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Risk Factors and Frequency of Breast Cancer among Women across Different Age Groups in Mosul City

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ABSTRACT

Breast cancer is the most common cancer among women. According to the World Health Organization, its incidence is rising in developing countries, likely due to increased life expectancy, urbanization, and the adoption of Western lifestyles. Aim: This descriptive cross-sectional study aimed to investigate the frequency of breast cancer and assess socio-demographic risk factors among women of reproductive age in Mosul City. Patients and methods, the study spanned from September 2023 to August 2024. Data were collected retrospectively using a non-randomized convenience sampling method from patients diagnosed with breast cancer at Al-Jamhuri, Al Salam, and Al-Khansa'a Teaching Hospitals. Diagnosis was confirmed using ultrasound, mammography, and histopathology. Sociodemographic and clinical data were gathered via questionnaires. Data analysis was conducted using SPSS version 28. Results Seventy-four women were included in the study. The overall incidence rate of breast cancer was 3.7919 per 100,000 Mosulian women. The most affected age group was 50-59 years (36.47%), with a mean participant age of 59.3 years. Overweight and obese women comprised a significant portion of cases. Urban residents (54.06%) were slightly more affected than rural residents (45.94%). Blood group O was the most common among patients (31.1%). Early menarche (52.7%) and passive smoking (77.4%) were notable risk factors. Invasive ductal carcinoma was the predominant histological type (82.5%). Conclusion Breast cancer in Mosul City is associated with various demographic and lifestyle risk factors. Public health strategies should prioritize screening, prevention, and treatment, particularly for high-risk groups.

Keywords: Frequency, Breast cancer, Reproductive age, Mosul.

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1. Introduction

Breast cancer (BC) is the most common cancer worldwide, accounting for 12.5% of all cancer cases reported each year, and it represents a leading cause of cancer-related deaths. This highlights the critical need for continued research, public health initiatives, and increased awareness to improve prevention, early detection, and treatment strategies (Wilkinson & Gathani, 2022).

The significance of understanding breast cancer cannot be overstated due to its widespread prevalence and substantial impact on global health. The World Health Organization reports that the incidence of breast cancer is increasing in developing countries, potentially due to rising life expectancy, increased urbanization, and the adoption of Western lifestyles (Gurjia et al., 2023).

Benign breast tumors affect 25% to 50% of adult women and account for approximately 3% of all female visits to the medical offices (Lv et al., 2023). A new breast mass could be the initial symptom in the majority of these cases. However, a thorough and consistent clinical approach assists in early diagnosis and treatment (Rebner & Pai, 2020).

Breast cancer is categorized into three main types based on specific characteristics of the cancer cells, particularly the presence of hormone receptors: hormone receptor-positive breast cancer, human epidermal growth factor receptor 2 overexpression (HER2+)-positive breast cancer, and triple-negative breast cancer (TNBC) (Al Alwan, 2022). Early identification of the breast tumor is especially helpful for further management therapy. Thus, HER2-positive and estrogen receptor-positive breast cancers usually get benefits from hormonal therapy (Burstein et al., 2021).

Overexposure to estrogens is the primary cause of breast cancer risk. Thus, it is essential to look into the period of estrogen exposure in any patient who presents with a new breast tumor (Sacca et al., 2020). While early menarche, late age at first pregnancy, nulliparity, use of oral contraceptive or hormone replacement medication, and late menopause all increase estrogen exposure, breastfeeding is a protective factor against it (Mohsin & Mohamad, 2024).

Typically, when a patient is diagnosed with breast cancer, information should be gathered to build sociodemographic, clinical, and pathologic profiles, including family history, past medical history and gynecologic history, whereas determining the tumour staging and molecular subtype via histopathological examination is crucial for both appropriate therapy and survival rates (Al-Assaf et al., 2008).

According to several studies examining the clinicopathologic aspects of breast cancer, it has been reported that the incidence, staging, therapy, and survival are influenced by the ethnic variations in the Iraqi population (Siegel et al., 2024). The data collected in 2019 from Nineveh Province indicated a higher incidence among women aged 40-49 years. The overall frequency of breast cancer in Iraq showed a significant increase between 2000 and 2019, highlighting the evolving nature of the disease burden in different regions (Alwan, 2010).

The severity of breast cancer ranges from highly aggressive cancers to physiological adenosis. Males can also be affected by breast cancer, which needs a high index of suspicion for early diagnosis (Al-Hashimi, 2021). It is estimated that 2.3 million new cases of BC are diagnosed each year globally.

Gene expression of mRNA is the fundamental basis for the classification of BC into various molecular subtypes that provide insights into new strategies in the prognosis and management (Mohammed & Rabeea, 2021). One of the most important steps in cancer control is the implementation of patient care programs that work on gathering information about pathological and clinical characteristics of tumors, as well as patient parameters (Cooper, 2025).

2. Patients & Methods

This observational, descriptive, cross-sectional study was adopted within a period starting from September 2023 to August 2024. Data were collected retrospectively from participants using the non-randomized convenience sampling technique. This study was approved by the Local Scientific Council of Arab Board of Health Specializations of General Surgery in Iraq.

Patients presenting with breast masses who were referred by specialists to the Breast Consultation Clinic in Al-Jamhuri, Al Salam and Al- Khansa'a Teaching Hospitals in Mosul City were included. All patients had been previously diagnosed with breast cancer by ultrasound and mammography, with confirmation by histopathological examination reports.

Data were collected using a specifically designed questionnaire. Signed consent forms were obtained from patients who were informed about the nature and goals of the study. All collected data were kept confidential and used solely for research purposes.

Demographic information included patient age, weight, height, and BMI; residence; occupation; blood group; educational level; marital status; and number of pregnancies. Specific questions were focused on the description of breast cancer itself, such as age of starting menses, menstrual cycle regularity, age at menopause, history of previous breast problems, number of first-degree relatives with breast cancer, history of tumors at other sites, and any previous medical, surgical, gynecological, and social problems. Clinical presentation data, such as the main complaint, recurrence history, and histopathological type, were documented.

Included cases included patients under 15 years of age, those who refused to participate in the study, and women diagnosed with non-cancerous breast disease. The collected data were evaluated and analyzed to fulfil the study objectives.

3. Statistical Analysis

The data were analyzed using SPSS version 28. Numbers (percentage) and means ± standard deviation (SDs) were calculated for demographic data. The differences between categorical variables were assessed by Chi–squared ($\chi 2$) test. A p-value of < 0.05 was considered statistically significant.

4. Results

The present study included 74 participants. The incidence of breast cancer was found to be 3.7919 per 100,000 Mosulian women over an eleven-month period.

The distribution of study participants according to the months of the study period shows that the incidence of breast cancer was zero in October and November 2023, as well as in January, February and April 2024. The incidence ranged from 0.1037 per 100000 in December 2023 to 1.1159 per 100000 in July 2024.

The mean age of the participants was 59.3 years. It was observed that women aged 50-60 years were the most prevalent group, accounting for 27 participants (36.47%). No participants were recorded in the age category of less than 10 years **Table 1**.

Table 1. Distribution of the study sample according to age.

Age Mean= 59.3 years	Number	Percent	P-value
0 - less than 10	0	0 %	
10 - less than 20	1	1.35 %	0.1
20 - less than 30	2	2.70 %	0.1
30 - less than 40	3	4.04 %	0.2
40 - less than 50	7	9.50 %	0.1
50 - less than 60	27	36.47 %	0.01
60 - less than 70	20	27.03 %	0.01
More than 70	14	18.91 %	0.01
Total	74	100 %	

The distribution of study participants according to BMI showed that the prevalence of breast cancer was 0% among underweight women, compared with 24.3% among overweight and obesity grade I (BMI = 30 - 34.9) women Table 2.

Table 2. Distribution of the study sample according to the body mass index.

BMI Means = 29.7 kg/ m^2	No.	Percent	P-value
Under weight (BMI < 18.5)	0	0 %	
Normal (BMI =18.5 - 24.9)	10	13.6 %	0.1
Overweight (BMI = 25 - 29.9)	18	24.3 %	0.01
Obesity grade I (BMI = 30 - 34.9)	18	24.3%	0.01
Obesity grade II (BMI = 35 – 39.9)	14	18.9 %	0.01
Morbid obesity (BMI > 40)	14	18.9 %	0.01
Total	74	100 %	

Regarding place of residence, 54.06% of the study sample resided in urban regions, while 45.94% resided in rural regions. Moreover, the distribution of participants by blood group showed that blood group O was the most frequent (31.1%), whereas blood group AB was the least frequent (16.2%) among the study sample Table 3.

Table 3. Distribution of the study sample according to the blood group.

Blood group	No.	Percent	P-value
A	19	25.6 %	
B	20	27.1 %	0.0
O	23	31.1 %	0.01
AB	12	16.2 %	
Total	74	100 %	

Concerning the marital state, breast cancer was found among 37.9% of married women, 29.7% of widowed women, and 16.2% of both single and divorced women Table 4.

Table 4. Distribution of the study sample according to the marital state.

Marital State	No.	Percent
Single	12	16.2 %
Married	28	37.9 %
Widow	22	29.7 %
Divorced	12	16.2 %
Total	74	100 %

Table 5 presents the distribution of the study sample across different Gynecologic-Obstetric and social histories. Among the gynecologic-obstetric variables, early menarche was the most common factor, observed in 52.7% of participants. Passive smoking was the most frequent social variable, observed in 77.4% of the study sample. The distribution of cancer TNM stages ranged from 32.5% in Stage II to 0% in Stage 0.

Table 5. Distribution of the study sample according to the obstetric and social histories.

Variable	No. (n=74)	Percent (%)
Early Menarche	39	52.7 %
Late menopause	26	35.1 %
Irregular Cycle	32	43.2 %
Hormonal use after menopause	15	20.2 %
Nulliparity	9	12.1 %
Breast feeding of the first child	15	20.2 %
Breast feeding of the last child	10	13.5 %
Oral contraceptive pills use	18	24.3 %
Drugs for stimulate ovulation	9	12.1 %
History of pre-existing breast issue	22	29.7 %
Family history of breast cancer	18	24.3 %
Family history of other cancer	9	12.1 %
Radiation exposure	13	17.6 %
Active smoking	10	13.5 %
Passive smoking	57	77.0%

4. Discussion

The incidence of breast cancer exhibits significant regional variation. The incidence of breast cancer among women in developed countries is higher than that among women in developing countries (55.9 versus 29.7/100,000, respectively) (71). Highest incidence rates are found in Australia/New Zealand (95.5/100,000), Western Europe (90.7/100,000), North America (89.4/100,000), and Northern Europe (86.4/100,000). Lowest incidence rates are found in South-Eastern Asia (41.2/100,000), Central America (39.5/100,000), Eastern Africa (33.0/100,000), Middle Africa (32.7/100,000), and South-Central Asia (26.2/100,000) (Gupta & Goyal, 2022).

Breast cancer is one of the top ten malignant neoplasms that seriously endanger Iraqi women. In developing Middle Eastern countries, including Iraq, the prevalence of breast cancer is continuously rising. Breast cancer is the most prevalent malignancy among women in Iraq (Lucaccioni et al., 2020). Between 2006 and 2014, the Iraqi governorate of Sulaymaniyah had the highest prevalence of female breast cancer; in 2017, it was reported as the most frequent cancer in the Basra governorate (Alwan, 2016).

In agreement with our findings, previous studies have reported that the overall incidence of new cancer cases in Iraq increased over time, from 52.00 per 100,000 individuals in 2000 to 91.66 per 100,000 individuals in 2019. Genetic traits that include gender, age, ethnicity, family history of the disease, early menstrual onset, and menopause are typically unmodifiable risk factors for breast cancer (Fahad Ullah, 2019).

From another point of view, a wide range of lifestyle factors, such as physical inactivity, obesity, alcohol intake, parity, use of certain drugs (such as oral contraceptives), and exposure to carcinogens, are considered as modifiable risk factors for breast cancer (Alsdfan et al., 2025). In contrast to developed countries, where the incidence of breast cancer is much higher, developing countries have far lower rates of breast cancer, based on available statistical data (Mustafa et al., 2008).

The current study investigates the incidence of breast cancer among patients attending the main breast clinic in Mosul City. Moreover, the study describes the percentage of different variables that may help direct governmental efforts toward high-risk individuals for early detection, thereby improving overall prognosis (Chaane et al., 2024).

The study included 74 female patients, with a mean age of 59.3 years. The incidence of breast cancer was found to be 3.7919 per 100,000. It should be noted that the data were collected over an eleven-month period, and the incidence rate varied significantly, ranging from 0% in October 2023, November 2023, January 2024, February and April 2024 to 1.1159 per 100000 in July 2024. These variations could be explained by the fact that the confirmation tools are not always reasonable. However, no comparable studies have been conducted in Mosul to compare the incidence results.

In the present study, the analysis of the women's ages showed a mean age of 59.3 years. Moreover, the 50 to less than 60-year age group was the most prevalent, while no participants were identified in the 0 to less than 10-year age group. Comparably, Al-Hashimi (2021) studied trends in breast cancer incidence in Iraq during the period 2000-2019 and reported that individuals aged 50-59 years exhibited the greatest incidence rates of breast cancer (Adelegan et al., 2024). Additionally, other studies reported that the median age of women with breast cancer was 51 years at the time of diagnosis, with a range of 17 to 82 years (Al-Hashimi, 2021). The finding of the current study that overweight and obesity are more prevalent among breast cancer patients agrees with the results of Smith et al., who reported similar findings regarding the impact of body mass index on breast cancer (Smith et al., 2021). Furthermore, Abd M et al. (Abd, 2023) reported that a higher body mass index is associated with elevated serum insulin and interleukin-6 levels. Likewise, elevated interleukin-6 levels were correlated with malignant breast mass.

Regarding residence, the higher prevalence of urban compared with rural residence may be attributed to factors such as limited transportation infrastructure and lower levels of awareness about breast cancer in rural areas. Similar findings have been reported previously by LeBlanc G et al., (LeBlanc et al., 2022).

The observation that patients with breast cancer more frequently had blood group O and less frequently had blood group AB is comparable with previous studies that highlight blood type A as a potential risk factor for breast cancer compared with blood type O; however, this relationship was not insignificant for blood types B and AB (Alwan et al., 2019).

The association between both passive and active smoking and breast cancer observed in this study has been similarly reported in numerous studies, which stated that smoking is linked to a higher likelihood of cancer being detected through screening rather than through clinical symptoms (Alchazal et al., 2025).

Comparing gynecological and obstetric histories in this study, early menarche was observed in more than half of the cases, late menopause and menstrual cycle irregularity in more than one-third, nulliparity in about one-tenth, and a positive family history in about one-quarter of the study cases. All these findings are comparable to those reported by Roheel et al. (2023), whose systematic review identified multiple risk factors for breast cancer, with their relative importance varying across world regions (Luo et al., 2011).

Similarly, Hashim et al. (2021) reported that, among Iraqi women, family history is a significant predictor of breast cancer and that the governorate of Nineveh had some of the highest lifetime and five-year breast cancer risks (Roheel et al., 2023). Moreover, Koca et al. (2024) explored the role of having a first-degree relative with breast cancer as a significant risk factor, while Arriaga et al. (2019) studied the preventable burden of breast cancer among premenopausal and postmenopausal women in Australia and reported that late menopause is associated with an increased risk of breast cancer (Hashim et al., 2021; Koca & Acikgoz, 2024).

The finding that a lower proportion of women reported a history of breastfeeding their last child compared with those who breastfed their first child in the current study is consistent with previous studies supporting the hypothesis that both breastfeeding and longer breastfeeding duration reduce the risk of cancer, particularly breast cancer (Arriaga et al., 2019; Oikonomou et al., 2024).

Regarding oral contraceptive pill use and hormonal stimulation for ovulation, a history of use was reported in one quarter and one tenth of participants, respectively. These findings are supported by a meta-analysis examining the type and timing of menopausal hormone therapy and breast cancer risk that indicated a modest but significant association between these hormonal therapies and an increased risk of breast cancer. This risk varied according to duration of use, type of hormones involved, and

individual patient characteristics. These insights underscore the importance of personalized medical guidance when considering hormonal (Abdullah et al., 2024).

Radiation exposure history, including CT scans, radiotherapy, or exposure to blasts, was reported among 17.6% of the women with breast cancer in the current study. In agreement with this finding, a recent article published in 2024 revealed that following exposure to radiation for Hodgkin's lymphoma, breast cancer is diagnosed at an earlier stage, and these women are at greater risk of bilateral disease. Such findings support the need for close follow-up of contralateral tumors (Barańska et al., 2021). However, more than three million individuals were internally displaced as a result of the most recent war in Mosul, which negatively affected disease incidence and the general health services provided by the Iraqi Ministry of Health (Elkin et al., 2011).

5. Conclusion

This study highlights that breast cancer remains a significant health concern among women in Mosul, with an observed incidence of 3.79 per 100,000 over an eleven-month period. The majority of affected women were aged 50–59 years and had overweight or obesity; early menarche, late menopause, passive smoking, and a family history of breast cancer were identified as common risk factors. Invasive ductal carcinoma was the most prevalent histological type, and urban residency was slightly more associated with the disease. These findings emphasize the need for targeted health interventions, including improved awareness, routine screening, and early detection programs, particularly for high-risk groups. Integrating these measures into public health strategies could help reduce the disease burden and improve outcomes for women in this region.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of the current manuscript.

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Ethics Statements

This study was approved by the Local Scientific Council of Arab Board of Health Specializations of General surgery in Iraq.

Author Contribution

The authors confirm contribution to the paper as follows: study conception and design: Muna Z. Al-Hamdany, Modhar S. Al-Omary, data collection: Imad Ali Mohammed, analysis and interpretation of results: Muna Z. Al-Hamdany, Modhar S. Al-Omary , draft manuscript preparation: Imad Ali Mohammed. All authors reviewed the results and approved the final version of the manuscript.

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