are four stages of lymphedema, namely

- Stage 0: This stage is known as the subclinical or pre-lymphedema stage. This typically includes all patients who have had lymph node dissection. Swelling is not evident, although impaired lymph flow is present. Patients may report a feeling of heaviness in the arm. The stage may last for a long time, therefore education on risk reduction is critical.
- Stage I: In this stage, there is an accumulation of fluid and protein in the tissues. The patients present with pitting oedema which resolves with elevation. This stage is reversible.

- Stage II: This stage shows signs of swelling that do not reduce with elevation; pitting is present with fibrosis. There is a positive Stemmer sign, whereby the skin of the dorsum of the fingers of the affected arm cannot be lifted or can only be lifted with difficulty. Infections of the skin occur at this stage as a result of a compromised immune system.
- Stage III: At this stage, the fibrotic tissue has indiscernible pitting; this includes skin thickening and large limb volume known as elephantiasis, a morbid condition where lymph stasis and chronic inflammation develop into fibro sclerosis and additional tissue swelling. The Stemmer sign at this stage is more prominent, recurrent bacterial as well as fungal infection of the skin and nail occurs (Lawenda, Mondry & Johnstone, 2009:11-13; Morrell, *et al*, 2005:1482; Poage *et al*, 2008:952).

2.9 THE IMPACT OF LYMPHEDEMA ON QUALITY OF LIFE OF THE PATIENT

Quality of life can be affected by the different treatments for breast cancer. This situation can adversely influence the patient's willingness to continue with the treatment plan. Quality of life is an important approach that can be used to evaluate the burden of lymphedema on breast cancer survivors.

Previous studies have described lymphedema to be associated with inferior quality of life and a high level of arm symptom-associated distress, depression and anxiety (Dubernard, Sideris, Delaloge, Marsiglia & Rochard, 2004:728-734; Mak, Suen, Chan, Ma, & Yeo, 2009:110-115; Sakorafas, *et al*, 2006:153-165).

This shows that lymphedema, and its effects on quality of life, can have a negative effect on coping with the disease and also on compliance with treatment. Therefore efforts are needed to improve the quality of life of the patients living with lymphedema.

2.10 DIAGNOSING LYMPHEDEMA

Early diagnosis of lymphedema is important in its effective treatment.

The following methods are used in diagnosing lymphedema:

2.10.1 Detailed medical history and physical examination

A detailed medical history taken by the health care professional is important in early detection of lymphedema. Medical history should include time of onset, location of swelling, the course of progression of the swelling, pain and other symptoms (NLN Medical Advisory committee, 2011). The health care professional should observe the patients 'arm, inspect and palpate the skin for any signs according to the stages of lymphedema.

A cluster of self-reported symptoms that are common to a breast cancer patient with lymphedema include arm swelling, pain, heaviness and numbness (Armer & Fu, 2005:200-207; Edward, 2000, 412-418; Lacovara & Yoder, 2006:304).

These symptoms should be investigated by the health care provider in order to make decisions about effective lymphedema treatment.

2.10.2 Measurement of limb volume

Limb volume measurement is considered to be the standard method of diagnosing lymphedema, since it can quantify the severity of lymphedema and the effectiveness of treatment (NLN Medical Advisory committee, 2011).

Measurement of limb volume in diagnosing lymphedema involves the following methods:

2.10.2.1 Circumferential arm measurement

Lymphedema diagnosis is done by using a tape measure to circumferentially measure both arms at 4 cm interval (Lacovara & Yoder, 2006:303). A geometric formula is used to calculate the limb volume and finding a difference of 2cm or more between the affected and the unaffected arms indicates lymphedema (Casley-Smith, 1992:70-83; Horning & Guhde, 2007:221-227).

This technique has been shown to be accurate in detecting lymphedema if the measurements on the two arms are always taken by one person.

2.10.2.2 Water displacement

Water displacement is another method of assessing limb volume to diagnose lymphedema. It requires submerging the limb in water and the displaced water is measured (Harris, Hugi, Olivotto & Levine, 2001:191-199; Horning & Guhde, 2007:221-227; NLN Medical Advisory committee, 2011).

2.10.3 Other diagnostic test

There are other diagnostic tests that can be used in diagnosing lymphedema. These include

- Soft tissue imaging such as magnetic resonance imaging (MRI), ultrasonography and computed tomography are used to detect the presence of extra fluid in the tissues.

- Lymph vessel imaging such as lymphoscrintigraphy are used for imaging lymph vessels and lymph electrical conductance testing (BIS), for example bioimpedance spectroscopy is used to measure water content in tissues and nodes (Hanks *et al*, 2006:648; Lacovara & Yoder, 2006:304; NLN Medical Advisory committee, 2011). According to Lawenda, Mondry & Johnstone, (2009:16), bioimpedance spectroscopy is found to be much more reliable than circumference measurement and water displacement volumetry. However, these methods measure different components of lymphedema, whole limb volume versus fluid volume, therefore bioimpedance spectroscopy might not be much more reliable in another setting.

Using these tests in diagnosing lymphedema can be very expensive and may not be available at every facility.

Once lymphedema is diagnosed, treatment of lymphdema should follow immediately to prevent progression of the condition.

2.11 THE TREATMENT OF LYMPHEDEMA

Lymphedema treatment is based on correct diagnosis. The treatment is life-long which requires maintenance therapy to reduce the edema and further prevent other complications. Reduction of swelling is best achieved through compression (E European Wound Management Association (EWMA), 2005:2).

The treatment of lymphedema includes combination treatment modalities.

Complete decongestive therapy (CDT) is the recommended treatment for lymphedema.

2.11.1. Complete Decongestive Therapy (CDT)

Complete decongestive therapy combines multiple treatment modalities in order to achieve a maximum reduction in swelling of the affected arm.

Complete decongestive therapy comprises:

- Manual lymph drainage (MLD),
- Compression applied through short-stretch compression bandages and compression garments,
- Meticulous skin and nail care,
- Remedial exercise and
- Patient education on self care (NLN Medical Advisory committee, 2011).

Complete decongestive therapy has two phases: an intensive phase when the arm volume is reduced during treatment by the therapist, and a maintenance phase, when the patient is instructed on self management.

Several studies support the use of complete decongestive therapy in treating lymphedema. Studies have shown improvement in pain associated with lymphedema, reduction in limb volume as well as improvement in shoulder range of motion after about one month of complete decongestive therapy (Didem, Ufuk, Serder & Zumre, 2005:49-54; Hamner & Fleming, 2007:1904-1908; Jeffs, 2006:71-79; Moseley, Carati & Piller, 2007:639-646; Szuba, Achalu & Rockson, 2002:2260-2267).

Complete decongestive therapy use in early treatment of lymphedema has been reported to be inexpensive for the patient, with a better than average outcome and also saves time and resources (Hamner & Flemming, 2007:1904-1908; Jeffs, 2006:71-79;

McNeely, Maggee, Lees, Bagnail, Hay Kwosky & Hanson, 2004:95-106; Moseley *et al*, 2007:639-646).

The benefits of the use of complete decongestive therapy which involves manual lymph drainage, compression bandaging, a compression garment, skin care and exercise makes it the most frequently recommended therapy for treating lymphedema.

2.11.1.1 Manual lymph drainage

Manual lymph drainage is one of the treatment modalities used in complete decongestive therapy. It uses a series of rhythmic, light strokes massage to reduce swelling and improve the return of lymph to the circulatory system (NLN Medical Advisory committee, 2011).

According to Moseley *et al*, (2007:639-646), and Jeffs, (2006:71-79), manual lymph drainage improves patient's self-reported lymphedema symptoms. In palliative care settings where compression bandaging and garment is no longer appropriate, manual lymph drainage is frequently recommended (Lymphedema framework, 2006).

2.11.1.2 Compression bandaging

Compression bandaging is a systematic application of short-stretched bandaging with various types of padding. Compression bandaging is used 24 hours per day in the intensive phase. Wraps are applied with moderate tension at the distal portions of the affected limbs gradually decreasing to low tension in the more proximal portions (Poage *et al*, 2008:955).

According to Jeffs, (2006:71-79) and McNeely *et al*, (2004:95-106), patients, who had compression bandaging with or without manual lymph drainage, experienced a

significant reduction in limb volume with the greatest benefit occurring after two weeks of daily treatment. This supports the use of compression bandaging as an intervention for lymphedema.

2.11.1.3 Compression garment

A compression garment can be used in lymphedema treatment. A compression garment is a knit, two-way stretch sleeve or stockings that is worn to assist in controlling a swelling and to aid in the movement of lymph fluid from the affected area (Poage *et al*, 2008:954).

The use of a compression garment is individualized and requires careful patient assessment, fitting and monitoring by the lymphedema therapist.

2.11.1.4 Skin and nail care

Lymphedema patients are at risk of skin infections known as cellulitis which requires the use of antibiotics. Therefore lymphedema patients should be educated to practice good skin and nail care. Good skin care can be achieved by the use of low PH soaps and moisturizers and also by protecting the skin from sun burns and insects (NLN Medical Advisory committee, 2011). Punctures caused by procedures such as injections and blood draws, should be avoided in the lymphedema arm.

2.11.1.5 Exercise

A position statement on exercise by the National Lymphedema Network recommends individualized lymphedema exercise as a standard component of complete decongestive therapy. Lymphedema patients can perform aerobic and resistive exercise only when:

- compression bandage or garments are worn,
- the affected arm is not exercised to fatigue and
- Appropriate modifications are done to prevent trauma and overuse (NLN Medical Advisory committee, 2011).

The benefit of the exercise is to enhance the efficacy of the muscle pump and promote the flow of lymphatic fluid (NLN Medical Advisory committee, 2011; Poage *et al*, 2008:957). Lymphedema exercise is best achieved if initiated by a trained lymphedema therapist.

2.11.1.6 Lymphedema patient education

Patient education focuses on prevention, early detection and treatment of lymphedema symptoms. The important focus areas include risk reduction practices, self-lymph drainage, skin care, signs and symptoms of infection, proper fit and care of garments, the importance of good nutrition, exercise and weight control (NLN Medical Advisory committee, 2011).

The patient should be educated on the following risk reduction practices:

1. To avoid any puncture or injury to the skin. Meticulous skin care should be taken.
2. To avoid vaccination, injection, blood pressure monitoring, blood drawing and intravenous administration in that arm.
3. To avoid wearing constricting sleeves or jewellery.
4. To avoid heat, such as sunburns or tanning and baths.
5. To avoid violent exercises and strenuous exertion.

2.11.2 Infection treatment

Lymphedema patients are at a high risk of infection (Harris *et al*, 1991:822). Cellulitis is the most common infection in lymphedema patients. It is an acute infection of the skin and underlying tissue, that is characterized by painful swelling and erythema (Weissleder & Schuchhardt, 2008:138-139).

Group A hemolytic streptococcus bacterium or streptococcus pyogens, staphylococcus aureus and co-infections are the most common cause of infection in lymphedema patient (Bernard, 2008:122-128; Lymphedema Framework, 2006).

A penicillin based antibiotic is the treatment of choice (Hanks, *et al*, 2006:646). Infection should be treated promptly and prolonged periods without compression should be avoided (Lymphedema framework, 2006).

2.11.3 Pneumatic compression pump

A pneumatic compression pump may be effective in managing lymphedema if used by a trained personnel.

Moseley *et al,* (2007:639-646), found that there is 26% decrease in limb volume with intermittent pneumatic compression pump therapy used in combination with complete decongestive therapy.

Contrary, Zuther (2005:270) do not support the use of pneumatic pump because it can cause more harm than good, by causing an increase in scarring and fibrosis, which worsens lymphedema. This effect occurs because a pneumatic pump only moves water without removing the proteins in the interstitial space and also fails to create any space for the moved fluid in the larger lymphatic vessels in the trunk of the body (Poage *et al*, 2008:960).

2.11.4 Drug therapy (Medication)

The use of drugs in treating lymphedema has not been recommended by several authors. Drugs that are normally used in treating lymphedema are diuretics and benzopyrenes (Hanks, *et al*, 2006:645; Harris *et al*, 1991:825).

There is no research supporting the use of diuretics in treating lymphedema. This is because diuretics take away water but not protein rich fluid, which is in the case of lymphedema (Lymphedema framework, 2006). This makes a diuretic ineffective in lymphedema treatment.

The use of benzopyrenes is supported by Moseley *et al*, (2007:639-646) and Piller, (1980:109). Benzopyrenes, which include flavonoids, oxerutins and coumarin combined with hesperidin, are all used in the treatment of lymphedema (Harris *et al*, 1991:825; Lymphedema Framework, 2006).

2.11.5 Other surgical treatment

Liposuction and macro surgical or microsurgical techniques are occasionally used (NLN Medical Advisory committee, 2011; Ridner & Dietrich, 2008:57-63).

Microsurgical techniques include lymphovenous anastomosis, lymph vessel transplantation and the interposition of small calibre veins to replace scarred or absent lymph vessels (Baumeister, 2003:202-209; Campisi, 2004:609-613).

The review of the literature has shown that effective treatment of lymphedema improves lymphedema symptoms as well as the quality of life of the patient.

2.12 SUMMARY

In summary, many studies have identified the incidence, the risk factors and the signs and symptoms associated with lymphedema. These studies have further identified complete decongestive therapy as the most effective management of lymphedema. Knowing the incidence and the risk factors of lymphedema, diagnosing and treating lymphedema effectively has been described by research to improve the quality of life of the patient as well as saving time and resources.

This study aimed at identifying the incidence of lymphedema, the risk factors and the treatment strategies at KATH. The implication of the research on practice is to improve on the treatment strategies of lymphedema so as to ensure good quality of life of the patients.

CHAPTER 3

3.0 RESEARCH METHODS

3.1 INTRODUCTION

Research methods describe how the study was conducted and includes the study design, the sample, data collection process and data analysis (Burns & Grove, 2007:46; Polit & Hungler, 1999:707).

In this chapter, the research approach is described, the study population is identified and ethical considerations are presented. The composition of the data capturing sheet, the data collection and data analysis used in this study are also described.

3.2 RESEARCH METHODS

3.2.1 Research Approach

A quantitative study approach is used in this study. Burns and Grove (2007:17-18) define quantitative research as a formal, objective, systematic process where numerical data are used to obtain information about the world. Quantitative research is used to describe and test relationships between variables and to examine cause-and-effect relationships.

In this study, a quantitative approach was applied to determine the incidence of lymphedema, to describe the risk factors associated with lymphedema and to examine the treatment strategies of lymphedema, at KATH. The aim was to establish a base-line data on breast cancer-related lymphedema at KATH.

3.2.2 Study Design

The design used in this study is a descriptive, retrospective survey. According to Burns and Grove (2007:240), a descriptive study is designed to gain more information about characteristics within a particular field of study. They go on to explain that a descriptive study provides a picture of the situation as it occurs naturally or may be used to identify problems with current practice or justify current practice.

A retrospective design is when the researcher starts with effect and works backwards to determine what was associated with this effect in the past (Brink, 2006:102).

Polit and Hungler also (1999:200) defined a survey as a type of research designed to obtain information from a population regarding the prevalence, distribution and interrelations of variables within those population.

In order to apply a descriptive retrospective design to this study, the researcher reviewed the medical records of all breast cancer patients that were treated at KATH oncology unit from 01 January, 2005 to 31 December, 2008. The aims are to:

- Identify the types of breast cancer treatment received by patients at KATH during the specified study period.
- Determine if any of the breast cancer patients developed lymphedema as a complication of the breast cancer treatment.
- Identify the risk factors that were associated with lymphedema.
- Identify how the lymphedema patients were treated during the study period.

The findings are to be used to establish base-line data on breast cancer-related lymphedema at KATH.

3.2.3 Study Setting

Komfo Anokye Teaching Hospital (KATH) oncology directorate is the study setting. KATH is located in Kumasi, the second largest city in Ghana. (See Chapter 1, section 1.2).

3.2.4 Population

3.2.4.1 Study population

A population is the entire aggregation of cases or group of people that meet the set of criteria which the researcher is interested in studying (Brink, 2006:123; Polit & Hungler, 1999:278).

The population of this study is the medical records of all breast cancer patients treated at KATH from 01 January 2005 to 31 December 2008 (N=313).

3.2.4.2 Sampling

No sampling method is used in this study because the entire population was included in the study (N=313). The medical records of all breast cancer patients treated at KATH oncology unit from 01 January, 2005 to 31 December, 2008 were all included in the study.

3.2.5 Ethical consideration

Application was made to the Health and Wellness Sciences Study Ethics Committee of Cape Peninsula University of Technology to conduct the study. The approval was granted with reference number: CPUT/HW-REC 2009/H007. The ethics approval was also supported by a written permission from the Consultant-Radiation Oncologist and

Head of Department, Oncology unit of Komfo Anokye Teaching hospital for the study to be conducted.

The purpose of the study, the potential benefit and the absence of risk in the study were the time commitment involved as well as procedures were explained to the committee. Contact details were provided to the committee for any further questions about the study.

To ensure confidentiality of patients' records during the study, no names or contact details were collected. However unique patient's numbers were created for the purpose of the study, in order to ensure anonymity and confidentiality of patients' records. For the purpose of quality checks and to assess if data was correctly captured, only the researcher was in a position to link the unique patient's number with a patient's medical record number.

Data was collected using appropriate study codes, where yes was coded as 1 and no as 2. All data was identified only with the code number and not with the patient.

Data was kept and securely locked away at the oncology unit. The only person who had access to the data was the researcher. This was to ensure confidentiality and privacy of patients' medical records.

The benefit of the study outweighed the risk in this study. Virtually, no risks were seen for any patient as only the relevant data were collected from the medical records of breast cancer patients treated at KATH oncology from 01 January, 2005 – 31 December, 2008.

The study findings are to provide base-line data on lymphedema incidence and the associated risk factors, which would help in early detection of lymphedema and improve its treatment at KATH.

3.2.6 Composition of data capture sheet

Data capture sheet (Appendix A) was developed by the researcher and evaluated by a statistical expert for this study. The data capture sheet was developed based on the aims and objectives of the study as well as the literature review.

The data capture sheet was used to:

- Determine the cancer treatment received by all breast cancer patients at KATH within the specified period of study.
- Identify the profile of breast cancer patients who have developed lymphedema.
- Identify the number of breast cancer patients who developed lymphedema within the period.
- Determine the risk and contributing factors associated with lymphedema after breast cancer treatment of breast cancer patients attending the oncology unit.
- Identify the reported signs and symptoms of lymphedema after breast cancer treatment.
- Identify treatment strategies used at the KATH oncology unit for lymphedema.

3.2.7 Aspects addressed in data capture sheet

The data capture sheet was divided into three sections:

Section 1

- date of first-registration of each patient at KATH,
- year patient started treatment at KATH,
- gender ,
- age and
- body mass index.
- Blood pressure

Section 2

Breast cancer-related variables captured on the data sheet are:

- breast cancer diagnosis,
- stage of breast cancer,
- breast cancer treatment received and
- lymph node metastases.

These variables were captured on the data sheet based on the risk factors associated with lymphedema as described in the literature review in Chapter 2.

Section 3

Variables captured on lymphedema are:

- lymphedema diagnosis,
- date of lymphedema diagnosis,
- signs and symptoms of lymphedema,
- location of lymphedema in the arm,
- body mass index and

- lymphedema treatment.

The variables associated with lymphedema were captured in order to find out if there is any association between lymphedema and these variables at KATH oncology.

3.2.8 Pilot study

A pilot study is a small scale study conducted prior to the main study on a limited number of subjects from the population at hand (Brink, 2006:166).

The purpose of a pilot study is to investigate the feasibility of the proposed study and to detect possible flaws in the data collection instrument such as inadequate time limits, ambiguous instruction or wording as well as whether the variables defined by operational definitions are actually observable and measurable (Brink,2006:166). Specifically the pilot study is to assess the reliability and validity of the study instrument.

In this study, the pilot study was conducted in a manner similar to the actual study. The population of the actual study was defined as the medical records of all breast cancer patients treated at KATH from 01 January 2005 to 31 December 2008. For the purposes of the pilot study, 10 patient medical records were randomly selected, five medical records were each selected from the years, 2004 and 2009.

The reason for conducting the pilot study was to ascertain whether the data capture sheet accurately measure what it was supposed to measure, and to ensure content validity. It was also to identify errors in the data capture sheet so that these can be avoided in actual data collection. Furthermore, the pilot study was to assess if patients medical records were up to date and correctly completed. It was also used for quality

control measures, for instance to check for discrepancies and missing information in the medical records.

Although some information were missing from some of the medical records, the missing information was of little or no significance for the bigger study. No adjustments had to be made to the data capture sheet during the pilot study.

3.2.9 Collection of data

3.2.9.1 Time frame

The intention was that the data would be collected during the six months from 01 July 2009 to 31 December, 2009. However, the pilot study was conducted from the 17th to the 21st of November, 2009 and the data collection for the actual study started on the 25th November 2009 and ended on the 31st of March, 2010.

3.2.9.2 Data collection

With the permission granted by the head of department of the oncology unit, the researcher had access to available patients' medical records at the records department within the unit. No informed consent needed to be used as patient's medical record were examined and provided with codes without revealing patient identity. Data was collected at KATH oncology unit by the researcher.

For the purpose of this study, unique numbers were allocated to each individual patient. A Microsoft Excel spread sheet was printed. Data that had been captured with the data capture sheet were coded. These codes were entered manually onto the printed Excel spread sheet. The collected data was then transferred unto the Excel spreadsheet on

the computer for analysis. The same categories of data were collected from the medical record of all patients.

3.2.10 Validity and reliability of the data collection instrument

The validity and reliability of the study instrument is discussed here.

3.2.10.1 Validity

Validity is the degree to which the data collection instrument measures what it is supposed to measure (Polit & Hungler, 1999:418).

In this study, the validity of the data capture sheet was tested in the pilot study to measure the extent to which the data sheet represents all the various variables in this study. To ensure content validity, an in-depth review of 10 patients' medical records was conducted by the researcher using a data capture sheet which collected information on breast cancer, breast cancer treatment and lymphedema.

3.2.10.2 Reliability

Reliability is how consistent and accurate the data collection instrument and technique can be if used repeatedly over a period of time on the same population (Brink, 2006:163).

In this study, a pilot study was conducted to ensure reliability. The patient medical records used in the pilot study were randomly selected and the same categories of data were collected in order to assess how consistently the data capture sheet measures the variables related to lymphedema after breast cancer treatment.

The validity and the reliability of the data capture sheet gave a positive outcome during the pilot study and no adjustments had to be made.

3.2.11 Data analysis

Data analysis in the study was conducted to organize and give meaning to the collected data. With the assistance of a statistician, the collected data was analyzed as descriptive statistics using SPSS software version 17.0.

The following statistical techniques were chosen in the data analysis based on the aim and objectives of the study.

- Descriptive statistics are used to organize and describe the characteristics of a collection of data (Polit & Hungler, 1999:439; Salkind, 2007:9).

  In this study, descriptive statistic techniques were applied to variables such as age, body mass index prior to lymphedema, systolic and diastolic blood pressure, radiation dose, body mass index during lymphedema as well as age in years of lymphedema.

- A frequency is determined by counting the number of occurrences of a particular value. Frequencies can be summarized in a frequency table and also presented in the form of charts such as bar charts (Huizingh, 2007:17-18).

  Frequency tables were used in the data analysis for variables such as, the year the patient started receiving treatment at KATH, gender, marital status, the treatment received at KATH, the location of lymphedema in the arm and

the signs and symptoms associated with lymphedema. The percentages, mean, minimum and maximum values of these variables are calculated presented.

The standard deviation, which describes the extent of deviation of values from the mean is also presented in this study (Polit &. Hungler, 1999:452; Huizingh, 2007:208; Grove, 2007:117).

- Crosstabulation tables are used to determine relationships between two variables: that is whether and how two variables are related (Huizingh, 2007:20-21, 252). Crosstabulation provides information on the strength and the direction of association between two variables.

  In this study, crosstabulation was used to compare axillary lymph node dissection and lymphedema patients were compared in order to find out the relationship between these two variables.

- A Chi-square test is a classical method of analyzing frequencies and is referred to as homogeneity, randomness, association, independence and goodness of fit (Fowler, Jarvis & Chevannes, 2002:115). It is used to determine whether or not two categorical variables are independent (unrelated) of each other or not (Burns and Grove, 2007:420).

  A Chi-square test was applied to the two variables, axillary lymph node dissection, breast cancer stage and lymphedema patient to find out if these variables were independent or related in this study.

- A Student's t-test for related samples is used to determine whether there is significant difference between the two related numerical measurements (Fowler, Jarvis & Chevannes, 2002:171).

  A Student's t-test for unrelated samples was applied in the data analysis of this study to find if there was a significant difference between lymphedema patients and non-lymphedema patients in terms of their ages, body mass index, systolic and diastolic blood pressure and radiation dose received for the treatment of breast cancer.

- All tests in the data analysis of the study were performed at a 5% level significance. Statistical test was considered significant if the P value was less than 0.05 (P value<0.05) (Huizingh, 2007:20-250).

3.3 DELIMITATION OF THE STUDY

The study is limited to the medical records of breast cancer patients treated at KATH oncology unit from 01 January, 2005 to 31 December, 2008.

3.4 SUMMARY

This Chapter described the research methods used in this study. This included the research approach, the study design, the study population, the data collection instrument and the procedure.

The chapter went on to describe the ethical consideration, the data analysis process and concluded with the delimitation of the study.

This chapter brought to light the application of scientific method in the study. The next chapter will discuss and interpret the results.

CHAPTER 4

4.0 STUDY FINDINGS AND INTERPRETATION

4.1 INTRODUCTION

The aim of the study was to determine the incidence, risk factors and treatment of lymphedema after breast cancer treatment at the oncology unit of KATH, Kumasi, Ghana from 01 January 2005 to 31 December 2008.

This chapter presents the study findings. The outcomes of the statistical tests used in the data analysis and the significance of the outcomes are presented and interpreted.

4.2 OVERVIEW OF VARIABLES AND ANALYSIS

The data capture sheet was divided into three sections (See Appendix A).

The first section of the data capture sheet assessed variables such as registration date of patients first visit, year patient started treatment at KATH, gender, age, body mass index prior to lymphedema diagnosis.

The second section captured information on variables related to breast cancer. This included breast cancer diagnosis, stage of breast cancer, breast cancer treatment received, and lymph node metastases.

Variables associated with lymphedema were in the last section (Section three) on the data capture sheet. This also included lymphedema diagnosis, date of lymphedema diagnosis, signs and symptoms of lymphedema, and location of lymphedema in arm, body mass index and lymphedema treatment.

Variables such as age, body mass index (BMI) prior to lymphedema, radiation dose, body mass index of lymphedema patients and age when diagnosed with lymphedema were analyzed as descriptive statistics (See table 4.1).

Frequency distributions with percentages were used in the data analysis on variables such as, year patient started treatment at KATH, gender and marital status. This was used to organize the data and indicate where the scores were located.

Cross tabulations were applied to find association between variables. Chi-square tests were used to determine whether these associations were significant using a significant value of 0.05.

4.3 DESCRIPTIVE STATISTICS

Table 4.1: The descriptive statistics of variables of the study

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age	313	22	95	50.65	12.232
Body mass index prior to lymphedema diagnosis	305	13.2	65.0	25.699	6.0129
Systolic blood pressure	309	80	180	130.56	16.588
Diastolic blood pressure	309	50	120	81.73	10.463
Radiation dose	177	48	13512	8935.12	1969.519
Body mass index of lymphedema patients	31	16.1	36.4	26.558	5.8310
Age in years when lymphedema was diagnosed	31	31	80	53.61	10.963

Age

Table 4.1 reflects the descriptive statistics of the physical ages of patients who were treated at KATH during the study period. Three hundred and thirteen patients' medical records were reviewed. The youngest age was 22 and the oldest age being 95 years. The mean age of this study was 50.65 (Standard deviation: Std =12.232) years. The standard deviation shows that on average, the ages of the patients deviate from the mean age by 12.232 years.

According to literature (Armer, & Fu, 2005:200-207), age is considered as one of the risk factors of lymphedema. The mean age of 50 years shows that, the younger population is affected. This evidence can be used in the planning of breast cancer and lymphedema awareness programs at KATH.

Body Mass Index (BMI) prior to lymphedema

The body mass index (BMI) of the patients' treated for breast cancer at KATH during the study period is shown in table 4.1. The BMI of 305 patients was captured on the data sheet. The minimum body mass index was 13.2 kg/m^2 and the maximum body mass index being 65 kg/m^2. The mean body mass index was 25.699 kg/m^2 (Standard deviation: Std =6.0129 kg/m^2), showing that the body mass index of the breast cancer patients prior to lymphedema deviates from the mean body mass index at 6.0129 kg/m^2

Systolic blood pressure

In terms of systolic blood pressure of the patients, 309 systolic blood pressure values were captured. The minimum and maximum systolic blood pressure were 80 mmHg and 180 mmHg respectively with 130.56 as the mean (Standard deviation: Std=16.588)

mmHg (See Table 4.1). The standard deviation of 16.588 mmHg is an indicator of variability of the systolic blood pressure.

Diastolic blood pressure

Table 4.1 shows the diastolic blood pressure of the patients. With 309 cases captured under diastolic blood pressure, 50 mmHg was the minimum value and 120 mmHg the maximum, with 81.73 mmHg as the mean diastolic blood pressure. The standard deviation of 10.463 mmHg shows that, on average, the diastolic blood pressure of the patients deviates from the mean by that value.

Hypertension (High blood pressure where systolic and diastolic BP are greater than 140 mmHg and 90mmHg respectively) is reported by previous studies to be associated with lymphedema (Bohler, *et al*, 1992:344-349; Kocak & Overgaard, 2000:389-392). Based on the values of systolic and diastolic blood pressure, there is evidence in this study that the majority (77.4%, See Table 4.24) of the lymphedema patients at KATH did not have high blood pressure which may have lowered the risk of developing lymphedema.

Radiation dose

In terms of radiation dose as a treatment for breast cancer, a majority of the patients (177) received doses of radiation. The minimum radiation dose received by patients was 48 cGray and 13512 cGray was the maximum dose. The mean was 8935.12 cGray and the standard deviation: Std=1969.519 cGray.

Averagely, breast cancer patients treated at KATH during the specified study period received high doses of radiation. Radiation doses greater than 5000 cGray has been reported to be associated with lymphedema (Hinrichs, *et al*, 2004:573–580). Late stage

presentation of breast cancer at KATH (Chapter one, Figure 1.2) may have resulted in patients receiving high dose radiation, which is a risk factor for lymphedema.

Body Mass Index (BMI) of lymphedema patients

Table 4.1 shows the body mass index (BMI) of patients who developed lymphedema after breast cancer treatment. There were 31 patients identified as having lymphedema. The minimum body mass index was 16.1 kg/m^2 and 36.4 kg/m^2 was the maximum body mass index of the lymphedema patients. The mean body mass index was 26.558 (Standard deviation: Std=5.8310) kg/m^2.

Helyer, *et al,* (2010:48-54), Clark, *et al*, (2005:343-348), Park, *et al*, (2008:1450-1459), Swenson *et al*, (2009:185-193) and Werner, *et al*, (1991:177-184) reported that high body mass Index was primarily and significantly associated with lymphedema after breast cancer treatment. Contrary to previous studies, body mass index of lymphedema patients was not significantly different from the group that did not develop lymphedema. Therefore, there was no association between body mass index and lymphedema in this study.

Age when diagnosed with lymphedema

With the 31 lymphedema patients, the youngest age was 31 years and 80 years was the oldest age. The mean age of the lymphedema patients was 53.61 and the deviation from the mean was 10.963 years (Standard deviation).

The age of lymphedema patients in this study was not significantly associated with lymphedema as previously reported in other studies (Armer, & Fu, 2005:200-207; Kiel & Rademacker, 1996:279-283; Werner, *et al*, 1991:177-184).

Table 4.2 Descriptive statistics of patients with or without lymphedema

Patients with or without Lymphedema		Age	BMI prior lymphedema	Systolic blood pressure	Diastolic blood pressure blood pressure	Radiation dose	BMI of lymphedema patients	Age when diagnosed with lymphedema
Yes	N	31	31	31	31	21	31	31
	Mean	52.81	26.865	134.19	85.16	8981.33	26.558	53.61
	Grouped Median	52.50	27.800	136.25	86.00	8912.00	27.900	53.33
	Std. Deviation	10.901	6.7490	17.659	8.896	1110.171	5.8310	10.963
	Std. Error of Mean	1.958	1.2121	3.172	1.598	242.259	1.0473	1.969
	Minimum	30	15.8	100	60	7000	16.1	31
	Maximum	78	46.7	170	100	11260	36.4	80
	Kurtosis	0.196	1.047	-0.099	1.040	-0.095	-1.091	0.280
	Skewness	0.196	0.629	-0.382	-.963	0.475	-0.146	0.210
No	N	282	274	278	278	156		
	Mean	50.42	25.567	130.15	81.35	8928.90		
	Grouped Median	48.78	25.042	129.69	80.31	9002.15		
	Std. Deviation	12.364	5.9231	16.448	10.569	2060.386		
	Std. Error of Mean	0.736	0.3578	0.987	0.634	164.963		
	Minimum	22	13.2	80	50	48		
	Maximum	95	65.0	180	120	13512		
	Kurtosis	0.505	6.164	0.430	0.235	5.645		
	Skewness	0.667	1.254	0.427	0.057	-1.785		
Total	L N	313	305	309	309	177	31	31
	Mean	50.65	25.699	130.56	81.73	8935.12	26.558	53.61
	Grouped Median	49.23	25.100	129.87	80.43	8971.73	27.900	53.33
	Std. Deviation	12.232	6.0129	16.588	10.463	1969.519	5.8310	10.963
	Std. Error of Mean	0.691	0.3443	0.944	0.595	148.038	1.0473	1.969
	Minimum	22	13.2	80	50	48	16.1	31
	Maximum	95	65.0	180	120	13512	36.4	80
	Kurtosis	0.445	5.302	0.273	0.183	6.141	-1.091	0.280
	Skewness	0.620	1.174	0.341	-0.029	-1.795	-.146	0.210

Table 4.2 indicates the descriptive summary of results. The response "Yes" represents lymphedema patients and "No" represents non lymphedema patients.

Further explanation of this table follows.

Table 4.3 The independent sample test for equality of means

Equal variances assumed	t-test for Equality of Means						
	t-value	df	p-value (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
BMI prior to lymphedema	1.140	303	0.255	1.2977	1.1388	-0.9433	3.5388
Age	1.032	311	0.303	2.388	2.314	-2.165	6.942
Systolic blood pressure	1.288	307	0.199	4.042	3.138	-2.132	10.217
Diastolic blood pressure	1.931	307	0.054	3.809	1.973	-0.073	7.690
Radiation dose	0.114	175	0.909	52.436	459.088	-853.66	958.498

Table 4.2 and 4.3 show that there were no statistically significant differences between the groups with diagnosed lymphedema and no diagnosed lymphedema. In each case the t-test for equal variances was used since the Levene's test for equal variances gave the result that the assumption of equal variances were not violated (all p-values were > 0.05).

4.4 FREQUENCY DISTRIBUTION OF VARIABLES

Table 4.4 The year patient started treatment at KATH oncology

			N=313
Year patient started treatment	Frequency	Valid Percent	Cumulative Percent
2005	14	4.5	4.5
2006	25	8.0	12.5
2007	143	45.7	58.1
2008	131	41.8	100.0
Total	313	100.0	

Table 4.4 shows the year patients started receiving treatment for breast cancer at KATH. Between the years 2005 and 2008, 313 patients were treated at KATH oncology unit. There were 14 patients who started treatment in the year 2005, representing (4.5%) and 25 (8%) patients treated in 2006. Almost half of the patients, 45.7% (143) were treated for breast cancer in 2007 and 131 (41.9%) patients, were treated in the year 2008.

This study provides evidence that, the number of patients treated at KATH, increased tremendously during 2007 and 2008. This shows that more patients were diagnosed with breast cancer and referred to the oncology unit for cancer treatment. As the patients continue to receive cancer treatment, they may develop lymphedema as a complication of the cancer treatment, therefore, this evidence can be used in the planning programs for the early detection of breast cancer and lymphedema.

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Table 4.5 Gender of breast cancer patients at KATH

			N=313
Gender	Frequency	Valid Percent	Cumulative Percent
Male	3	1.0	1.0
Female	310	99.0	100.0
Total	313	100.0	

Table 4.5 shows the gender of breast cancer patients treated at KATH during the specified study periods. Of the 310 patients the majority, 99% were females. There were only three male patients representing 1%.

Breast cancer is the most common cancer among women worldwide (Otto, 2001:113; Itano &Taoko, 2005:494), in Ghana (Badoe & Baako, 2000:449-477; Kath cancer report, 2007).

This study provides evidence that breast cancer affects more females than males. As more women than men are affected by breast cancer, they are likewise faced with lymphedema as a complication of breast cancer treatment. Therefore, women should be the most targeted group in all breast cancer awareness programs at KATH.

Table 4.6 Marital status

			N=313
Marital status	Frequency	Valid Percent	Cumulative Percent
Married	176	56.2	56.2
Single	20	6.4	62.6
Divorced	54	17.3	79.9
Widow	63	20.1	100.0
Total	313	100.0	

More than half, 56.2% (176) of breast cancer patients treated at KATH from 01 January, 2005 to 31st December, 2008 were married and 6.4% (20) were single. 17.3% (54) of the patients were divorced and 20.1% (63) widowed.

The findings could be explained by saying that, patients who are married tend to report early signs of breast cancer due to partner support. This can serve as a guide in the planning of educational programs on breast cancer and lymphedema. This also calls for further research on the effect of marital status on breast cancer and lymphedema diagnosis at KATH.

4.5 TYPES OF BREAST CANCER TREATMENTS

Table 4.7 Mastectomy

			N=313
Mastectomy	Frequency	Valid Percent	Cumulative Percent
Yes	123	39.2	39.2
No	190	60.7	100.0
Total	313	100.0	

Table 4.7 reflects breast cancer patients who had mastectomy. Mastectomy was performed on 123 (39.2%) breast cancer patients. The majority, 60.7% (190) did not have mastectomy.

According to Otto, 2001 (133) and Itano &Taoko, 2005 (499), nearly all patients with operable breast cancer are candidates for mastectomy with axillary lymph node dissection. The late presentation of breast cancer, when surgery is no longer an option could have resulted in a reduced number of patients undergoing mastectomy at KATH. Therefore the problem of late presentation of breast cancer at KATH needs to be addressed effectively. Further research is needed in this area.

Table 4.8 Lumpectomy

			N=313
Lumpectomy	Frequency	Valid Percent	Cumulative Percent
Yes	87	27.8	27.8
No	226	72.2	100.0
Total	313	100.0	

The number of breast cancer patients that underwent lumpectomy as a form of breast cancer surgery was 87 (27.8%). Lumpectomy was not performed on the majority, 72.2% (226), of the patients.

Lumpectomy which is a breast conserving treatment is recognized as an appropriate procedure for women with smaller tumours, stage I and II disease (Otto, 2001:133; Itano &Taoko, 2005:498). The late presentation of breast cancer at KATH could explain why the majority of the patients did not have lumpectomy. A much more effective screening and early detection program on breast cancer needs to be implemented at KATH to address this problem.

Table 4.9 Biopsy of the breast

			N=313
Biopsy performed	Frequency	Valid Percent	Cumulative Percent
Yes	31	9.9	9.9
No	282	90.1	100.0
Total	313	100.0	

Table 4.9 reflects the number of patients who had biopsy of the breast. The majority of the patients, 90.1% (282), did not have any form of biopsy of the breast. There were only 31 (9.9%) of the 313 patients that had biopsy possibly due to late stage of breast cancer disease.

Table 4.10 Other surgical procedures

			N=313
Other surgical procedures	Frequency	Valid Percent	Cumulative Percent
Yes	6	1.9	1.9
No	307	98.1	100.0
Total	313	100.0	

The number of patients who had other form of surgical procedure for their breast cancer shows that, almost none of the breast cancer patients, 98.1% (307) had any other form of surgical procedure. There were only six patients of the 313 representing 1.9% who underwent other breast cancer surgery or procedure.

Table 4.11 Axillary lymph node dissection

			N=313
Axillary lymph node dissection	Frequency	Valid Percent	Cumulative Percent
Yes	64	20.4	20.4
No	249	79.6	100.0
Total	313	100.0	

Table 4.11 shows that only 20.4% (64) of the patients had axillary lymph node dissection as a form of breast surgery. The majority of the patients, 79.6% (249) did not undergo axillary lymph node dissection.

Patients with early stage breast cancer, normally undergo mastectomy with axillary lymph node dissection (Otto, 2001:133; Itano &Taoko, 2005: 499). This study shows that few of the breast cancer patients at KATH had axillary lymph node dissection. The majority of breast cancer patients presenting with late stage breast cancer disease may not have been candidates for axillary lymph node dissection.

In the literature, axillary lymph node dissection is a number one risk for lymphedema (Blanchard *et al*, 2003:341-350; Golshan, Martin & Dowlashahi, 2003:209-211). This suggests that the few patients who had axillary lymph node dissection remained at a higher risk of developing lymphedema at KATH.

Table 4.12 Sentinel lymph node biopsy

			N=313
Sentinel lymph node biopsy	Frequency	Valid Percent	Cumulative Percent
Yes	2	0.6	0.6
No	311	99.4	100.0
Total	313	100.0	

Only two of the 313 (0.6%) patients had sentinel lymph node biopsy.

Previous studies reported that sentinel lymph node biopsy remains a risk of lymphedema but at a significantly lower rate, due to the less invasive nature of the procedure (McLaughlin, Wright, Morris & Giron, 2008; 5213-5219; Morrell, *et al*, 2005:1480-1484).

Due to lack of resources and expertise, axillary lymph node dissection is mostly performed at KATH instead of sentinel lymph node biopsy depending on the stage of breast cancer disease. Therefore, performing sentinel lymph node dissection at KATH for all breast cancer patients without positive axillary lymph node could reduce the risk of lymphedema.

Table 4.13 Radiation

			N=313
Radiation	Frequency	Valid Percent	Cumulative Percent
Yes	177	56.5	56.5
No	136	43.5	100.0
Total	313	100.0	

The number of breast cancer patients who received radiation treatment was 117 (56.5%) while 136 (43.5%) did not.

Radiotherapy is considered as a significant treatment-related risk factor of lymphedema (Bani *et al*, 2007:311-318; Hanks, *et al*, 2006:641; Hinrichs, *et al*, 2004:573–580). The findings of this study shows that majority of the patients had radiation treatment, hence putting them at risk of developing lymphedema.

Table 4.14 Chemotherapy

			N=313
Chemotherapy treatment	Frequency	Valid Percent	Cumulative Percent
Yes	263	84.0	84.0
No	50	16.0	100.0
Total	313	100.0	

Table 4.14 reflects that majority of the patients, 84% (263) had chemotherapy as a form of treatment for breast cancer and only 16% (50) of the patients did not.

4.6 LYMPHEDEMA PATIENTS.

Table 4.15 The number of lymphedema patients

			N=313
Lymphedema patients	Frequency	Valid Percent	Cumulative Percent
Yes	31	9.9	9.9
No	282	90.1	100.0
Total	313	100.0	100.0

The number of breast cancer patients who developed lymphedema after treatment was 31(9.9%) patients. The majority of the patients, 282 (90.1%) did not develop lymphedema after treatment.

The lymphedema incidence of 9.9% in this study is quite low but still falls within the reported range of 5% to 60% (Clark *et al*, 2005:343-348; Loudon & Petrek, 2000:65-71; Poage *et al*, 2008:951-964; Sakorafas, *et al*, 2006:153-165).The differences in the incidence rate depends on the type of surgery, the extent of axillary surgery, the number of lymph nodes removed, the use of radiotherapy, the interval between axillary treatments and the methods used to define lymphedema (Bani *et al*, 2007: 311-318; Kocak & Overgaard, 2000:389-392).

In this study, lymphedema was diagnosed and documented if:

- The patient attending the follow-up clinic self-reported symptoms associated with lymphedema: swelling, pain in the ipsilateral arm, heaviness of the arm numbness, stiffness and tenderness.

- The radiation oncologist or the oncology nurse visibly observed a swelling of the ipsilateral arm or asymmetry of the patient's arms.

Self-report of lymphedema symptoms by breast cancer survivors and observation of swelling by a health care professional can be useful in the early detection of lymphedema (Armer & Ridner, 2006:2). Edward, (2000:412-418) found that, more women reported symptoms of lymphedema than were diagnosed using volume measurement.

Armer & Stewart (2005:208-217) compared four different methods of diagnosing lymphedema, and concluded that there is no "gold standard" rule for objective measurement of swelling associated with lymphedema. However, the National Lymphedema Network Medical Advisory Committee recommends volume measurement which involves circumferential measurement of the arm with a tape measure and water displacement as the standard method of diagnosing lymphedema. The benefit of volume measurement is that it can quantify the severity of lymphedema and the effectiveness of treatment (NLN Medical Advisory Committee, 2011).

At KATH, volume measurement is not routinely used in diagnosing lymphedema. This could have contributed to the low incidence of lymphedema among the breast cancer patients.

Another factor that may have resulted in low incidence of lymphedema in this study is under-documentation of lymphedema diagnosis in patients' medical records (McCredie *et al*, 2001:520). Actual limb measurement and symptom assessment will contribute to more accurate data. Further research is needed on the use of objective measurement in

diagnosing lymphedema at KATH. More trained lymphedema therapists are also needed at KATH.

Table 4.16 The time of onset of lymphedema

Descriptive statistics	Time in months
Mean	9.70
Median	10.2
Standard Deviation	7.46
Range	25.4
Minimum	0
Maximum	25.4

The mean time of onset of lymphedema was 9.70 months, the median was 10.2 months and the average deviation from the mean time was 7.46 months (Standard deviation). With the maximum time of onset of lymphedema being 25.4 months, the range which is the difference between the minimum and the maximum time of onset of lymphedema was 25.4 months.

Lymphedema may develop at any stage after the onset of treatment (Clark *et al*, 2005:343-348; Loudon & Petrek, 2000:65-71; Poage *et al*, 2008:951-964; Sakorafas *et al*, 2006:153-165).

Powell *et al,* (2003:1209-1215) noted 39 months as the median time interval to lymphedema development versus, 10 months being the median time of onset of lymphedema in this study. According to Werner *et al*, (1991:177-184) the onset of lymphedema after treatment ranged between two and 92 months. In this study, lymphedema onset ranged between right after treatment (0 month) and 25 months after treatment.

Lymphedema incidence increases with time (Kiel & Rademacker, 1996:279-283; Casley-Smith, 1995:174-185). This suggests that a long term follow-up on the breast cancer patients is of much importance in identifying lymphedema at KATH.

4.7 THE PROFILE OF LYMPHEDEMA PATIENTS

Table 4.17 The year lymphedema patient started treatment at KATH

			N=31
Year treatment was started	Frequency	Valid Percent	Cumulative Percent
2005	0	0	0
2006	2	6.5	6.5
2007	16	51.6	58.1
2008	13	41.9	100.0
Total	31	100.0	

The year lymphedema patients started receiving treatment for breast cancer at KATH is shown in table 4.17. In 2005, no lymphedema patient started breast cancer treatment. Two lymphedema patients (6.5%) were treated for breast cancer in 2006. More than half of the lymphedema patients, 51.6% (16) were treated for breast cancer in 2007 and 41.9% (13) 2008.

With the onset of lymphedema occurring any time after breast cancer treatment, the time patients' start breast cancer treatment can be used as the time to initiate assessment for early detection of lymphedema.

Table 4.18 Gender of lymphedema patients

			N=31
Gender of lymphedema patients	Frequency	Valid Percent	Cumulative Percent
Female	31	100.0	100.0
Male	0	0	0
Total	31	100.0	100.0

Table 4.18 reflects gender of the lymphedema patients. All 31 lymphedema patients were females. The explanation is linked with the fact that breast cancer affects more females than male (See Table 4.5). As the breast cancer patients undergo treatment for breast cancer, they are, at the same time, faced with lymphedema as a complication of breast cancer.

Table 4.19 The marital Status of lymphedema patients

			N=31
Marital status of lymphedema patients	Frequency	Valid Percent	Cumulative Percent
Married	15	48.4	48.4
Single	4	12.9	61.3
Divorced	4	12.9	74.2
Widow	8	25.8	100.0
Total	31	100.0	

The majority of the lymphedema patients, 48.4% (15) were married, 12.9% (four) each were single and divorced. The remaining 25.8% (eight) of lymphedema patients were widowed.

Hayes, Janda, Cornish, Battistutta & Newman (2008:3541), found that the incidence of lymphedema was more than doubled in breast cancer patients who were not married. The researchers suggested that partner support may play an important role in physical recovery after breast cancer. In contrast to previous study, this study found lymphedema to be more common among married women. This may indicate that the partner support among the breast cancer survivors at KATH was minimal. This could be due to the existing tradition and cultural beliefs that gives the married woman the sole responsibility over the household chores. According to Golshan & Smith, (2006:385) heavy arm exercise can trigger lymphedema which could have been the situation in this study.

Another reason could have been that, the partners of the married lymphedema patients may have detected swelling of the arm associated with lymphedema early, thereby

making the patients report the symptoms to the hospital. More research is needed on the effect of marital status on lymphedema.

4.8 RISK AND CONTRIBUTING FACTORS OF LYMPHEDEMA

Table 4.20 Risk and Contributing factors of lymphedema

					N=31
Profile of lymphedema patients	N	Minimum	Maximum	Mean	Std. Deviation
Age prior to lymphedema	31	30	78	52.81	10.901
BMI prior to lymphedema	31	15.8	46.7	26.865	6.7490
Systolic blood pressure	31	100	170	134.19	17.659
Diastolic blood pressure	31	60	100	85.16	8.896
Radiation dose	21	7000	11260	8981.33	1110.171
Age when diagnosed with lymphedema	31	31	80	53.61	10.963
BMI after lymphedema diagnosis	31	16.1	36.4	26.558	5.8310

The profile of lymphedema patients are described as follows:

Age of lymphedema patients prior to lymphedema diagnosis

As shown in table 4.20, the youngest age of lymphedema patients is 30 years and the oldest age is 78 years. The mean age is 52.81 years and the standard deviation is 10.901 years.

Age has been reported by many studies to be associated with lymphedema (Armer, & Fu, 2005:200-207; Kiel & Rademacker, 1996:279-283; Werner *et al*, 1991:177-184). In this study, an average age of 52 years shows the breast cancer patients at KATH were quite young. This calls for a more effective public breast cancer awareness and early detection screening program.

Body Mass Index (BMI) prior to lymphedema

The minimum body mass index prior to lymphedema diagnosis was 15.8 kg/m^2 and the maximum body mass index was 46.7 kg/m^2. The mean body mass index was recorded as 26.865 kg/m^2 and the standard deviation was 6.7490 kg/m^2.

In this study, the mean (average) body mass index of 26.865 kg/m^2 prior to lymphedema shows that the majority of breast cancer patients at KATH were at risk of developing lymphedema.

Systolic blood pressure

The minimum systolic blood pressure of lymphedema patients was 100 mmHg and the maximum systolic blood pressure was 170 mmHg. The mean systolic blood pressure was 134.19 mmHg and the standard deviation was 17.659 mmHg.

Diastolic blood pressure

Table 4.20 presents the minimum diastolic blood pressure of lymphedema patients as 60 mmHg and the maximum diastolic blood pressure as 100 mmHg. The mean diastolic blood pressure was recorded as 85.16 mmHg. The diastolic blood pressure deviated from the mean by 8.896 mmHg.

Radiation dose

Previous studies have identified radiation to be a significant risk factor associated with arm lymphedema, especially with radiation doses greater than 5000 cGray (Bani *et al*, 2007:311-318; Hanks, *et al*, 2006:641; Hinrichs, *et al*, 2004:573–580; Yao, 2004:144).

In this study, 21 of the 31 lymphedema patients received radiation dose as a form of breast cancer treatment. The minimum radiation dose received by all the lymphedema patients was 7000 cGray and the maximum was 11260 cGray. The mean radiation dose was 8981.33 and the standard deviation was 1110.171 cGray.

Previous study reported high dose radiation to be associated with lymphedema (Hinrichs, *et al*, 2004:573–580). Radiation was not a significant risk factor of lymphedema in this study.

Age when diagnosed with lymphedema

The mean age of lymphedema patients at the time of lymphedema diagnosis was 53.61 years. The youngest age was 31years and the oldest age was 80 years. The ages of lymphedema patients at the time of lymphedema diagnosis deviate from the mean by 10.963 years.

Age has been reported by many studies to be associated with lymphedema (Armer, & Fu, 2005:200-207; Kiel & Rademacker, 1996:279-283; Werner *et al*, 1991:177-184). In this study, age was not a statistically significant risk factor associated with lymphedema (p-value was > 0.05).

Body Mass Index (BMI) after lymphedema diagnosis

The minimum body mass index of lymphedema patients at the time of diagnosis was 16.1 kg/m^2 and the maximum body mass index being 36.4 kg/m^2. The mean body mass index was 26.558 kg/m^2 and the standard deviation is 5.8310 kg/m^2.

Studies have shown that body mass index greater than 26 kg/m^2 to be a significant risk factor of arm lymphedema in breast cancer patients (Clark, *et al*, 2005:343-348; Park, *et*

al, 2008:1450-1459; Werner, *et al*, 1991:177-184). In this study, body mass index was not significantly associated with lymphedema. The possible reason for this finding could be associated with the small number of patients that were diagnosed with lymphedema in this study.

Even-though greater body mass index in this study was not significantly associated with lymphedema (Table 4.1), the mean body mass index is higher than 26 kg/m^2 among lymphedema patients. As it is proven in the literature that high BMI is associated with lymphedema, a weight reduction program is needed.

Table 4.21 Lymphedema patients with axillary lymph node dissection

			N=31
Axillary lymph node dissection	Frequency	Valid Percent	Cumulative Percent
Yes	12	38.7	38.7
No	19	61.3	100.0
Total	31	100.0	

The number of lymphedema patients that underwent axillary lymph node dissection as a form of breast surgery was 38.7% (12). The majority, 61.3% (19) of the lymphedema patients did not undergo axillary lymph node dissection.

Table 4.21.1 The crosstabulation of axillary lymph node dissection and patients with or without lymphedema

					N=313
Axillary lymph node dissection			Lymphedema Patient		Total
			Yes	No	
Axillary lymph node dissection	Yes	Count	12	52	64
		% within Axillary lymph node dissection	18.8%	81.3%	100.0%
	No	Count	19	230	249
		% within Axillary lymph node dissection	7.6%	92.4%	100.0%
Total		Count	31	282	313
		% within Axillary lymph node dissection	9.9%	90.1%	100.0%

In table 4.21.1, the crosstabulation of breast cancer patients who underwent axillary lymph node dissection and developed lymphedema and the patients who did not develop lymphedema is shown. With 313 breast cancer patients, 64 had axillary lymph node dissection of which 12 developed lymphedema and 52 did not develop lymphedema.

The 249 of the 313 breast cancer patients did not have axillary lymph node dissection, of which 19 developed lymphedema and 230 did not.

Table 4.21.2 Chi-Square test of axillary lymph node dissection and lymphedema patient

Axillary lymph node dissection	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.055[a]	1	0.008
N of Valid Cases	313		

The chi-square test shows that there is a significant relationship between having had axillary lymph node dissection and being diagnosed as a lymphedema patient (Chi-square test value=7.055, P value=0.008).

The findings of this study are consistent with previous studies that identified axillary lymph node dissection as a significant risk for lymphedema (Blanchard & Donohue, 2003; Clark, *et al,* 2005:343-348; Engel, *et al*, 2003:47–57; Golshan, Martin & Dowlashani, 2003:209-211; Husen,*et al*, 2006:620-628; Morrell, *et al*, 2005:1480-1484. Schijven *et al*, 2003:341-350). Therefore, surgeons at KATH should move to performing sentinel lymph node biopsy, which is associated with minimal lymphedema risk, rather than continue with axillary lymph node dissection.

Table 4.22 The breast cancer stage of lymphedema patients

			N=31
Breast cancer stage of lymphedema patients	Frequency	Valid Percent	Cumulative Percent
Stage I	1	3.2	3.2
Stage II	4	12.9	16.1
Stage III	3	9.7	25.8
Stage IV	20	64.5	90.3
Unknown/missing information	2	6.5	96.8
Other	1	3.2	100.0
Total	31	100.0	

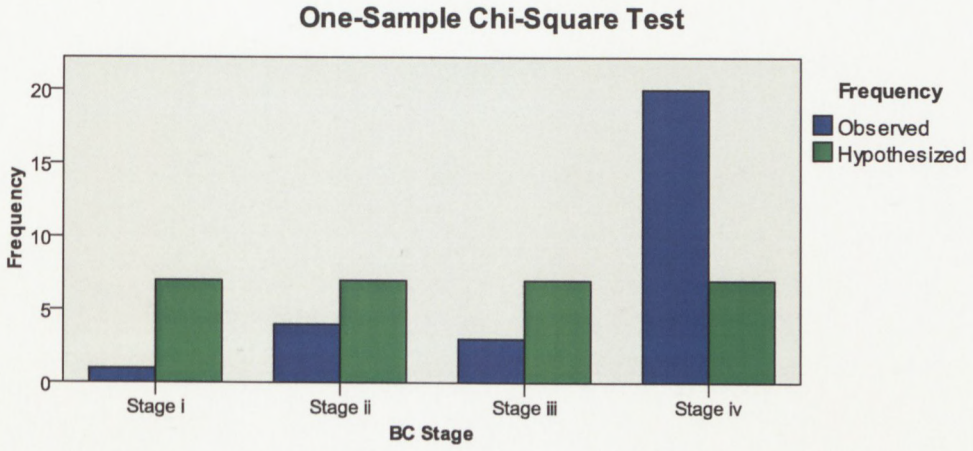
The majority of the lymphedema patients, 64.5% (20) had late stage breast cancer disease (stage four) followed by 12.9% (four) with stage two and 9.7% (three) also with stage three breast cancer. Only 3.2% (one) of the lymphedema patients had stage one breast cancer disease. For the remaining 6.5% (2) of the lymphedema patients, their breast cancer stages were either unknown or not stated in the patient medical records and the other 3.2% (one) had other stages of breast cancer disease.

Data indicates that there is an increased lymphedema risk associated with late staging of the breast cancer disease with lymph nodes involvement (Park, Lee & Chung, 2008:1450-1459; Swenson, *et al* 2009:185-194; Schunnemann & Willich, 1997:536-541). In contrast, other studies did not find any correlation between late stage breast cancer and lymphedema (Werner *et al* 1991:177-184; Warmuth, Bowen, & Prosnitz, 1998:1362-1368).

In this study, late stage of breast cancer was not a statistically significant risk factor associated with lymphedema however when using the one-sample chi-square test it

showed that a significantly high percentage of lymphedema patients had late stage breast cancer.

Table 4.22.1 One sample Chi-Sqaure test of late stage breast cancer and lymphedema



Total N	28
Test Statistic	32.857
Degrees of Freedom	3
Asymptotic Sig. (2-sided test)	.000

1. There are 0 cells (0%) with expected values less than 5. The minimum expected value is 7.

The statistical test shows the null hypothesis stating that the categories of breast cancer stages occur with equal probabilities must be rejected.

Table 4.22.2 Hypothesis test summary of breast cancer stage

Hypothesis Test Summary			
Null Hypothesis	**Test**	**p-value**	**Decision**
The categories of BC Stage occur with equal probabilities.	One-Sample Chi-Square Test	0.000	Reject the null hypothesis.
Asymptotic significances are displayed. The significance level is 0.05.			

Thus, with majority of the lymphedema patients having late stage breast cancer, it can be concluded that there was an association with late stage of breast cancer and lymphedema. Late stage disease with spread of cancer to the lymph node (Table 4.23) results in having more aggressive surgery along with radiation to the axilla, increasing the risk of lymphedema.

Table 4.23 The spread of cancer to the lymph node (metastases)

N=31			
Lymph node metastases	Frequency	Valid Percent	Cumulative Percent
Yes	27	87.1	87.1
No	4	12.9	100.0
Total	31	100.0	

Table 4.23 presents the number of lymphedema patients that had spread of cancer (metastases) to the lymph nodes. The majority of the lymphedema patients, 87.1% (27) had breast cancer spread to the lymph nodes. There were only 12.9% (4) of the lymphedema patients who did not have any spread of cancer to the lymph nodes.

The explanation is the same as shown in table 4.22. A spread of cancer to the lymph nodes, shows that the disease has reached an advanced stage, which results in more aggressive treatment and hence increasing the risk of developing lymphedema.

Table 4.24 The hypertensive status of lymphedema patients

			N=31
Hypertensive	Frequency	Valid Percent	Cumulative Percent
Yes	7	22.6	22.6
No	24	77.4	100.0
Total	31	100.0	

The majority of the lymphedema patients, 77.4% (24/31) did not have hypertension. Only seven out of 31 lymphedema patients, representing 22.6%, were hypertensive.

Kocak & Overgaard, (2000:389-392), have noted hypertension to be another contributing risk factor of developing lymphedema in breast cancer patients. The incidence of arm lymphedema in patients treated for both axillary surgery and irradiated was 35% among patients with normal blood pressure versus 61% for patients with hypertension (Bohler, Rhomberg & Doringer, 1992:344-349). This study provides no evidence that there is an association between lymphedema and hypertension.

4.9 THE REPORTED SIGNS AND SYMPTOMS OF LYMPHEDEMA

Studies have showed that breast cancer and lymphedema patients may report swelling, pain, numbness, heaviness, stiffness, tenderness and burning sensation of the affected arm associated with the occurrence of self-reported lymphedema incidence (Armer & Fu, 2005:200-207; Armer & Ridner, 2006:2; Bani *et al*, 2007:311-318; Husen, Paaschburg & Flyger, 2006:620-628; Radina, Armer & Daunt, 2007:17; Thomas-Maclean, Miedema & Tatemichi, 2005:246-247).

Table 4.25 Swelling or edema of the arm

			N=31
Swelling/edema	Frequency	Valid Percent	Cumulative Percent
Yes	31	100.0	100.0

All the 31 lymphedema patients, representing 100% reported swelling as a sign of lymphedema at KATH oncology.

Table 4.26 Numbness in the arm

			N=31
Numbness	Frequency	Valid Percent	Cumulative Percent
Yes	16	51.6	51.6
No	15	48.4	100.0
Total	31	100.0	

More than half of the lymphedema patients, 51.6% (16) reported numbness as a symptom of lymphedema while 48.4% (15) did not.

Table 4.27 Pain in arm

			N=31
Pain in arm	Frequency	Valid Percent	Cumulative Percent
Yes	16	51.6	51.6
No	15	48.4	100.0
Total	31	100.0	

The number of lymphedema patients who reported pain in the arm was 51.6% (16) while 48.4% (15) made no report of pain in the arm associated with lymphedema.

Table 4.28 Tenderness in the arm

			N=31
Tenderness	Frequency	Valid Percent	Cumulative Percent
No	31	100.0	100.0

None of the 31 patients diagnosed with lymphedema reported tenderness as a symptom associated with lymphedema.

Table 4.29 Stiffness of arm

			N=31
Stiffness of arm	Frequency	Valid Percent	Cumulative Percent
Yes	9	29.0	29.0
No	22	71.0	100.0
Total	31	100.0	

The majority of the lymphedema patients, 71% (22/31) did not report stiffness in the arm as a symptom of lymphedema, but 29% (9/31) of the lymphedema patients did.

Table 4.30 Heaviness in the arm

			N=31
Heaviness in the arm	Frequency	Valid Percent	Cumulative Percent
Yes	19	61.3	61.3
No	12	38.7	100.0
Total	31	100.0	

More than half of the lymphedema patients, 61.3% (19) reported having heaviness in the arm. About 38.7% (12) of the lymphedema patients did not report any heaviness in arm.

Table 4.31 Wound Infection

			N=31
Wound infection	Frequency	Valid Percent	Cumulative Percent
Yes	3	9.7	9.7
No	28	90.3	100.0
Total	31	100.0	

Almost all the lymphedema patients, 90.3% (28/31) did not report any wound infection. There were only 9.7% (3) who reported having wound infection.

In this study, swelling, numbness, pain, stiffness and heaviness of the arm were all associated with lymphedema.

Table 4.32 The location of lymphedema in human body

			N=31
Location of lymphedema in human body	Frequency	Valid Percent	Cumulative Percent
Right arm	17	54.8	54.8
Left arm	14	45.2	100.0
Total	31	100.0	

Table 4.31 presents the data on the location of lymphedema in the human body of lymphedema patients at KATH. The majority of the lymphedema patients, 54.8% (17) developed lymphedema in their right arm while 45.2% (14) developed lymphedema in the left arm.

Querci della Rovere, Ahmad & Singh, (2003:158-161) reported that right breast cancer patients who received cancer treatment had 3 to 4 times the risk of post-operative lymphedema, compared with those patients who received treatment for left breast

cancer. The findings of the study statistically did not show any significant difference between the affected side with cancer and lymphedema development.

4.10 THE TREATMENT OF LYPHEDEMA AT KATH ONCOLOGY

Table 4.33 Lymphedema treatment received

			N=31
Lymphedema treatment received	Frequency	Valid Percent	Cumulative Percent
Yes	10	32.3	32.3
No	21	67.7	100.0
Total	31	100.0	

The majority of lymphedema patients, 67.7% (21) did not receive any form of treatment for their lymphedema. Only 32.3% (10) of lymphedema patients received some form of lymphedema treatment.

Complete decongestive therapy is the most frequently recommended therapy for lymphedema management.

Complete decongestive therapy comprises:

- Manual lymph drainage (MLD),
- Compression applied through short-stretch compression bandages and compression garments,
- Meticulous skin and nail care,
- Remedial exercise and
- Patient education on self care (NLN Medical Advisory committee, 2011).

The use of complete decongestive therapy in managing lymphedema not only reduces the symptoms associated with lymphedema but is also reported to be less expensive for

the patient (Didem *et al*, 2005:49-54; Hamner & Fleming, 2007:1904-1908; Jeffs, 2006:71-79; McNeely *et al*, 2004:95-106; Moseley *et al*, 2007:639-646; Szuba, Achalu & Rockson, 2002:2260-2267).

In this study, only 32% of the lymphedema patients received treatment but the outcome of treatment was not specified in the patients' medical records. More lymphedema therapist and training programs are needed at KATH to effectively manage lymphedema.

Table 4.34 Manual lymph drainage

			N=10
Manual lymph drainage	Frequency	Valid Percent	Cumulative Percent
Yes	5	50.0	50.0
No	5	50.0	100.0
Total	10	100.0	

Half of the ten lymphedema patients who received treatment had manual lymph drainage and the other half did not.

Moseley *et al,* (2007:639-646) and Jeffs (2006:71-79) both noted improvement in patient's self-reported lymphedema symptoms after receiving manual lymph drainage.

This study is limited in the outcome of the use of manual lymph drainage in treating lymphedema at KATH.

Table 4.35 The use of bandaging at KATH

			N=10
Bandaging	Frequency	Valid Percent	Cumulative Percent
Yes	6	60.0	60.0
No	4	40.0	100.0
Total	10	100.0	

The six (60%), out of the ten lymphedema patients (60%) who received treatment, had compression bandaging for their lymphedema symptoms whilst the other four, 40% did not.

Previous studies show that, patients who had compression bandaging, with or without manual lymph drainage, experienced a significant reduction in limb volume after two weeks of daily treatment (Jeffs, 2006:71-79, McNeely *et al*, 2004:95-106). This study is limited in terms of the outcome of the bandaging, therefore detailed documentation in the patient's medical records is important. Further research is needed on the use of bandaging in reducing symptoms associated with lymphedema.

Table 4.36 The use of compression garment at KATH

			N=10
Compression garment	Frequency	Valid Percent	Cumulative Percent
Yes	0	0.0	0
No	10	100.0	100.0
Total	10	100.0	

None of the ten lymphedema patients, representing100%, used a compression garment as lymphedema treatment. This study shows that much needs to be done to improve the treatment strategies of lymphedema at KATH.

Table 4.37 Patient education on self management

			N=10
Patient eductaion	Frequency	Valid Percent	Cumulative Percent
Yes	10	100.0	100.0
No	0	0	
Total	10	100.0	

Table 4.37 reflects that all the ten (100%) lymphedema patients received some form of education on self management of lymphedema during the specified study period. Bani *et al*, (2007:317) found that provision of information to the patient postoperatively, resulted in compliance with the use of manual lymph drainage but not with the use of compression garments. This study was limited in the outcome of the education provided to the lymphedema patient. This shows that there is a need for proper assessment and documentation of patient information in the medical records at KATH. Further research on patient education and lymphedema management is also needed.

Table 4.38 Pneumatic pump

			N=10
Pneumatic pump	Frequency	Valid Percent	Cumulative Percent
Yes	0	0.0	0.0
No	10	100.0	100.0
Total	10	100.0	

Moseley *et al,* (2007:639-646) found a 26% decrease in limb volume with intermittent pneumatic compression pump therapy used in combination with complete decongestive therapy. In this study, none of the ten lymphedema patients received and used a pneumatic pump as a form of lymphedema treatment.

Table 4.39 The use of drugs in lymphedema treatment at KATH

N=10			
Drugs	Frequency	Valid Percent	Cumulative Percent
Yes	0	0.0	0.0
No	10	100.0	100.0

There were no drugs used in treating lymphedema at KATH. None of the 10 (100%) lymphedema patients received any form of drugs or medication for the treatment of lymphedema.

4.10 SUMMARY

This chapter presented, interpreted and discussed the findings of the data analysis.

The next chapter will summarize the findings of the study and make recommendations.

CHAPTER 5

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

At the same time as breast cancer patients undergo treatment, they are faced with the possibility that there will be complications following the treatment. Breast cancer-related lymphedema is one of the most significant complications following breast cancer treatment (Helyer, *et al*, 2010:48-54; Paskett, 2008:5666) but is under-studied worldwide. An intensive literature search did not find any publication on lymphedema that is related to Ghana. This study was conducted to obtain some baseline data on lymphedema at KATH. The findings were discussed and the interpreted in Chapter Four.

This chapter provides a conclusion to the study, in relation to the incidence, risk factors, signs and symptoms as well as to the treatment of lymphedema. The implications of findings to nursing practice and recommendations that follow on from them are discussed later in this chapter.

5.2 CONCLUSION

5.2.1 The incidence of lymphedema

In this descriptive retrospective survey on the medical records of all the 313 breast cancer patients treated at KATH between 01 January, 2005 and 31 December, 2008, shows that 31(9.9%) developed lymphedema. Despite the relatively low incidence of lymphedema found in this study, it still falls within the reported range of 5% to 60% in the literature (Chapter 2, Section 2.4).

5.2.2 Time of onset of lymphedema in this study

Chapter 2, section 2.5 shows that lymphedema can occur at any time after breast cancer treatment. In this study, lymphedema onset ranged from immediately after treatment (0 month) to 25 months after treatment, with 10 months being the median time (Chapter 4, table 4.1).

5.2.3 Risk factors of lymphedema in this study

In the literature, axillary lymph node dissection, radiation, the stage of breast cancer diagnosis, high body mass index, age and hypertension were identified as risk factors of lymphedema. A discussion of the risk factors associated with lymphedema revealed by this study follows.

Axillary lymph node dissection

This descriptive survey found that axillary lymph node dissection is a statistically significant risk factor associated with lymphedema (Chi-square test value=7.055, P=0.008).

The findings of this study are consistent with previous studies in the literature that identified axillary lymph node dissection as a significant risk for lymphedema (Chapter 2, section 2.6.1.1). The performance of a mastectomy and lumpectomy without axillary lymph node dissection was not found to be significantly associated with lymphedema in this study, as was found in a study by Meric, Buchholz & Mirza, (2002:543-549).

Radiation

Previous studies have identified radiation to be a significant risk factor associated with arm lymphedema, especially when the radiation dose is greater than 5000 cGray (Bani *et al*, 2007:311-318; Hanks, *et al*, 2006:641;Hinrichs, *et al*, 2004:573–580; Yao, 2004:144).

In this study, 21 out of 31 patients developed lymphedema after receiving a minimum radiation dose of 7000cGray. However, radiation was not a statistically significant risk factor of lymphedema in this study (P value> 0.05).

Stage of breast cancer disease

In the literature, late stage breast cancer with a spread to the lymph nodes result in having more aggressive surgery along with radiation to the axilla, thus increasing the lymphedema risk (See Chapter 2, section 2.6.2).

Late stage breast cancer was not found to be a statistically significant risk of lymphedema (P value > 0.05) in this study. However, when the one-sample chi-square test was used, it showed that, a significantly high percentage of lymphedema patients had late stage breast cancer.

Late stage breast cancer results in undergoing more aggressive treatments, hence increasing lymphedema risk.

Age

Age has been reported by many studies as a contributing factor associated with lymphedema (Armer, & Fu, 2005:200-207; Kiel & Rademacker, 1996:279283; Werner, *et al*, 1991:177-184).

This study provides evidence that, there were no statistically significant differences in age between the groups of patients that developed lymphedema and the group of patients that did not (all p-values were > 0.05).

Body mass index

In the literature, body mass index greater than 26 kg/m^2 has been found statistically to be a significant risk of arm lymphedema in breast cancer patients (Chapter 2, Section 2.6.3.2). Body mass index was not found to be a statistically significant risk factor of lymphedema in this study (p-value was > 0.05). Even though high body mass index in this study was not significantly associated with lymphedema (Chapter 4, Table 4.1), the mean body mass index of 26.2 kg/m^2 is high and a weight reduction program is needed.

Hypertension

There is evidence showing that hypertension (high blood pressure) is another contributing risk factor of developing lymphedema in breast cancer patients (Bohler *et al*, 1992:344-349; Kocak & Overgaard, 2000:389-392). The findings of this study shows that, there were no significant differences in the systolic and diastolic blood pressures between the groups of patients that developed lymphedema and the group of patients

that did not (p-value was > 0.05). Therefore, hypertension was not a statistically significant risk factor of lymphedema in this study.

5.2.4 Signs and symptoms of lymphedema in this study

Swelling was the principal symptom of lymphedema in this study, as was identified in previous studies (Radina, Armer & Daunt, 2007:13; Thomas-Maclean *et al*, 2005:246-247). In agreement with the literature (Chapter 2, section 2.7), numbness, pain, stiffness and heaviness of the affected arm were associated with the occurrence of lymphedema in this study. Tenderness of the arm was not reported but wound infection was identified in few patients. It was observed that the majority of the patients developed lymphedema in the right arm rather than the left arm.

5.2.5 Treatment of lymphedema in this study

According to the literature, Complete Decongestive Therapy (CDT) is the recommended treatment for lymphedema (Chapter 2, section 2.11.1). However, the majority of the lymphedema patients in this study did not receive any treatment. Only 32% of the lymphedema patients were treated but the outcome of treatment were not specified in the patients' medical records. The types of complete decongestive therapy identified in this study were manual lymph drainage, compression bandaging and patient education on self management. This study found that compression garments, pneumatic pumps and drugs were not used as lymphedema treatments. This shows that lymphedema therapist and training programs are needed at KATH to effectively treat lymphedema.

5.3 IMPLICATIONS OF FINDINGS FOR NURSING PRACTICE

This study provides evidence that the incidence of lymphedema at KATH between 01 January, 2005 and 31 December, 2008 was 9.9%. Axillary lymph node dissection is shown to be a statistically significant risk factor of lymphedema after breast cancer treatment, in this study. Radiation treatment and the stage of breast cancer diagnosis may have contributed to the development of lymphedema. Age, greater body mass index and hypertension were not associated with lymphedema in this study. Manual lymph drainage, compression bandaging and patient education on self management were the various types of complete decongestive therapy that 32% of the lymphedema patients received as treatment. Compression garments, pneumatic pumps and drugs were not used by any of the patients in this study.

Lymphedema is under-studied worldwide and this being the first study to be conducted on breast cancer-related lymphedema at KATH in Ghana, contributes significantly to the limited body of knowledge. The findings serve as the base-line data on breast cancer related lymphedema at KATH which can be added to the hospital-based cancer registry.

5.4 RECOMMENDATIONS

As it is evident from this study and many other studies, that axillary lymph node dissection is the most common treatment–related risk factor of lymphedema, therefore, it is recommended that a change in the surgical practice at KATH be implemented. Sentinel lymph node biopsy which is associated with lower lymphedema risk should replace axillary lymph node dissection at KATH. Currently, sentinel lymph node biopsy is the gold standard offered to all patients undergoing breast surgery in many advanced

countries. Therefore, surgeons in Ghana should be trained in performing sentinel lymph node biopsy so as to help in reducing the incidence of lymphedema.

Many cancer survivors are not aware of lymhedema even though they are at risk of developing it. Therefore there is a great need to create more awareness on lymphedema. Consent forms signed before surgery or radiation should include information on lymphedema risk associated with the treatment.

Nurses, oncologist, surgeons and other health professionals should be familiar with the risk factors, early signs and symptoms, arm measurements and management of lymphedema. Nurses and other health care professionals can use the lymphedema risk reduction strategies outlined by the Medical advisory committee of the National lymphedema Network, to educate the breast cancer patients before and after treatment.

The findings of this study show that the majority of the patients who developed lymphedema did not have access to treatment services. Therefore, training programs should be organized for nurses and other health care professional on the risks of developing lymphedema, the early signs and symptom and the treatment techniques.

Early diagnosis of lymphedema is significant in its effective management. The findings of this study can be used to develop a simple assessment tool that can be used for early detection of lymphedema in breast cancer patients at KATH.

The low incidence of lymphedema in this study may have been as a result of under-documentation of lymphdema diagnosis and missing information in the patient medical records. Documentation of lymphedema diagnosis should be of great importance to all health care professionals at KATH.

5.4.1 Future research

A long-term prospective study, with a larger sample size, involving other hospitals will be of great value. Additional research using volume measurement in defining the incidence of lymphedema is needed.

With the majority of lymphedema patients not receiving treatment in this study, one can conclude that little is known about the treatment of lymphedema. This calls for an investigation in Ghana, to assess the knowledge of health professionals on breast cancer-related lymphedema so as to identify the knowledge gaps and address them.

5.5 SUMMARY

This study provides evidence that the incidence of lymphedema following breast cancer treatment was 9.9% with axillary lymph node dissection as the only statistically significant risk factor. Radiation and the stage of breast cancer at diagnosis may have contributed to the development of lymphedema in this study. High body mass index, age and hypertension were not associated with lymphedema.

Arm swelling, numbness, pain, stiffness and heaviness of the affected arm were found to be associated with lymphedema in this study.

Manual lymph drainage, compression garments and patient education on self management were the forms of treatment given to only 32.3% of the lymphedema patients. Compression garments, pneumatic pumps and drugs were not used for treating lymphedema in this study.

With the majority of breast cancer patients not only presenting with the disease at a late stage but also undergoing axillary lymph node dissection, lymphedema will continue to be a problem in Ghana. Knowing the incidence, risk factors, early signs and symptoms as well as the various treatments of lymphedema, not only helps in the early detection and effective treatment of lymphedema but this knowledge also provides the base-line data for future lymphedema research in Ghana.

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APPENDICES

APPENDIX A

DATA CAPTURE SHEET

Breast cancer patients attending oncology unit at KATH that develop lymphedema after treatment: 01 January 2005- 31 December 2008.

V No.	Variable description/codes	For office use only
1.	Unique IDA Number (only identification)	
2.	Registration date dd/mm/yyyy R date	
3.	Patient folder number (only identification) IDA No.	
4.	Year patient started treatment at KATH: 2005=5 2006=6 2007=7 2008=8	
5.	Gender: Male=1 Female=2	
6.	Age in years	
	Marital status Married=1 Single=2 Divorced=3 Widow=4	

7.	Body mass index(weight kg/height m2)	
8.	a. Blood Pressure in mmHg b. Hypertensive (BP >140/90)	 Yes=1 No=2
9.	Stage of breast cancer Stage i=1 Stage ii=2 Stage iii=3 Stage iv=4 Recurrent=5 Unknown/missing information=6 Other=7	
10.	Breast Cancer Treatment Received	Yes =1 No=2
10. a	i) Surgery	
	Mastectomy	
	Lumpectomy	
	Biopsy	
	Other	
	ii). Extent of axillary surgery	
	Axillary lymph node dissection (Axillary clearance)	
	Sentinel lymph node dissection	
10. b	b. Radiation	Yes=1 No=2
	b.(i) Radiation dose in Gray (number)	
10. c	c. Chemotherapy	Yes=1 No=2

11.	Lymph nodes Metastases	Yes=1 No=2
12.	Lymphedema diagnosis	Yes=1 No=2
13.	Date in years of lymphedema Diagnosis	
14.	Signs and symptoms of diagnosed lymphedema	Yes = 1 No = 2
	Swelling	
	Numbness	
	Pain in arm	
	Tenderness	
	Stiffness	
	Heaviness of the arm	
	Wound Infection	
15.	Location of lymphedema Right arm=1 Left arm=2	
16.	Body mass index during lymphedema	
17.	Lymphedema treatment received	Yes=1 No=2
18.	Type of lymphedema treatment received: a. Complete decongestive therapy	Yes =1 No=2
	Manual lymph drainage	
	Bandaging	
	Compression garment	
	Patient education on self management	
	b. Pneumatic pump	
	c. Drugs	

APPENDIX B

Cape Peninsula
University of Technology

17 June 2009
CPUT/HW-REC 2009/H007

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

At the meeting of the Health and Wellness Sciences-REC on the 8 May 2009 approval was granted to M O Sekyere, pending additional information and amendments now received. This approval is for research activities related to an M Tech Nursing at this institution

TITLE:
Lymphoedema after breast cancer treatment: Ghana

SUPERVISORS:
Internal: Dr M Clarke

External: Not indicated

Comment:
This ethics approval is supported by written permission from the Consultant-Radiation Oncologist and Head of Directorate at the institution in Ghana where the study will be conducted.

Research activities are restricted to those detailed in the proposal and application of April 2009.

Approval will not extend beyond 30 June 2010. An extension must be applied for should data collection for this study continue beyond this date

Prof PENELOPE ENGEL-HILLS
CHAIR: HEALTH AND WELLNESS SCIENCES RESEARCH ETHICS COMMITTEE

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APPENDIX C

KOMFO ANOKYE
TEACHING HOSPITAL

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ONCOLOGY DIRECTORATE

8TH APRIL 2009

TO WHOM IT MAY CONCERN

RE: MISS MIRIAM OWUSU SEKYERE

Student Number: 207145211

I write to inform you that Miss Miriam Owusu Sekyere has been given the permission conduct her research on Lymphedema after breast cancer treatment at Komfo Anoky Teaching Hospital, Oncology Directorate Kumasi, Ghana.

The necessary support will be given to her throughout the research.

DR. BAFFOUR AWUAH
CONSULTANT-RADIATION ONCOLOGIST
& HEAD OF DIRECTORATE