


# Breast Cancer in Iraq: Epidemiological Trends, Risk Factors, Genetic Susceptibility, and Healthcare Challenges: A review

Ghufran Mudher Khalaf 

College of Science for Women, University of Baghdad, Baghdad, Iraq

Corresponding Author Email:Ghufran.m@csw.uobaghdad.edu.iq

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## Abstract

Breast cancer is the most common type of cancer among women in Iraq, accounting for approximately 20.5% of all diagnosed cases in women and being a leading cause of cancer-related deaths. This research paper focuses on the epidemiology of breast cancer in Iraqi governorates, drawing on recent reports from the Iraqi Ministry of Health 2023 and research published in peer-reviewed journals in Iraqi communities. The findings indicate the prevalence of breast cancer among Iraqi women, attributed to several risk factors, including genetic predisposition, which accounts for approximately 5-10% of all cases. This predisposition arises from genetic variations in breast cancer-causing genes such as BRCA1 and BRCA2, molecular biomarkers, and socioeconomic and cultural factors. The study also addresses common diagnostic methods and the importance of early detection screening in improving survival rates. Furthermore, it explores the use of machine learning techniques, which can create a large database of affected women and facilitate the development of appropriate treatment plans. The study also highlighted treatment and prevention methods. Early diagnosis of breast cancer facilitates more treatment options compared to advanced stages. Integration of complementary and alternative medicine practices into conventional treatment can alleviate side effects. Adherence to treatment is crucial for maximizing its effectiveness and improving survival rates. Furthermore, strategies for incorporating psychosocial support as a routine practice in the care of women with breast cancer are also important.

**Keywords:** Breast Cancer, Risk factors, CAM, Genetic predisposition

سرطان الثدي في العراق: الاتجاهات الوبائية، عوامل الخطر، الاستعداد الوراثي،  
وتحديات الرعاية الصحية

غفران مظهر خلف 

كلية العلوم للبنات، جامعة بغداد، بغداد، العراق

ايمل الباحث المراسل:Ghufran.m@csw.uobaghdad.edu.iq

## الخلاصة

يعد سرطان الثدي أكثر أنواع السرطان شيوعاً بين النساء في العراق، إذ يمثل حوالي 20.5% من جميع الحالات المشخصة لدى النساء، ويعتبر سبباً رئيسياً للوفيات المرتبطة بالسرطان. تركز هذه الورقة البحثية على وبائيات سرطان الثدي في المحافظات العراقية، بالاستناد إلى تقارير حديثة من وزارة الصحة العراقية لعام 2023، وأبحاث منشورة في مجلات علمية محكمة في المجتمعات العراقية. تشير النتائج إلى انتشار سرطان الثدي بين النساء العراقيات، والذي يعزى إلى عدة عوامل خطر، بما في ذلك الاستعداد الوراثي، الذي يمثل حوالي 5-10% من جميع الحالات. ينشأ هذا الاستعداد من اختلافات جينية في جينات مسببة لسرطان الثدي، مثل BRCA1 وBRCA2، بالإضافة إلى المؤثرات الحيوية الجزيئية، والعوامل الاجتماعية والاقتصادية والثقافية. تتناول الدراسة أيضاً أساليب التشخيص الشائعة، وأهمية الكشف المبكر في تحسين معدلات البقاء على قيد الحياة. علاوة على ذلك، تستكشف الدراسة استخدام تقنيات التعلم الآلي، التي يمكنها إنشاء قاعدة بيانات ضخمة للنساء المصابات، وتسهيل وضع خطط علاجية مناسبة. كما تسلط الدراسة الضوء على أساليب العلاج والوقاية. يتيح التشخيص المبكر لسرطان الثدي خيارات علاجية أكثر مقارنة بالمرحلة المتقدمة. يمكن أن يساهم دمج ممارسات الطب التكميلي والبديل في العلاج التقليدي في تخفيف الآثار الجانبية. ويعد الالتزام بالعلاج أمراً بالغ الأهمية لتعزيز فعاليته وتحسين معدلات الشفاء. علاوة على ذلك، تعد استراتيجيات دمج الدعم النفسي والاجتماعي كجزء من الرعاية الروتينية للنساء المصابات بسرطان الثدي ذات أهمية بالغة.

**الكلمات المفتاحية:** سرطان الثدي، عوامل الخطر، الطب البديل والتكميلي، الاستعداد الوراثي.

## 1-Introduction

Most breast conditions affecting women are benign and more common than breast cancer worldwide (Brayet al.,2018; Abdul Wahhab et al.,2025). The symptoms of benign breast condition are similar to those of breast cancer, especially in its early stages when it is treatable (Abdul Wahhab et al.,2025). Breast tumors arise from the abnormal proliferation of cells within breast tissue, usually from the ducts. These tumors then develop into metastatic cancer due to continuous stimulation by various carcinogens, thus invading surrounding tissues and spreading to distant parts of the body (Abdulsalam, 2025). Cancer that originates in the ducts is known as ductal carcinoma. Breast cancer is generally classified into two types: invasive ductal carcinoma (IDC) and ductal carcinoma in situ (DCIS). Invasive ductal carcinoma refers to the abnormal (malignant) proliferation of breast cancer cells that penetrate the duct wall into the connective tissue. In addition, histological effects, a type of tumor microenvironment, are crucial for tumor growth and metastasis. Given the prevalence of this disease, women should recognize the importance of regular screening for the early detection of breast cancer and adhere to appropriate treatment plans until remission, thus reducing mortality rates (Alrawi,2022; Gatea & Salih, 2025). The study aims to determine the prevalence of breast cancer and its correlation with age, genetic predisposition, and additional factors. The study aimed to determine the prevalence of breast cancer in Iraq and its relationship to genetic predisposition and molecular markers as risk factors. It also highlighted the importance of early screening as a fundamental diagnostic method to enable treatment of the disease, in addition to other diagnostic methods.

## 2-Methodology

This article employed a narrative compilation methodology to gather and evaluate available evidence on the epidemiology of breast cancer, its risk factors, modern diagnostic methods, and the health response and coping mechanisms following recovery in Iraqi women.

## Search Strategy

The scientific literature search was conducted using the databases PubMed, Scopus, Web of Science, the World Health Organization's Global Health Library, and Google Scholar, employing a combination of medical subject areas (MeSH) and relevant search terms such as breast cancer, women, Iraq, epidemiology, risk factors, registry, treatment, screening, palliative care, and health policy. Other sources were found in the official publication of the Iraqi Ministry of Health and Environment.

## Data Analysis and Transfer

The methodological quality and suitability of all included sources were rigorously verified. The data covered disease incidence measures such as incidence, prevalence, and mortality, as well as risk factors, ranging from genetic factors to molecular factors and environmental, social and cultural factors. In addition, the analysis highlighted the importance of early detection and understanding the burden of breast cancer and the healthcare response in Iraq. All studies exclusion with non-Iraqi populations, those focusing on treatment, and those that did not adequately address the objectives of this study were excluded. Studies were selected based on a review of the article title, abstract, and full text. Ultimately, 55 articles published in English were included.

## Ethical Considerations

This study relied on secondary data collected from published journals; therefore, no ethical or informed consent was needed.

## 3-Results and Discussion

### Epidemiology of Breast Cancer

Breast Cancer is the most common cancer among women worldwide, and it is responsible for high incidence and mortality rates in both developed and developing countries. In 2023, the total number of common cancers in Iraq was 29.149, representing 67.7% of all cancer cases, overall cancer among females were more than males; it affected 18.041 (41.9%) male and 25.021 (58.1%) females. Breast cancer accounted for 8.849 cases (20.5%), representing 34.8% of all cases diagnosed in women. The five governorates with the highest incidence rates, categorized by age group, were Erbil (92.3 per 100,000 population), followed by Baghdad (83.8 per 100,000 population), Karbala (80 per 100,000 population), Najaf (71.4 per 100,000 population) and Basra (69 per 100,000 population) (Fig. 1). A worrying trend in recent years is the rising incidence of cancer in Iraq. Approximately two-thirds of cancer deaths occur among low- and middle-income patients, reflecting the increasing burden of the disease and the cost of treatment (Alih et al.,2025). The incidence of breast cancer in the United States is estimated at approximately 12.4% or approximately one in eight women (Al-Askari & Abdelkefi, 2023). The interplay between genetic vulnerability, epigenetic alterations and the tumor microenvironment is a critical factor of neoplastic progression. Among the main parameters, which are clinically and pathologically important, there are the size of the tumor, histopathological grading, nodal invasion, and endocrine receptor (Trnkova et al., 2024).



**Figure1. Distribution of Breast Cancer ASR (per 100.000) of Top Ten Among Governorates, Iraq 2023.**

## **Risk Factors**

### **Genetic predisposition**

Genetic predisposition is a major risk factor that determines an individual's susceptibility to various types of cancer. Including breast cancer. The cause of this predisposition lies in the genomic variability, i.e. single-nucleotide polymorphisms or pathogenic mutations, which inherited from parents to offspring, as described by Jassama et al. (2025), such as PARP1(Al-Gburi et al.,2024), HER2 (Hussein,2021) and XRCC3(Al-Khalidi and Al-Husseini,2024). Inherited gene mutations that cause breast cancer represent approximately 5-10% of cases. The BRCA1 and BRCA2 genes are among the classical examples of tumor suppressor genes whose mutations hinder the production of proteins that aid in repairing DNA in normal cells. This leads to the creation of abnormal cell growth, as a result of which breast carcinoma occurs (Ain et al., 2023; Alabedi et al., 2025; Mohammed Ali and Muslim, 2025). These pathogenic variants are rare and are estimated to occur in about one in every 500 individuals. They are also transmitted in Mendelian manner, by either parent, irrespective of sex. Studies show that women with possess deleterious BRCA1 or BRCA2 alleles have a cumulative incidence of breast cancer of 85% during their lifetime (Obeagu & Obeagu, 2024). Furthermore, compared to other women, women with these inherited mutations are more likely to develop breast cancer before the age of 40 years (Saeed et al.,2023). It is also essential to clarify the similarities and characteristics of breast cancer patients in Iraq with a positive genetic predisposition, including tumor type and aggressiveness resulting from hoemone receptor status. This will help develop effective prevention and early detection initiatives to improve overall outcomes by identifying those at higher risk based on their family history. Family history of the condition is very important in genetic counseling for making evidence-based decision and supporting families regarding screening, prevention, and possible interventions. (Jagsi et al.,2022).

## **Molecular Biomarkers**

Over the past decades, molecular classification has significantly augmented diagnostic and therapeutic modalities of breast cancer, due to an arsenal of molecular submarkers that provide more insight into tumor biology, clinicopathological characteristics, and therapeutic responsiveness (Al-Tameemi et al.2025). Molecular classification has significantly contributed to improving the diagnosis and management of breast cancer, providing deeper information about tumor behavior and potential treatment responses. The estrogen receptor (ER), progesterone receptor (PR), human epidermal growth factor receptor 2 (HER2), and the proliferation index Ki-67 represent the principal molecular biomarkers routinely employed in breast cancer characterization (Zhang et al., 2022; Jumaah et al., 2025; Hameed and Abed, 2025). ER and PR are essential in the biological pathogenesis and progression of the disease. Their expression level is a crucial factor in determining treatment, particularly hormonal therapy. Approximately 70 ER positive tumors in the breast are associated with a good prognosis and response to hormonal therapy (Scabia et al., 2022). PR expression is often used together with ER and is another sign of hormonal responsiveness, and it is associated with better clinical outcomes (Li et al., 2022). HER2 overexpression, a member of the epidermal growth factor receptor family, is found in about 20 per cent of breast cancers; HER2 positive tumors tend to show more aggressive behaviour and worse clinical prognosis, but they are highly sensitive to targeted therapies, which makes HER2 status a decisive factor in the stratification of treatments. Ki-67 is a cell proliferation marker that has been shown to be an effective prognostic factor of disease progression and outcomes (Jumaah et al., 2025). The importance of the tumor molecular classification studies has been reinforced by the fact that the prevalence of the molecular subtypes differs globally. The diagnostics are therefore easily available and not expensive in terms of resource in limited environments thus making them key assets in strengthening the oncology services in Iraq (Scabia et al., 2022 ; Jumaah et al., 2025).

## **Social, Economic, and Cultural Factors**

In Iraq, breast cancer is a major source of psychological and social stress for women and their families. Qualitative research in some Iraq governorates indicates fear of various social consequences, issues of shame, a lack of understanding about breast cancer, and reluctance to undergo breast examinations or mammography, which reduces the rate of clinical breast examinations and diagnostic follow-up, even when health services are available (Republic of Iraq. Ministry of Health and Environment,2024). It has been suggested that overcoming these obstacles can be achieved by organizing specialized awareness campaigns about the disease in each community, providing appropriate screening services for women, and involving local leaders and women's groups (Mohammed Ali & Muslim, 2025). Addressing breast cancer diagnosis and employing different methods and strategies is essential to overcoming this situation (Mingorance et al.,2019). Therefore, many women resort to coping skills that include managing a wide range of stressors, including the effects of surgery, the side effects of supportive therapies, and the physical and psychological burdens. According to recent Iraqi research, emotional-focused coping mechanisms are the most common among breast cancer survivors, and the lower the quality of life is, the more severe the symptoms, the earlier the diagnosis, and the fewer the social support networks (Mohammed Alsdfran, 2025; Ali,

2025). In Iraq, formal psychosocial support services and care programs remain limited, unevenly distributed, and not fully integrated with treatment pathways, leading many patients to prefer using their networks instead of professional psychosocial care (Skelton et al., 2023; Republic of Iraq, Ministry of Health and Environment, 2024; Mohammed et al., 2025). Economic factors also pose a barrier to treatment decisions and continued care, as personal expenses for diagnosis, medication, and travel to specialized centers are a significant obstacle for women with limited income. The likelihood of women in low- and middle-income countries getting regular preventive screening is lower as compared to women in high-income Western countries (Ahmed, 2023; Abdul-Zahra, 2024). In the high-income nations, breast cancer survival within five years is more than 80, but in the low-income nations like India is less than 70 and in South Africa less than 50, these improved due to be explained by advanced approaches to early diagnosis and effective treatment (Almeshari et al., 2023; Hassan & Al-Attar, 2025). Thus, the encouragement of health education and the introduction of financial risk insurance is one of the key steps towards the equitable control of the disease (Al-Hashemi, 2021). Play a public awareness and medical knowledge high degrees of variance and a critical role in early detection of the disease hence increasing the chances of survival. Empirical studies performed in Iraq and other nearby areas have confirmed that reduced educational levels and poor health literacy is associated with poor diagnostic ability and symptom awareness, which in consequence reduces the quality of treatment and recovery.

## **Diagnosis and Detection of Breast Cancer**

### **Diagnosis using common Techniques**

There are several methods for detecting breast cancer, including mammography, ultrasound, magnetic resonance imaging, biopsy (which can be further divided into subtypes such as lymph node biopsy and fine-needle aspiration biopsy) (Obeagu & Obeagu, 2024), flow cytometry, and breast self-examination (BSE) (Apatić & Lovrić, 2023). Breast self-examination is the simplest method, as women can perform it at home anytime, and it is free of charge. However, self-examination may not detect breast cancer in its early stages. Therefore, regular breast examinations are strongly recommended for breast cancer detection, as they can detect the disease even in its early stage (Huang et al., 2022).

### **Diagnosis using machine learning mechanisms**

This is a modern, digitally-based approach to breast cancer diagnosis through data analysis, helping medical professional to make more accurate and timely clinical decisions. Over the last few years, machine-learning models have been utilized in computer-aided diagnostic systems in many different ways, such as classification, regression, feature mapping, data optimization, and image segmentation. The methods allow the identification of minor anomalies, which can be overlooked or misunderstood by a human observer, which is emphasized in the review by Syamsiah Mashoor et al. (2023). At the same time, Dar et al. (2022) suggested a set of machine-learning algorithms with the feature-selection strategies. Most of the research available in this area relies heavily on the well-known and heavily-utilized datasets, specifically, the Wisconsin Breast Cancer (WBC) and Wisconsin Breast Cancer Diagnosis (WBCD) databases, as claimed by Yadav et al. (2023). Another study, conducted

on residents of Basra Governorate, used a locally collected dataset to identify optimal algorithms and conduct a comparative analysis of the classification performance of leading machine models for breast cancer diagnosis in terms of contextual relevance. The availability of a local dataset enhanced the environmental validity of the study by providing a diverse knowledge base in this field (Mahmood et al.,2025).

## **Treatment and Prevention**

### **Early Detection of Breast Cancer**

The diagnosis of any neoplastic pathology in a timely manner is central to making therapeutic decisions, disease management, and preventing morbidity and mortality related to cancer (Tobore, 2019). The detection of breast carcinoma at an early stage significantly reduces the likelihood of adverse outcomes and expands the range of possible therapeutic options, as opposed to the situation when the diagnosis occurs at a widespread stage (Barrios & Global, 2022). The Ministry of Health in Iraq with the World Health Organization, the Ministry of Higher Education and Scientific Research and other interested parties launched a national breast cancer early detection and stage program in 2000. Since then, referral centers and specialist clinics that focus on the early detection of malignant breast neoplasma have been formed in major public hospitals in all Iraqi governorates (Alwan et al., 2019). This is an all-encompassing program aimed at reducing the mortality rate of breast cancer by providing high-quality primary and secondary health care, systematic screening of all women at the age of twenty or more and shifting the focus of the programs to early diagnoses where the probability of recovery is increased and the cost of treatment and prognosis are more favourable (Abdu Wahhab et al., 2025; Ghalib, 2025).

### **Complementary and Alternative Medicine (CAM)**

A variety of practices, such as herbal remedies, acupuncture, yoga, meditation, and dietary supplements, are typically used in conjunction with or instead of conventional therapies, including surgical interventions, chemotherapy, and radiotherapy (Choi et al.,2022). CAM has been widely used by patients because it addresses not only physical but also emotional, spiritual, and psychological aspects of their health. However, concerns remain regarding the use of CAM due to its efficacy, safety, and potential interaction with standard treatments. A study in northern Iraq developed culturally informed and appropriate healthcare strategies for integrating CAM practices into breast cancer patients to alleviate treatment side effects, improve overall well-being, and regain a sense of control over their health (Msbah & Al-Mukhtar, 2025).

### **Adherence to Treatment**

Although treatment regimens for breast cancer vary depending on the stage and characteristics of the tumor, adherence to treatment is crucial for maximizing its effectiveness and improving survival rates. Several factors significantly impact adherence to anticancer therapies, including the complexity of the treatment regimen, its duration, resulting side effects, drug interactions, drug-diet interactions, medication cost, and forgetfulness (Chacko et al.,2024). Furthermore, patients' beliefs and knowledge about the medication regimen and its potential side effects are modifiable determinants of adherence

(Saad et al.,2022). In its turn, the promotion of educational awareness is a central measure of improving the treatment adherence. Besides, empirical evidence indicates that the beliefs of patients about the therapeutic effect of medication have a positive correlation with adherence, and anxieties about potential side effects have a negative correlation; thus, it is necessary to consider both dimensions to maximize the adherence outcome of treatment (Bash and Rabeal, 2025).

### **Psychosocial Coping and Support**

According to recent research carried out in Iraq, the psychosocial burden of survivors of cancer is significant, and the coping mechanisms are largely emotion-oriented; thus, there are still significant gaps in the needs of cancer survivors in terms of counseling, palliative care, and survivorship services (Mohammed Alsdfran et al., 2025; Ali and Muslim, 2025). The need to incorporate psychosocial support into standard oncology practice, which includes regular distress assessments, community support groups, family-based counseling, and links with faith-based and community networks, to reduce isolation, increase adherence, and improve the quality of life, is eminent. Healthcare facilities would be in good position to conduct psychosocial screening with brief and validated tools at the time of diagnosis and at critical treatment points; they should be backed by referral processes to accredited counsellors and support groups in hospitals and provincial clinics (Mohammed Alsdfan et al., 2025). Moreover, the community-based survivorship programs, be it in-person or online, should be tailored to observe the cultural norms and local sensitivities (Ali and Al-Qazaz, 2025). Long-term physical, social, emotional, and psychological issues are also common problems encountered by breast cancer survivors even after treatment is over (Maurer et al., 2021). Intervention that is contextually relevant, sustainable and effective to increase coping and overall wellbeing by involving non-governmental organisations and survivor advocates leads to increased participation among the target demographic (Ali and Al-Qazaz, 2025).

### **4-Conclusions**

Breast cancer is a major public health problem in Iraq, and given the significantly high breast cancer mortality rate in the country, this research underscores the enormous burden of breast cancer globally. The study highlights several risk factors among Iraqi women, such as genetic predisposition, education level, general culture, and personal habits. The findings emphasize the need for early detection tools, targeted preventive measures, and definitive diagnostic methods to understand and manage this disease. Furthermore, psychosocial support should be incorporated as a routine practice in oncology patient care and survivor support within hospitals and clinics to reduce isolation, improve treatment adherence, and enhance quality of life.

### **Conflicts of Interest**

The authors declare that they have no conflicts of interest.

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