# Retrospective descriptive analysis of the demographic and clinicopathological presentation of breast cancer patients in Kasr Al-Ainy Hospital over 5 years

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**Background**
Breast cancer is the most common type of cancer and the second leading cause of mortalities among women. Early-stage diagnosis of breast cancer increases the chances of survival, and therefore, reduces mortality rates. A national initiative was implemented in Egypt in 2019 when women above the age of 18 years were granted free screening at 3538 healthcare units, and 114 hospitals nationwide.
**Objective**
To describe the sociodemographic factors and clinicopathological presentation of breast cancer among the patients presented to Cairo University Hospital over 5 years.
**Patients and methods**
We conducted a descriptive historical study at Kasr Al-Ainy Teaching Hospital of Cairo University, we retrospectively assessed all women with primary breast cancer diagnosed over 5 years during the period from the July 1, 2017 to the July 1, 2022. Data was collected from medical records, operative notes, radiology reports, and pathology reports from the database system of the Oncology Department of Cairo University Hospitals (Kasr Al-Ainy). The patient data is put into a spreadsheet that focuses on the demographic and clinicopathological characteristics of the patients (age, size of the tumor, side of breast affected, histopathology findings, imaging characteristics, immunohistochemistry, and TNM staging of breast cancer).
**Results**
We enrolled a total of 509 female patients who were screened for early detection of breast cancer during the past 5 years in general surgery, radio diagnosis, and oncology departments, Kasr Al-Ainy Teaching Hospital; they showed a mean age of 53.7±11.7 years and ranged between 26 and 88 years. In the current study molecular subtyping showed that 24.4% were Luminal A, 34% were Luminal B1, 19.4% were Luminal B2, 9.2% were HER2-enriched and 13% were triple-negative breast cancer subtype. We found that neoadjuvant therapy was prescribed for 190 (37.3%) patients, 36 (19%) of those patients achieved pCR, while the remaining patients had residual disease in the postoperative specimen.
**Conclusion**
We concluded that in our center, Egyptian females are diagnosed with breast cancer earlier compared with developed countries; however, the current study reports approximately the same percentages of molecular subtypes, rates of pCR, and metastatic disease at the time of presentation compared with developed countries.

**Keywords:**
breast cancer, clinicopathological, demographic, early stage, molecular subtypes

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## Introduction

Breast cancer is the most common cancer detected among women, accounting for approximately one in three cancers. According to findings from the Egyptian National Cancer Institute, breast cancer represents 18.9% of total cancer cases among women, with a prevalence among young age groups [1].

Breast cancer is always silent. The majority of people know about their disease through routine screenings. Others may appear with a breast lump that was discovered by accident, a change in breast shape or size, or nipple discharge. Mastalgia, however, is not uncommon. Breast cancer must be diagnosed through physical examination, imaging, particularly mammography, and tissue biopsy. Early detection improves survival rates. This describes and stresses the significance of breast cancer screening programs [2].

Breast cancer is the most frequent cancer among women all over the world. It is a very diverse neoplasm with several subgroups. Based on the immunohistochemical expression of hormone receptors, these subtypes are commonly classified into four categories: estrogen receptor-positive (ER+), progesterone receptor –positive (PR+), human epidermal growth factor receptor –positive (HER2+), and triple-negative breat cancer, which is defined by the lack of expression of any of the above receptors. ER expression is an essential diagnostic factor, as it is seen in ~70–75% of invasive breast carcinomas [3].

The PR is expressed in more than half of ER+ patients and only infrequently in ER– patients. Because ER regulates PR expression, physiological PR levels provide information about the functional ER pathway. ER and PR are both abundantly expressed in breast cancer cells and are both regarded as diagnostic and prognostic biomarkers of breast cancer. Higher levels of PR expression are related to improved overall survival, shorter time to recurrence, and shorter time to treatment failure or advancement, whereas lower levels are associated with a more aggressive course of disease, as well as worse recurrence and prognosis [4].

HER2 expression accounts for ~15–25% of breast tumors, and its presence is mostly relevant in treatment selection. HER2 overexpression is one of the first events in breast cancer development. The presence of HER2 raises the detection rate of metastatic or recurring breast cancer by 50–80%. Serum HER2 levels are thought to be a promising real-time marker for tumor presence or recurrence. HER2 amplification causes enhanced overactivation of proto-oncogenic signaling pathways, resulting in uncontrolled cancer cell proliferation, and is associated with poorer clinical outcomes in HER2+ patients [5].

Overexpression of HER2 is also associated with a significantly shorter disease-free duration. The Ki67 antigen is a biological marker of proliferation that is useful for determining cell proliferation. Ki67 proliferative activities represent the aggressiveness of the malignancy, as well as response to treatment and time to recurrence. As a result, Ki67 is critical in determining the best therapeutic strategy and possible follow-ups for recurrence. It could also be regarded as a prognostic factor. Ki67 expression is also associated with decreased survival rates [6].

## Patients and methods

We conducted a descriptive historical study in Kasr Al-Ainy Teaching Hospital of Cairo University, where we retrospectively assessed all women with primary breast cancer diagnosed over 5 years during the period from the July 1, 2017 to the July 1, 2022.

The study protocol was reviewed and permitted by the Institutional Research and Ethics Committee (available on request). The study involved 509 breast cancer patients.

The study included all patients' files diagnosed with both invasive and noninvasive breast cancer operated upon in the breast surgery unit of Kasr Al-Ainy Hospital from July 2017 to July 2022.

We excluded from the current study all male breast cancer and all nonmalignant female breast lesions (posttraumatic, benign breast diseases, and inflammatory breast lesions).

Also, we excluded the files with missing data which may affect the strength or credibility of the study.

Informed consent was obtained from all individual participants included in the study.

## Methods

Data were collected from medical records, operative notes, radiology reports, and pathology reports from the database system of the General Surgery Department, Oncology Department, and Radiology Department of Cairo University Hospitals (Kasr Al-Ainy), including all patients' files over 5 years (invasive, noninvasive, and metastatic breast cancer) after exclusion of the files with missing major data. Filling the patient data into a spreadsheet focuses on the demographic and clinicopathological characteristics of the patients (age, size of the tumor, side of breast affected, histopathology findings, imaging characteristics, immunohistochemistry, and TNM staging of breast cancer).

### Outcomes and objectives

(1) To describe the sociodemographic factors and clinicopathological presentation of breast cancer among the patients presented to Cairo University Hospitals (Kasr Al-Ainy) in the last 5 years.
(2) To construct a solid database of cancer breast patients in the last 5 years.

To correlate the time of presentation and sociodemographic distribution of the patients.

To correlate the clinical and pathological presentation of breast cancer and their immunohistochemistry profile.

### Sample size

The current study was estimated as a period sample including all patients who were diagnosed with breast cancer (invasive and noninvasive) Kasr Al-Ainy for the last 5 years starting from July 2017 till July 2022. We included all demographic, socioeconomic, clinical, radiological, and pathological data from eligible medical archives.

### Statistical analysis

Statistical analysis was conducted using IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp., and data were presented in a simple graphic presentation (tables and graphs).

## Results

A total of 509 female patients with breast cancer confirmed histopathologically were presented to Cairo University Hospital (Kasr Al-Ainy) during the last 5 years through data collection from medical reports, operative notes, radiology reports, and pathology reports from the database system of the Oncology Department of Cairo University Hospital (Kasr Al-Ainy); they showed a mean age of 53.7±11.7 years and ranged between 26 and 88 years. Age groups showed that 14.7% were aged between 20 and 40 years, 25.5% were aged between 41 and 50 years, 30.8% were aged between 51 and 60 years, 21.4% were aged between 61 and 70 years, and 7.5% of the included patients were aged between 71 and 88 years.

Urban residents outnumbered those from rural areas accounting for 53.8 versus 46.2% of the included patients (Table 1).

**Table 1 Demographics of the included patients**

| | Mean/count | % |
|---|---|---|
| Age | | |
| Years | 53.7 | 26–88 |
| Age groups | | |
| 20–40 years | 75 | 14.7 |
| 41–50 years | 130 | 25.5 |
| 51–60 years | 157 | 30.8 |
| 61–70 years | 109 | 21.4 |
| 71–88 years | 38 | 7.5 |
| Residence | | |
| Rural | 235 | 46.2 |
| Urban | 274 | 53.8 |

More than half of the included patients (55.2%) were presented with UOQ lesions, followed by UIQ in 16.3%, then LOQ in 10.4% of the included patients, and to a lesser extent LIQ, central, and axillary tail.

The affected breast side was almost equal between the left and right sides.

Clinical T stage showed that 15.9% of the included patients had T1 disease, 53.6% had T2 disease, 13.9% were T3 disease, 7.1% had T4 disease, 0.2% had T4a,

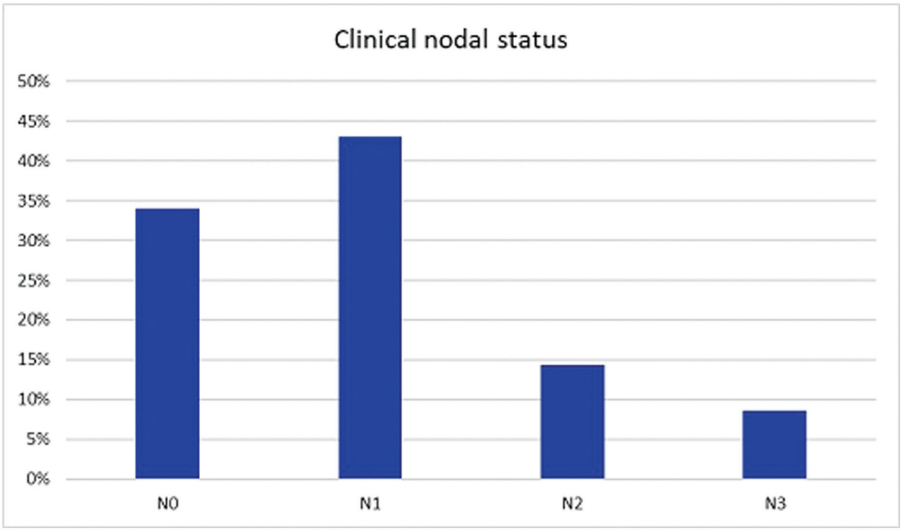
**Table 2 Clinical characteristics of primary tumor among the assessed patients**

| | Count | % |
|---|---|---|
| Side | | |
| Left | 255 | 50.1 |
| Right | 254 | 49.9 |
| Site within the breast | | |
| UOQ | 281 | 55.2 |
| UIQ | 83 | 16.3 |
| LIQ | 38 | 7.5 |
| LOQ | 53 | 10.4 |
| Central | 39 | 7.7 |
| Axillary tail | 15 | 2.9 |
| T stage | | |
| T1 | 81 | 15.9 |
| T2 | 273 | 53.6 |
| T3 | 71 | 13.9 |
| T4 | 36 | 7.1 |
| T4a | 1 | 0.2 |
| T4b | 37 | 7.3 |
| T4c | 2 | 0.4 |
| T4d | 8 | 1.6 |

**Table 3 Metastatic staging among the included patients**

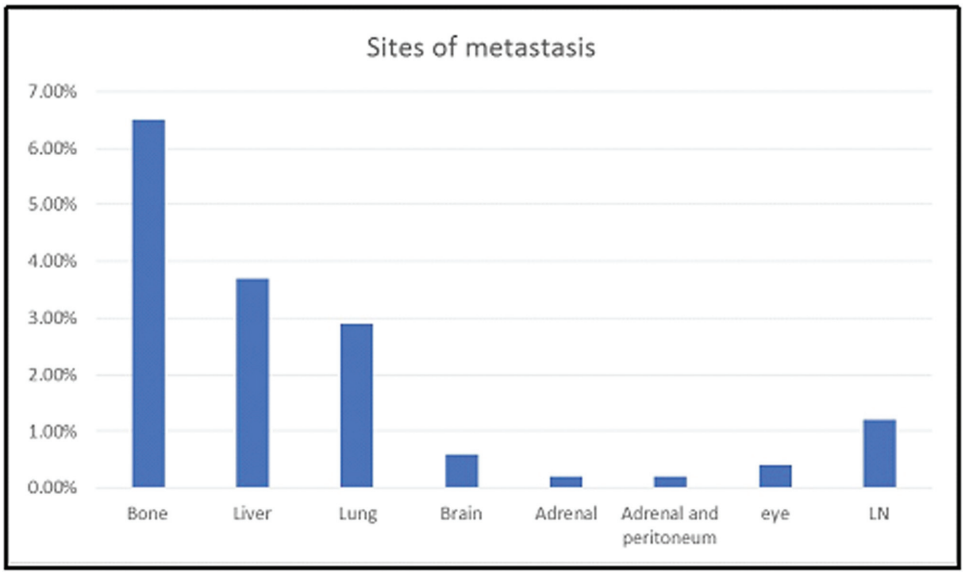
| | Count | % |
|---|---|---|
| M staging | | |
| M0 | 458 | 90.0 |
| M1 | 51 | 10.0 |
| Bone | | |
| No | 476 | 93.5 |
| Yes | 33 | 6.5 |
| Liver | | |
| No | 490 | 96.3 |
| Yes | 19 | 3.7 |
| Lung | | |
| No | 494 | 97.1 |
| Yes | 15 | 2.9 |
| Brain | | |
| No | 506 | 99.4 |
| Yes | 3 | 0.6 |
| Others | | |
| Adrenal | 1 | 0.2 |
| Adrenal and peritoneum | 1 | 0.2 |
| Eye | 2 | 0.4 |
| LN | 6 | 1.2 |

**Figure 1**




Bar chart showing clinical nodal status.

**Figure 2**




Bar chart showing sites of metastasis among the included patients.

7.3% had T4b, 0.4% had T4c, and 1.6% of the included patients had T4d for primary tumor (Table 2).

Clinical nodal status showed that 43% were of N1 stage, followed by N0 in 34.0%, N2 in 14.3%, and N3 in 8.6% of the included patients (Fig. 1).

Metastatic disease was detected in 51 (10%) patients; the most affected site was bone (6.5%) followed by the liver (3.7%), lung (2.9%), brain 0.6%), and other sites such as the adrenal gland, peritoneum, eyes and distant lymph nodes (para-aortic, portocaval, mediastinal, and internal iliac lymph nodes) among 2% of the included patients (Table 3, Fig. 2).

Histopathological assessment of biopsied masses showed that 91.4% were invasive ductal carcinoma (IDC), followed by invasive lobular carcinoma (ILC) in 5.3%, mixed ILC and IDC in 2.5%, and finally DCIS in five (1%) patients only.

The vast majority had a histological grade II accounting for 75.4% and grade III accounting for 19.6% of the included patients. Immunohistochemical

**Table 4 Histopathology findings among the included patients**

| | Mean/count | % |
|---|---|---|
| Pathological subtype | | |
| DCIS | 5 | 1.0 |
| IDC | 465 | 91.4 |
| ILC | 27 | 5.3 |
| Mixed IDC and ILC | 12 | 2.4 |
| Grade | | |
| I | 25 | 4.9 |
| II | 384 | 75.4 |
| III | 100 | 19.6 |
| ER | | |
| Negative | 118 | 23.2 |
| Positive | 391 | 76.8 |
| PR | | |
| Negative | 126 | 24.8 |
| Positive | 383 | 75.2 |
| HER2neu | | |
| Negative | 362 | 71.1 |
| Positive | 147 | 28.9 |
| Ki67 | | |
| % | 28% | 1–90 |
| Molecular subtypes | | |
| HER2-enriched | 47 | 9.2 |
| Luminal A | 124 | 24.4 |
| Luminal B1 | 173 | 34.0 |
| Luminal B2 | 99 | 19.4 |
| Triple-negative | 66 | 13.0 |

studies have shown that 76.8% were ER+, followed by 75.2% PR+. HER2 Neu was overexpressed in 28.9% of the included patients, and mean Ki67 was 28±20% among the included patients (Table 4).

Molecular subtyping showed that 9.2% were HER2-enriched, 24.4% were Luminal A, 34% were Luminal B1, 19.4% were Luminal B2, and 13% were triple-negative breast cancer subtype (Figs 3 and 4).

## Discussion

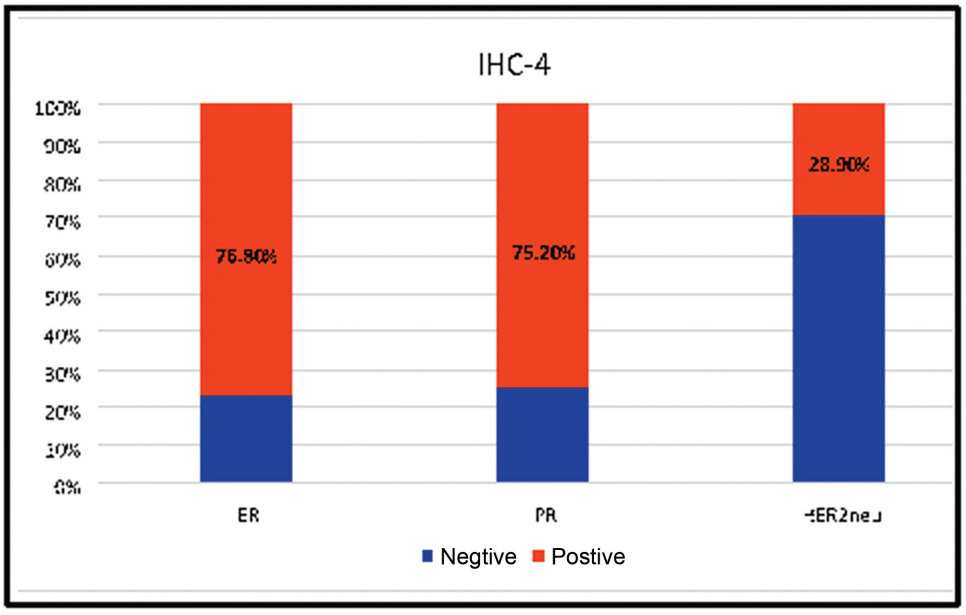
Breast cancer has surpassed lung cancer as the most diagnosed cancer worldwide, accounting for one in every eight cancer diagnoses and 2.3 million new cases in both sexes combined [7].

It was by far the most often diagnosed cancer in women in 2020, accounting for a quarter of all cancer cases in women, and its burden has been increasing in many regions of the world, particularly in transitioning countries. Breast cancer was expected to harvest the lives of 685 000 women in 2020, accounting for 16% of all cancer deaths in women [8].

Past incidence patterns have reflected changes in the prevalence of risk factors associated with breast cancer development, as well as enhanced identification through structured or opportunistic mammographic screening [9].

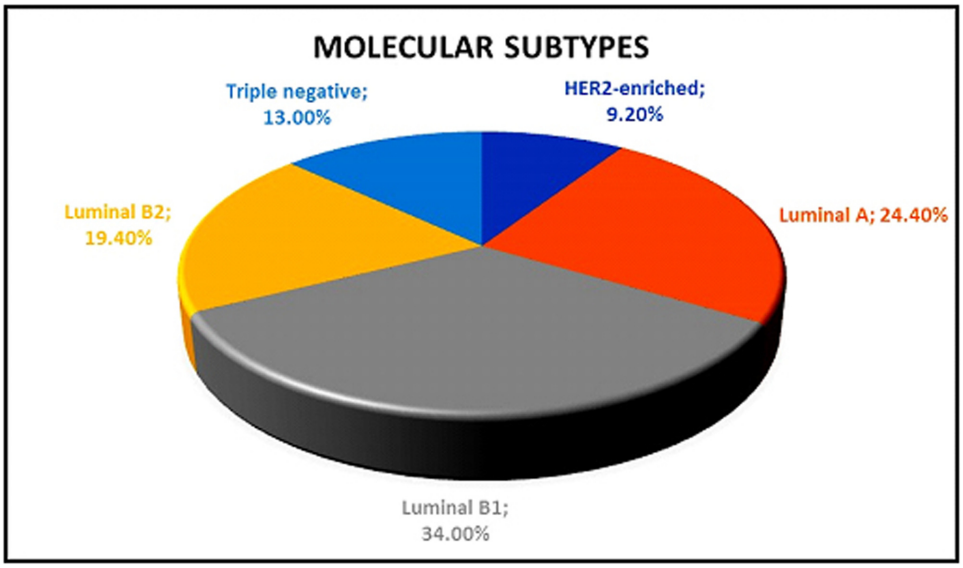
As estimated by the Global Cancer Observatory (GLOBOCAN) in December 2020, the most prevalent cancers in Egypt (5-year prevalence of all ages) are breast cancers followed by liver cancers [10].

**Figure 3**




Bar chart immunohistochemistry studies among the included patients.

**Figure 4**




Pie chart showing molecular subtypes among the included patients.

Since 2007, there has been an increase in the incidence of premenopausal and postmenopausal breast cancer in various high-income nations in North America, Europe, and Oceania [11].

Most of this increase has been attributed to increased detection of tiny, early-stage cancers with excellent prognoses in countries with well-established screening programs. The enhanced discovery of slow-growing ER+ tumors during mammographic screening may have contributed to the rising incidence of ER+ tumors, while ER– tumors are decreasing [12,13].

A national initiative was implemented in Egypt started in 2019 when women above the age of 18 years were granted free screening at 3538 healthcare units and 114 hospitals nationwide [14].

We conducted a historical descriptive study to describe the sociodemographic factors and clinicopathological presentation of breast cancer among the patients presented to Kasr Al-Ainy Hospital in the last 5 years.

We enrolled a total of 509 female patients with breast cancer confirmed histopathologically who were presented to Kasr Al-Ainy Hospital during the last 5 years through data collection from medical reports, operative notes, radiology reports, and pathology reports from the database system of General Surgery, Oncology, and Radiology Departments of Kasr Al-Ainy Hospital. They showed a mean age of 53.7±11.7 years and ranged between 26 and 88 years. Urban residents outnumbered those from rural areas accounting for 53.8 versus 46.2% of the included patients.

These findings are consistent with many studies in the literature, which mentioned 50–60 years is the mean age group with a diagnosis of breast cancer in the Egyptian population, which is considered younger than other well-developed countries (70–75 years old). This discrepancy can be explained by the advanced and well-established national screening programs during the past decades [15–19].

A meta-analysis published by Azim and colleagues stated that among 15 067 patients with BC in 12 studies the Egyptian BC population was significantly younger compared with the western counterparts with a mean age of 50.4 years at diagnosis and 57% being premenopausal/perimenopausal [20].

Rostom *et al.* [21] obseved that among 5236 female patients diagnosed with breast cancer, the mean age was 54 years.

A study by Adel and Abdelghani including 1002 cases was included in the study. The median age was 51 years, and the mean age was 51.64±11.74, with a range from 24 to 85 years [22].

Women aged 50–59 years had the highest overall breast cancer incidence rates through the years 1999–2008 among Egyptian women as stated by Hirko *et al.* [23].

A study by Salem *et al.* [24] included a total of 616 patients (32 males and 584 females) with a mean age of 46.5 years.

The percentage of screened women in urban and rural areas indicates the equal accessibility of Egyptians to healthcare facilities Our findings were similar to ones reported in studies conducted in developed countries such as the United States [25]. Similarily, LeBlanc *et al.* [26] showed that screening was implemented equally in rural and urban population. They stated that rural women showed statistically significant more advanced stage at the time of diagnosis [26]; however, early screening studies showed that urban residents had four times higher incidence of breast cancer compared with rural areas [27]. Similar findings were reported in different studies across Egypt [28,29].

A study conducted in Nebraska showed that a longer distance to the mammography center was associated with a higher proportion of urban women in the breast screening databases [30].

In the current study, the clinical T stage showed that 69.5% of the included patients had T1 or T2 stage for the primary tumor.

These findings were similar to the output of national screening campaigns conducted on 1 925 725 individuals, out of which 9899 patients were diagnosed with invasive breast cancer, and 66% were diagnosed with T1 and T2 disease versus 20% were T3 stage and the remaining could not be assessed Tx [31].

Our findings were consistent with a cross-sectional study conducted by Guo *et al.* [32], who used the data from the National Program for Cancer Registries and Surveillance and found that 83% of the assessed patients were diagnosed with early breast cancer localized disease.

A meta-analysis on clinicopathological presentations of breast cancer among Egyptian women published by Azim *et al.* [20] in the 10 studies that reported the T stage, with a total of 10 619 BC cases, the overall pooled estimated proportions were as follows: stage T1 (12%), T2 (55%), T3 (21%), and T4 (8%), with marked heterogeneity between studies.

Among 4566 cases, Rostom *et al.* [21] found that the majority (55.2%) of patients were diagnosed at early stages (0–II), 37.6% had locally advanced stage III, and only 7.2% had stage IV.

Our findings were consistent with the rate of positive lymph node affection during clinical assessment of newly diagnosed patients with breast cancer varying from 40 to 70% of the examined patients [33,34].

In the meta-analysis published by Azim and colleagues, 13 studies with a total of 14, 796 BC cases, the pooled estimated proportion of patients with positive lymph node involvement was 70%. Among patients with positive lymph nodes, eight studies had presented the detailed N stage, with a total of 10 612 BC cases. The overall pooled estimated proportions of stage N1 (2%), N2 (22%), and N3 (18%) were calculated [20].

In the current study, the prevalence of metastatic disease 10%. The most affected site was bone (6.5%) followed by the liver (3.7%), lung (2.9%), brain (0.6%), and other sites such as the adrenal gland, peritoneum, eyes, and distant LN among 2% of the included patients. In the United States, 6–10% of women diagnosed with breast cancer are initially diagnosed with metastatic disease at the time of presentation [35–37]. Bone metastasis was the commonest site of metastasis followed by lung metastasis, liver metastasis, other metastasis, and brain metastasis [38]. These findings were consistent with the findings in the current study.

IDC is the most common form of invasive breast cancer. It accounts for 55% [39]. ILC is the second major biologically distinct invasive mammary carcinoma other than IDC. It constitutes 5–15% of invasive breast carcinoma and usually affects older age group women affected by conventional IDC of breast cancer incidence on diagnosis [40]. In the present study biopsied masses showed that 91.4% were IDC, followed by ILC in 5.3%, mixed ILC and IDC in 2.5%, and finally DCIS in 1% only.

The meta-analysis published by Azim *et al.* [20] showed that the estimated proportion of invasive duct carcinoma was 87% among 15 171 patients with BC in 12 studies, while ILC represented 7%.

Luminal A tumors are characterized by the presence of ER and/or PR and the absence of HER2. It accounts for 50% of breast cancer females, and has a low expression of cell proliferation marker Ki67 (<20%). Luminal B tumors are of higher grade and worse prognosis compared with Luminal A. The HER2+ group constitutes 10–15% of breast cancers and is characterized by high HER2 expression with the absence of ER and PR.

Triple-negative breast cancer is ER–, PR–, and HER2–. They constitute about 20% of all breast cancers. It is most common among women under 40 years of age [41].

In the current study, molecular subtyping showed that 24.4% were Luminal A, 34% were Luminal B1, 19.4% were Luminal B2, 9.2% were HER2-enriched, and 13% were triple-negative breast cancer subtypes.

These findings were consistent with a systematic review that assessed six cohort studies, and they found that early detection of breast masses during breast screening was associated with 90% node-negative disease and a single breast lesion [42] Romanoff *et al.* [43] have also emphasized that early detection of breast cancer was associated with less nodal infiltration, and showed a single breast mass.

These findings agree with the findings reported in a Spanish screening study that screened two cohorts of females and found that the prevalence of the HER2+ subtype was significantly lower compared with the nonscreened population, with rates of 8.8 and 6.4% versus 16.4 and 13% of the studied groups, respectively [44].

In a retrospective study, 100 983 medical records of breast cancer patients and molecular profiles showed a statistically significant difference in the prevalence of HER2+ disease between screened and nonscreened populations with a rate of 11 versus 15.6% [45]. Similar findings were reported in different studies [46].

Other studies showed that the proportion of HER2+ BC was 17% among 'self-detected,' 15% among 'screening-detected (asymptomatic)' and 15% among 'screening-detected (symptomatic),' which did not show any statistically significant difference [47] Other studies have supported these findings [48–50].

These differences are probably related to a lead time bias due to early detection and the discrepancies between screened populations. In addition, different antibodies and threshold criteria were used for the evaluation of ER, PR, and HER2. Regarding ER and PR, some studies considered positive tumors with at least 1% of positive cells, whereas others used 5% [51].

The meta-analysis published by Azim and colleagues showed that among 5787 patients with BC in 10 studies, the estimated proportion of the HER2+ subtype was 21%. However, among 5591 patients with BC in seven studies the estimated proportion of the triple-negative breat cancer subtype was 10%. Moreover, in 11 studies with more than 11 000 patients, the proportions of ER+ and PR+ patients were 70 and 61% [20].

## Conclusion

We concluded that in our center, Egyptian women are diagnosed with breast cancer earlier compared with developed countries; however, the current study reports approximately the same percentages of molecular subtypes and metastatic disease at the time of presentation compared with developed countries.

### Recommendations

We recommend the construction of a National Cancer Registry across Egypt to compare the demographic, clinical, histopathology, and molecular profiles of breast cancer in Egypt versus Europe and Asia.

Also, large population-based studies should be conducted to assess survival and trends in the early detection of breast cancer.

Large epidemiological studies are also recommended to assess the trends in the incidence of breast cancer every decade.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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