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ORIGINAL ARTICLE

PREVALENCE OF UNI-FOCAL BREAST CANCER ACCORDING TO THE QUADRANTS AND HISTOPATHOLOGICAL TYPE OF THE TUMORS

Nawa Abdalhameed M Amin[1], Kawa Abdullah Mahmood[2], Abeer kadum Abass Alzuhairy[2], Mahabad Abdalaziz Salih[2], Lana R. A. Pshtiwan[3]

[1]Department of Radiology, Sulaimani X ray Center, Directory of Heath, Kurdistan Region, [2]Department of Surgery, College of Medicine, University of Sulaimani, Kurdistan Region, [3]Arab Board General Radiology, Shar Teaching Hospital-Breast Center, Sulaimani, Kurdistan Region, Iraq.

ABSTRACT

Background: Breast cancer is one of the most common and deadly diseases in women, and its prevalence is rising. Breast mammography being the first tool in diagnosis of suspicious breast masses. The aim of this study was to determine the distribution of uni-focal Breast cancer according to different quadrants of the breast and histopathological type of the tumors.

Materials & Methods: This was a cross sectional observational study conducted from Jan 2021 to Sep 2022, at the breast center in Shar hospital located in Sulaymaniyah, the North of Iraq. Convenience sampling method was used and the study enrolled 140 female patients who had biopsy proven uni-focal Breast cancer. For each female patient, specific information were gathered from their data including their basic demographics and their pathological tumor profiles. The malignancy quadrants depending on mammography and ultrasound examinations were used to assess the site of quadrant specific breast cancer.

Results: In this study, the patients' diagnostic age ranged between 25 to 91 years old, with a mean diagnosis range of 49.8 years. Among the included cases, 78 patients were premenopausal (56%) and 62 patients were post-menopausal (44%). The results of our study showed that the majority of tumors in uni-focal BCs were found in Upper Outer Quadrant +Axillary tail (60%). The tumor type according to the true-cut biopsy results showed that Invasive Ductal Carcinoma recorded highest incidence which was 122 cases (87.1%), followed by the Ductal Carcinoma Insitu 9 cases (6.4%), and Invasive Lobular Carcinoma 9 patients (6.4%).

Conclusion: The rate of breast cancer was slightly greater in premenopausal women than in postmenopausal women in this investigation. Our study revealed that the majority of uni-focal breast cancers are located in the upper outer quadrant and axillary tail.

KEY WORDS: Breast Cancer; Mammography; Quadrant Breast Cancer; Uni-focal Breast Cancer.

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INTRODUCTION

Breast cancer (BC) affects women more than any other cancer in both industrialized and developing countries, and is the leading cause of cancer-related death among women worldwide.[1] Multiple variables influence the development of BC, which is a complex disease. Despite the fact that the disease is present everywhere, there are significant regional variations in the disease's occurrence, morbidity, and survivorship. These variations may be caused by a variety of variables, including population dynamics, lifestyle, genetics, and environment. BC is becoming more common, and this trend is getting progressively worse due to changes in risk variables.[2]

The results of studies in the United States and England have shown that the Upper Outer Quadrant (UOQ) is the most frequent tumor site of BC. It is

Corresponding Author:

Dr. Mahabad Abdalaziz Salih
Lecturer, Department of Surgery,
College of Medicine, University of Sulaimani
Kurdistan Region, Iraq.
E-mail: mahabad.salih@univsul.edu.iq

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unclear why BC is more frequently diagnosed in the UOQ than in any other quadrant; although it is generally accepted that the greater proportion of epithelial tissue in this region is the main contributor. Previous research has shown that the reported incidence of BC in the UOQ is not only greater, but is also rising disproportionately over time compared to the other quadrants; suggesting that the higher incidence in this quadrant may be due to other causes, rather than just the greater amount of epithelial tissue.[3] Furthermore, the UOQ is not only the most common site of the tumor in BC, but also in many benign breast conditions including fibroadenoma and breast cysts.[4] In a study on 53905 patients, the most common tumor location was the upper quadrants (72.3%), followed by tumors located in lower quadrants (20.5%), and the central and nipple region (7.2%).[5]

Several vessels deliver blood to the breast parenchyma as well as the nipple-areola complex, with the internal mammary artery providing more than half of the blood circulation to the total breast parenchyma. As a result of the breast's extensive vascularization and hematogenic potential, the metastatic spread is not unusual as the illness worsens. Bones, the liver, and the lungs are sites where metastasis occurs most frequently.[6] Although the etiology of BC is complex and still not thoroughly grasped, there are several established risk factors. The most frequent danger elements include advancing age and feminine gender. Approximately 10% of BCs are caused by gene abnormalities, notably those in the Breast Cancer (BRCA) gene 1 as well as gene 2. Additional discernible risk factors include ductal carcinoma in situ history, high body mass index (BMI), early menarche (before age 13), nulliparity, first child at older age, late menopause, family history of BC or ovarian cancer, and use of postmenopausal hormone therapy.[7]

Early BC identification is crucial for a successful course of treatment. Beside clinical examination, there are several methods for diagnosing BC Mammography is a breast diagnostic scanning process that provides details on the morphology, anatomy, and diseases of the breast. It is employed to analyses breast mass lesions to diagnose and identify BC. Although this process uses low amounts of radiation, it is comparable to conventional X-rays in that it produces images with great contrast, excellent resolution, and minimal noise.[8] Young women with dense breasts benefit more from ultrasound. It separates solid lesions from cystic lesions. It is possible to investigate breast mass that is not palpable. Both fine needle aspiration cytology (FNAC) and core needle biopsy can be done with ultrasound guidance.[9]

Each of the BC subcategories has a distinct histology and prognosis. Invasive breast cancer (or infiltrating) called when BC has spread into the surrounding breast tissue.. About 1% of all BCs in the United States are inflammatory breast cancer. Metastatic breast cancer, also called stage IV breast cancer, is invasive breast cancer that has spread to the bones, liver, lungs, or brain. Non-invasive breast cancer (or in situ) is type of cancer that has not spread beyond the breast tissue where it started. There are two main types of non-invasive breast cancer: Ductal carcinoma in situ (DCIS), that is considered a precursor to invasive breast cancer and increases the risk of developing an invasive breast cancer later in life, and pleomorphic lobular carcinoma in situ (LCIS), that is non-invasive breast cancer that has not spread outside the lobules.[10] The most common histologic subtype of BC is IDC and it accounts for about 70–80% of all cases.[11]

MATERIAL & METHODS

This was a cross sectional observational study conducted from Jan 2021 to Sep 2022, at the breast center in Shar hospital located in Sulaymaniyah, the North of Iraq. Convenience sampling method was used in this study. The study enrolled 140 female patients who had biopsy proven uni-focal BC, their age ranged between 25 - 91 years old. Data on the patient's age at diagnosis, menopause state, mammographic breast density, histopathologic type of the tumor, the mammographic morphology, and the cancer's quadrant were gathered through a review of medical records in breast center.

The inclusion criteria was female patients with uni-focal BC that has been proved by histopathology and Exclusion criteria were male patients, multi-focal, multi-centric BCs, tumors without specific locations and cases whom the histopathology report were not available.

In this study, a group of experienced radiologists in breast imaging had reported the patients mammography images (craniocaudal (CC) and mediolateral oblique (MLO) views) using GE Healthcare 2010 mammogram machine and ultrasonography using 7-12 MHz linear array probe using Samsung HS60 ultrasound machine, for localization of the lesion the breast is divided in to 5 regions : upper outer quadrant (UOQ) including the axillary tail, upper inner quadrant (UIQ), lower outer quadrant (LOQ), lower inner quadrant (LIQ) and central region (including nipple areola complex). In breast quadrants by mammogram, using CC and MLO views, each view is split into two parts by a bisecting line that runs through the breast nipple to the lower edge of the pectoralis major muscle (nipple pectoral line) in the MLO view and running through the nipple perpendicular to the chest wall in the CC view. In CC view; the breast is segmented into outer and inner sections, a lesion located above the line is regarded to be located in the outer part, while below the line, and it is in the inner part of the breast. In the MLO view; the breast is segmented into superior and inferior areas by the nipple pectoral line, a lesion located above the mentioned line is located in the upper part, while below the line it's regarded to be located in the lower part of

the breast. Lesions that located just posterior to the nipple areola complex is assumed to have a central location. Furthermore, the Uni-focal BC reviewed with ultrasonography, in the right breast a lesion is regarded as an UIQ location if it's located between 12-3 o'clock, LIQ location if it's located between 3-6 o'clock, LOQ location if it's located between 6-9 o'clock, and UOQ location if it's located between 9-12 o'clock, central lesions located retoareolarly. While in the left breast a lesion is regarded as an UOQ location if it's located between 12-3 o'clock, LOQ location if it's located between 3-6 o'clock, LIQ location if it's located between 6-9 o'clock, and UIQ location if it's located between 9-12 o'clock, central lesions located retoareolarly, as illustrated in Figure 1.

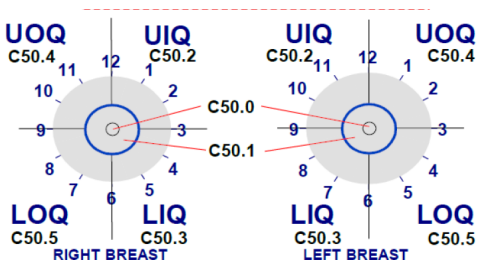

Figure 1: Ultrasound Breast Quadrants

Ethical consideration and consent

This study was approved by the ethical committee of the Arab Board in Radiology and Medical Imaging, Iraq. Verbal informed consent was obtained from the breast center administration for reviewing the imaging and medical data of the patients.

RESULTS

A total 140 female cases were evaluated, each had a uni-focal BC that has been proven by histopathology. In this study, the patients' diagnostic age ranged between 25 to 91 years old, with a mean diagnosis range of 49.8 years. They are divided into 8 groups. The frequency and proportion of uni-focal BC patients based on age groups are shown in Table 1. Among the included cases, 78 patients were premenopausal (56%) and 62 patients were post-menopausal (44%).

Table 1: Age groups of uni-focal breast cancer cases

Age group	Frequency	Percent
21-30	7	5%
31-40	15	10.7%
41-50	62	44.1%
51-60	30	21.7%
61-70	18	12.8%
71-80	7	5%
81-90	0	0%
91-100	1	0.7%

Quadrant of BC:

The results of our study showed that the majority of tumors in uni-focal BCs were found in UOQ+Axillary tail. Among the 140 women, 8 woman (5.7%) had a tumor found in central part of the breast, 11 women (7.9%) had a tumor found in LIQ of the breast, 15 women (10.7%) had a tumor found in LOQ of the breast, 22 women (15.7%) had a tumor found in UIQ of the breast, and 84 women (60%) had a tumor found in UOQ and axillary tail part of the breast. The number of women who had malignancies in the central, LIQ, LOQ, UIQ, UOQ, and axillary tail is shown in Figure 2. The order of the BC quadrant is UOQ+Axillary tail > UIQ > LOQ > LIQ > Central. In this study, the UOQ+axillary tail had the highest BC among 140 cases.

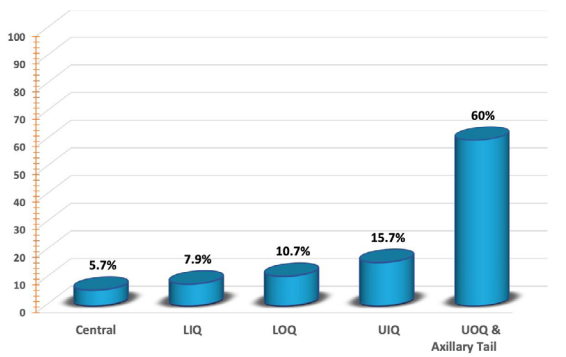

Figure 2: Quadrant specific breast cancer

Breast Density:

Mammographic breast density, a separate risk variable for BC, can hide abnormalities found during the exam. This study cases in which the breast density is classified into four categories include The American College of Radiology (ACR) A: (Almost entirely fatty), B: (Scattered fibroglandular density), C: (Heterogeneously dense breasts), and D: (Extremely dense breasts). Figure 3 showing that the majority of the cases were ACR C (55%) and minority were ACR A (2.9%).

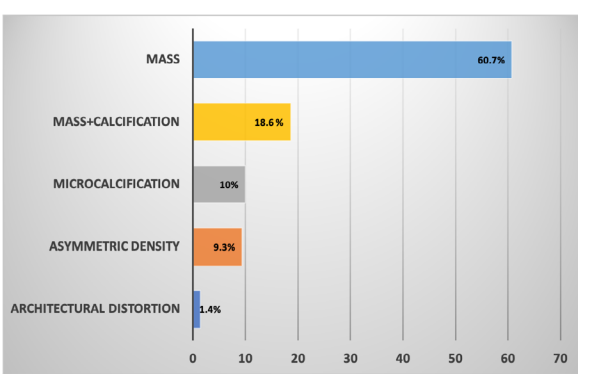

Figure 3: Mammographic Morphology of Uni-focal BC

Histopathological type of the tumor: The tumor type according to the true-cut biopsy results showed

that IDC recorded highest incidence which was 122 cases (87.1%), followed by the DCIS 9 cases (6.4%), and ILC 9 patients (6.4%).

Mammographic morphology of uni-focal BC: The Figure 3 shows the Morphology of the tumor in mammography. The results were as follow: in 85 cases (60.7%) the lesion appeared as a mass, mass+malignanat calcification in 26 cases (18.6%), malignant microcalcification in 14 patients (10%), focal asymmetric density in 13 (9.3%), while architectural distortion in only 2 cases (1.4%).

The Table 2 clarified the correlation between BC location and the histopathological type of the tumor, and the results showed that IDC comprises (86.9%) of the UOQ BCs.

Table 2: Correlation between Quadrant of Breast Cancer and Types of tumors by histopathology

Quadrant of Breast Cancer	Types of tumors by histopathology	%age
UOQ & axillary tail	Invasive ductal carcinoma	86.9%
UOQ & axillary tail	Ductal carcinoma insitu	7.1%
UOQ & axillary tail	Invasive lobular carcinoma	5.9%

The results of Figure 4 shows the relation between quadrant of BC (UOQ& axillary tail) and morphology by mammography, showing that most of the upper outer quadrant BCs will present as a mass on mammographic imaging.

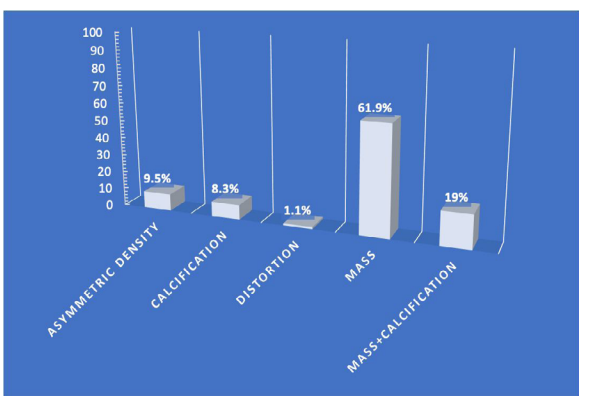

Figure 4: UOQ Breast Cancer and morphology by mammography

Figure 5 shows mammogram and ultrasonography of a 57 years old female with an UOQ BC. MG show dense speculated mass with pleomorphic microcalcifications. US shows speculated hypoechoic solid mass with posterior shadowing.

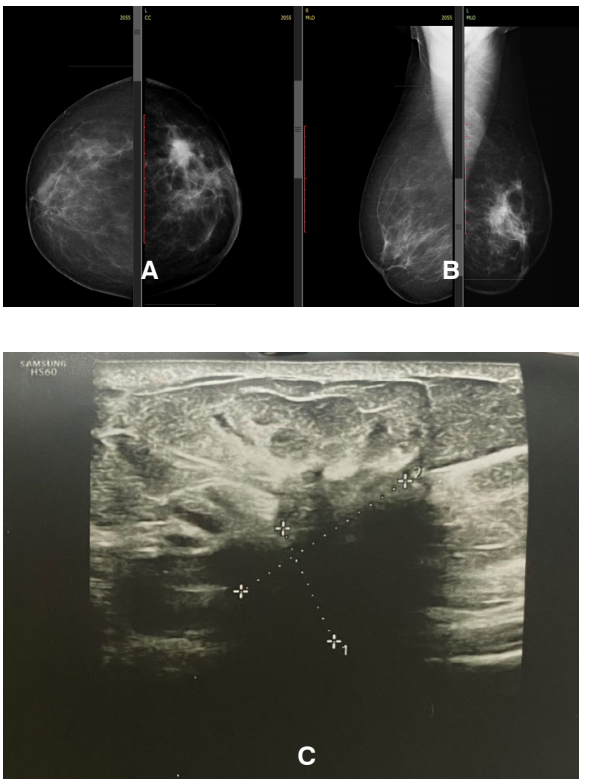

Figure 5: Mammogram and ultrasonography of a 57 years old female with an UOQ BC.

DISCUSSION

Breast cancer is the second most common type of cancer, accounting for 11.6% of all new cases. In addition, it is more likely to be fatal for women. Furthermore, BC is the most common in terms of new cases in 154 countries and 102 countries have the highest mortality rates.[12] BC is one of the most common and deadly diseases in women, and its prevalence is rising, BC is more common in older women, its incidence rises with age, and it is extremely rare in those under the age of 20. Across both pre & post-menopausal cases, premature menarche and late menopause were linked to an increased risk of BC, perhaps due to the prolonged time of hormone exposure.[13]

Our findings indicated that the UOQ+Axillary tail had the highest likelihood of BC occurrence (60%), which is comparable to the previously published studies which ranges from (51.5% to almost 84%) (3-5). Probably this variation is due to having a smaller sample size in our study. Among the patients age group, 41-50 years old group had the highest incidence of BC (44.2%). This incidence was slightly higher in premenopausal cases (56%). Collectively 87.1% of the cases were proven to have IDC on core biopsy. The most common imaging finding on mammographic imaging was “mass” which represented 60.7% of the cases.

According to prior studies (3-5) the higher incidence of BC in the UOQ of the breast is a well-established phenomenon, and there are several factors that may contribute to this finding: The anatomy of the breast: The UOQ has a larger amount of epithelial glandular tissue in comparison to the other quadrants, which makes it more susceptible to develop cancer. Additionally, this area of the breast has more ductal elements, which can be a site of tumor growth. Another factor probably due to that the axillary tail adds an extra volume of breast tissue to the UOQ; owing to a larger breast volume in this quadrant of the breast. Exposure to environmental factors. The UOQ of the breast is more sensitive to hormonal changes, such as those that occur during the menstrual cycle, which may contribute to the development of cancer. Furthermore, the UOQ is an area that is more easily examined during a physical breast exam and mammographic imaging, making it easier to detect abnormalities in this area. The UOQ is the most visible and accessible area of the breast in a mammogram. The UOQ had a disproportionately annual increase in BC diagnoses. Recently, it was speculated that the expanding use of deodorants in the close-by upper breast and underarm regions may be related to the increased risk of UOQ cancer. It is well recognized that armpit cosmetics contain substances like parabens that have the ability to penetrate the skin and behave as estrogens.[14]

Currently, BC diagnosis is a widely researched topic. An effective method for BC diagnosis is the use of histopathological images.[15] The most common histologic subtype of BC is IDC and it accounts for about 70–80% of all cases.[11] Tumors with an ILC, are the next most common histological subtypes of BC accounting for about 15–20% of all cases. There are also several histological types of BC including tubular, inflammatory, mucinous, and medullary carcinomas that are account for less than 2% of all cases.[16] The most common histological types of BC include: medullary carcinoma, metaplastic carcinoma, apocrine carcinoma, mucinous carcinoma, cribriform carcinoma, tubular carcinoma, neuroendocrine carcinoma, classic lobular carcinoma, and pleomorphic lobular carcinoma, in addition to the non-specific type of IDC, which includes the majority of recently diagnosed cases.[17]

CONCLUSION

To sum up, we divided each breast into quadrants using a standardized approach and employed mammography and ultrasound examinations in this retrospective analysis. We discovered that the UOQ+axillary tail region was where BC would have been most prone to develop. The order of Quadrant specific BC was as follow, UOQ+Axillary tail >UIQ >LOQ >LIQ >Central, while mammographic breast density was ACR C >ACR B >ACR D >ACR A, and the order of histopathological tumor type was IDC >DCIS = ILC.

Recommendation: As the upper outer quadrant of breast has the greatest probability to develop BC, this region should gain specific attention during examination by any modality of breast imaging.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	NAMA, KAM
Acquisition, Analysis or Interpretation of Data:	NAMA, KAM, AKAA, MAS, LRAP
Manuscript Writing & Approval:	NAMA, KAM, AKAA, MAS, LRAP

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.