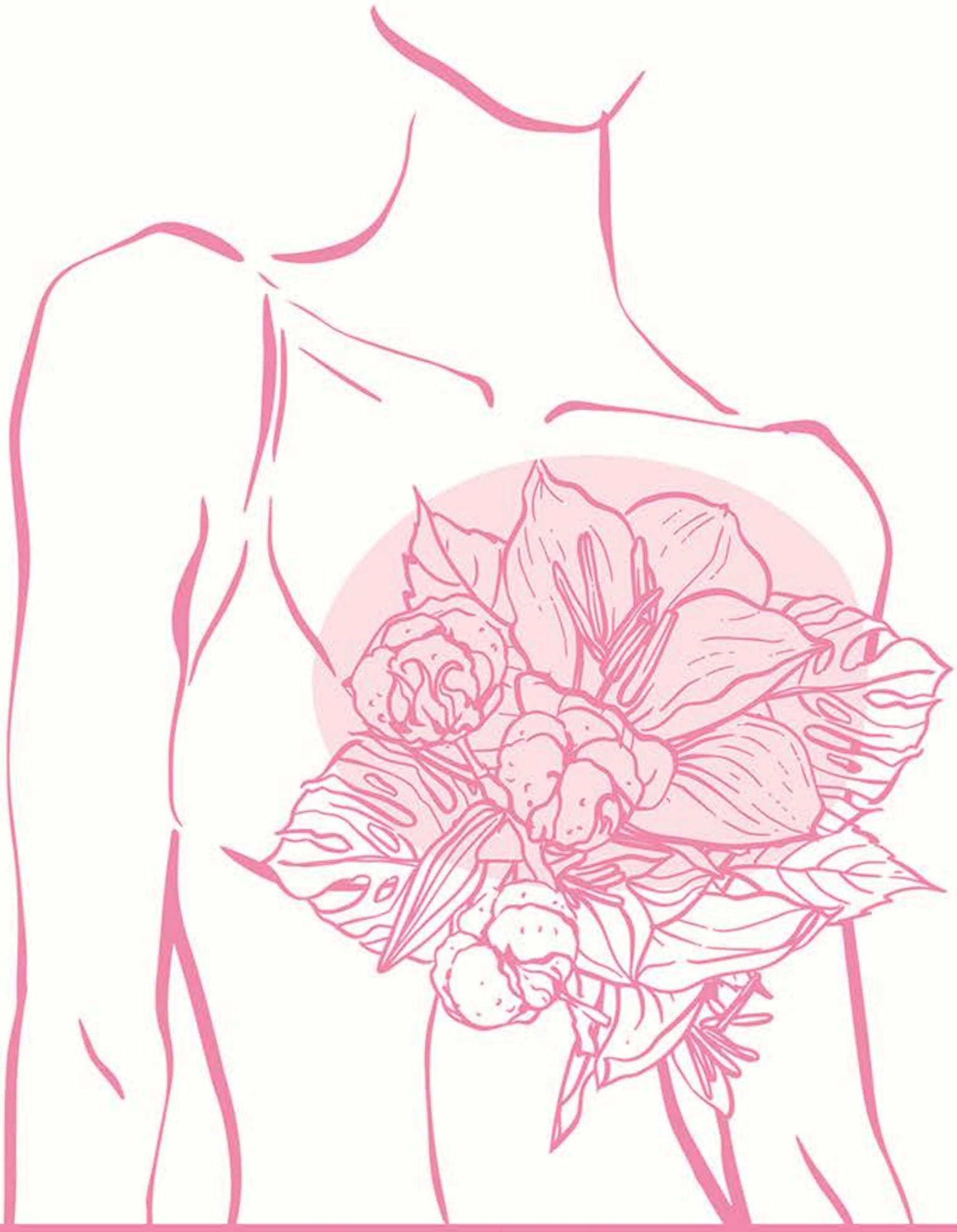
BREAST CANCER
IN THE MIDDLE EAST

AWARENESS, RISK FACTORS ,INCIDENCE QUALITY OF LIFE, AND SURVIVAL



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Breast Cancer in the Middle East: Awareness, Risk Factors, Incidence, Quality of Life, and Survival

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Chapters

Outlines

Contents

Chapter 1: Breast Cancer Awareness and Knowledge Among Women in Middle Eastern Countries

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Summary

This literature review examines the current state of breast cancer awareness, knowledge, and screening practices among women in Middle Eastern countries, identifies unique challenges, and proposes evidence-based recommendations for improvement. A total of 25 studies from Oman, Bahrain, Kuwait, Qatar, Saudi Arabia, UAE, Jordan, Iran, Turkey, Syria, Lebanon, Palestine, and Egypt were included, utilizing diverse methodologies such as cross-sectional studies (17 studies), qualitative studies (2 studies), an interventional randomized controlled trial (1 study), mixed-methods studies (1 study), systematic reviews (1 study), and descriptive cross-sectional studies (1 study). Sample sizes ranged from as small as 23 participants in qualitative studies to as large as 9,008 in large-scale surveys. Data was collected through various instruments, including structured and semi-structured questionnaires, online surveys, and focus group discussions.

The review highlights significant cultural, social, educational, and healthcare-related barriers to effective breast cancer awareness and screening in the Middle Eastern region. Cultural stigmas, conservative attitudes, and social norms were found to limit open discussions and participation in breast cancer screening programs. Educational gaps were also evident, with many women lacking sufficient knowledge about breast cancer symptoms, risk factors, and the benefits of early detection. Additionally, logistical challenges such as transportation, childcare, and financial constraints further restricted access to screening services. Countries with well-funded healthcare systems, such as Qatar and the UAE, exhibited more comprehensive and effective breast cancer awareness programs, while less affluent countries faced challenges due to limited resources.

Introduction

Breast cancer is the most commonly diagnosed cancer among women worldwide, presenting a significant public health concern (Yap et al., 2019). Early detection through heightened awareness and regular screening is essential for improving survival rates and reducing mortality. In many parts of the world, comprehensive public health campaigns and well-structured screening programs have significantly improved early detection rates (Wang et al., 2022; Anastasi & Lusher, 2019). However, Middle Eastern countries still face substantial disparities in breast cancer

awareness and screening practices. These disparities can be attributed to a combination of cultural, social, educational, and healthcare-related factors that influence women's knowledge and participation in breast cancer screening initiatives (Schliemann et al., 2019).

Cultural and social norms in Middle Eastern countries profoundly shape health behaviors and attitudes toward breast cancer screening. Concepts such as modesty, fear, and fatalism are deeply ingrained in many communities, affecting women's willingness to discuss and engage in breast health practices (Almutairi et al., 2019). Additionally, social stigmas associated with cancer and the perception of breast cancer as a taboo subject further exacerbate these barriers, leading to low levels of awareness and knowledge about the importance of early detection and available screening methods (Al-Ismaili et al., 2020; Al-Azri et al., 2021).

Educational gaps and healthcare access also significantly impact breast cancer screening rates in Middle Eastern countries. Many women in these regions have limited knowledge about breast cancer symptoms and the benefits of early detection (Al-Hosni et al., 2023). Existing educational initiatives are often insufficient or poorly targeted, failing to effectively reach a broad audience (Manzour & Gamal Eldin, 2019; Orabi, 2024). Furthermore, logistical challenges such as transportation, childcare, and financial constraints hinder access to screening services. The healthcare infrastructure in some Middle Eastern countries may also lack the necessary resources to support widespread screening programs (Hatem et al., 2021; Elshami et al., 2022). Understanding these multifaceted barriers is essential for developing targeted strategies to improve breast cancer awareness, education, and screening practices in the Middle East.

This literature review aims to provide an in-depth analysis of breast cancer awareness and knowledge among women in Middle Eastern countries, identify unique challenges, and propose evidence-based recommendations for improvement.

Methods

A literature review was conducted to analyze recent studies focused on breast cancer awareness, knowledge, and screening practices among women in the Gulf countries and other Middle Eastern countries, including Oman, Bahrain, Kuwait, Qatar, Saudi Arabia, the UAE, Jordan, Iran, Turkey, Syria, Lebanon, Palestine, and Egypt. The inclusion criteria for the review were studies published since January 2015, research articles written in English, national studies involving female participants, and studies addressing breast cancer awareness, knowledge, attitudes, practices, or screening behaviors.

A general literature search was performed using databases such as PubMed, Google Scholar, and Scopus. Keywords used for the search included "breast cancer awareness," "breast cancer knowledge," "breast cancer screening," "Gulf countries," "Middle East," "Oman," "Bahrain," "Kuwait," "Qatar," "Saudi Arabia," "UAE," "Jordan," "Iran," "Turkey," "Syria," "Lebanon," "Palestine," and "Egypt." Additional articles were identified through manual searches of reference lists from relevant studies.

Data abstraction was carried out using a standardized form to extract key information from each study. The extracted data included the author(s) and year of publication, study location, study design and methodology, sample size and population characteristics, instruments used for data collection, key findings related to breast cancer awareness, knowledge, and screening practices, identified barriers to awareness and screening, and recommendations provided by the study authors.

Results

Table 1 summarizes all studies per countries

Table 1: Summary of all studies

Country	**Summary with Citations**
Oman	Studies in Oman show a range of awareness levels and barriers. Al-Ismaili et al. (2020) found that 60.5% of female teachers had good overall knowledge of breast cancer (BC), while only 9% had excellent knowledge of risk factors, and 57% practiced BSE. Al-Azri et al. (2021) reported that 74.4% recognized lumps as a symptom, but emotional barriers such as fear (68.9%) and worry (62.8%) hindered help-seeking. An intervention by Al-Hosni et al. (2023) significantly improved recognition of BC risk factors and reduced barriers to seeking medical help.
Bahrain	In Bahrain, studies highlighted awareness levels and cultural barriers. Elgammal (2023) noted a high level of awareness but persistent barriers to regular mammograms due to misconceptions (anxiety, shyness, fatalism). Khonji et al. (2024) found poor knowledge (63.25%), attitudes (64.47%), and practice (56.03%) regarding BSE among university students, with cultural barriers and misconceptions identified as key issues.

Kuwait	Studies in Kuwait indicate low awareness and significant barriers. Almajed (2023) reported low knowledge of BC and mammography, with personal and cultural barriers such as fear, fatalism, and misconceptions about BC. Marzouq Muhanna & Floyd (2018) identified fear of discovering cancer, pain, cultural norms, and fatalism as major barriers to mammography screening, suggesting a need for culturally tailored awareness campaigns.
Qatar	In Qatar, Hamed et al. (2022) found that 69% of women were aware of BC warning signs, but there was low uptake of BSE and BCS. Effective BCS invitations (94% attendance) were noted, though barriers like appointment difficulties and fear of diagnosis remained significant.
Saudi Arabia	Studies in Saudi Arabia revealed varying awareness levels and screening practices. AlRajhi et al. (2023) reported that 66.3% of women had low awareness, and 59.4% did not regularly perform BSE. Elmaghraby et al. (2023) found that 36.4% practiced BSE, with 80% aware that BSE could detect lumps, but awareness of other risk factors like alcohol intake was lower.
UAE	In the UAE, Kharaba et al. (2021) found that only 33% of women were aware of BC incidence, and 46% practiced BSE. Cultural and informational barriers were significant. Abu Awwad et al. (2020) highlighted the need for more information from health professionals and the use of social media for dissemination. Al Hosani et al. (2022) reported that only 6% had excellent BC knowledge, and 4% had excellent BSE skills, indicating a need for more effective awareness campaigns.
Jordan	Studies in Jordan showed high awareness but low practice rates. Al-Najar et al. (2021) reported high awareness (99.5%) but low BSE (52.75%) and mammography (14.5%) practice rates, with media being the major information source (70%). Oglat et al. (2024) found good knowledge of risk factors (45.58%), but misconceptions and barriers such as pain persisted.
Iran	In Iran, awareness and screening practices were influenced by psychological factors. Emami et al. (2021) found that 38.2% had a mammogram within the last 24 months, with self-efficacy, motivation, and lower perceived barriers associated with screening practices. Mohebi et al. (2023) reported that 87% of high school students were unaware or had incorrect information regarding BC screening.

Turkey	Kayıkçıoğlu (2023) in Turkey found that 41.2% of women were aware of BC risk factors, with common symptoms like palpable lumps (36.4%) and redness of breast skin (16.9%) recognized. Awareness was influenced by education and marital status.
Syria	Studies in Syria highlighted inadequate awareness levels. Rahman et al. (2023) found significant correlations between breast cancer awareness and factors like smoking, family history, and marital status, but only 16.4% felt confident in detecting changes in their breasts. Bohsas et al. (2023) identified low knowledge of risk factors and symptoms, with higher education linked to better awareness.
Lebanon	Hatem et al. (2021) in Lebanon reported high recognition of carcinogens like smoking (97.5%), but poor recognition of other risk factors like HPV (32.6%). Financial barriers (57%) and fear of illness (53.7%) were significant obstacles to seeking care.
Palestine	In Palestine, Elshami et al. (2022) found that only 3.3% recognized age-related risk, with better awareness in Gaza Strip (42%) compared to West Bank (35.2%). Jobran et al. (2023) reported that 31.7% had good knowledge of BC, but only 4.1% practiced BSE regularly. Barriers included lack of knowledge about performing BSE and the absence of symptoms.
Egypt	In Egypt, Manzour & Gamal Eldin (2019) found that while most participants had correct information about mammography, there was poor knowledge about risk factors, with only 8.1% advised for mammography. Orabi (2024) reported that only 24.3% had satisfactory knowledge, with higher education and mass media playing a crucial role in improving awareness.

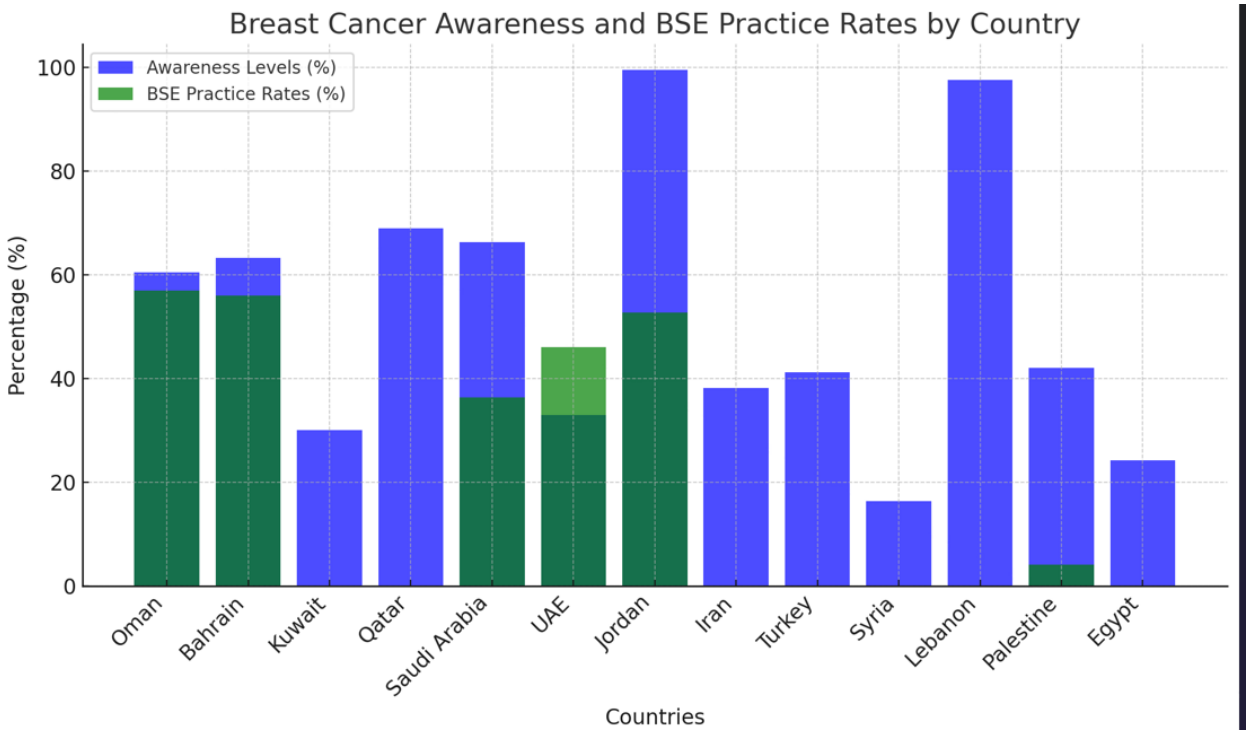

Figure 1: Result Summary

Awareness Levels and Knowledge Gaps

Breast cancer awareness varies significantly across different Middle Eastern countries, with notable gaps in knowledge about risk factors and symptoms. In some countries, like Oman, a significant portion of the population recognizes common breast cancer symptoms, such as lumps (Al-Azri et al., 2021), but there remains a lack of in-depth knowledge about specific risk factors (Al-Ismaili et al., 2020). In Bahrain, although there is a high level of general awareness, there are persistent misconceptions about breast cancer that prevent effective screening practices (Elgammal, 2023). Kuwait also shows low awareness levels, with significant gaps in knowledge about both breast cancer and mammography screening (Almajed, 2023).

In Iran, awareness is influenced by psychological factors, with many women lacking confidence in their ability to detect symptoms or understand the importance of screening (Mohebi et al., 2023). Similarly, in Syria, there is inadequate knowledge of risk factors and symptoms, and low confidence among women in detecting changes in their breasts (Bohsas et al., 2023). In Lebanon, while there is high recognition of common carcinogens like smoking, awareness of less known risk factors remains poor (Hatem et al., 2021). Palestine and Egypt also demonstrate low levels of awareness and knowledge regarding breast cancer, with only a small percentage of women understanding age-related risks or practicing breast self-examination (Elshami et al., 2022; Orabi, 2024).

Cultural and Psychological Barriers

Cultural norms and psychological factors significantly impact breast cancer awareness and screening behaviors across the region. In many countries, fear, anxiety, and fatalistic beliefs hinder women's participation in screening programs. For instance, in Kuwait, fear of discovering cancer, pain associated with mammography, and cultural norms are key barriers to mammography screening (Marzouq Muhanna & Floyd, 2018). Similarly, in Bahrain, misconceptions such as anxiety, shyness, and fatalism prevent women from undergoing regular mammograms despite awareness campaigns (Elgammal, 2023).

Studies in Oman reveal that emotional barriers, such as fear of diagnosis (68.9%) and worry about the disease (62.8%), significantly impede help-seeking behaviors (Al-Azri et al., 2021). In Syria, cultural and societal norms, as well as a lack of confidence, further restrict women's engagement in self-examination and screening practices (Rahman et al., 2023). In Iran, psychological factors like self-efficacy and motivation are crucial determinants of screening behaviors (Emami et al., 2021). Please see figure 2.

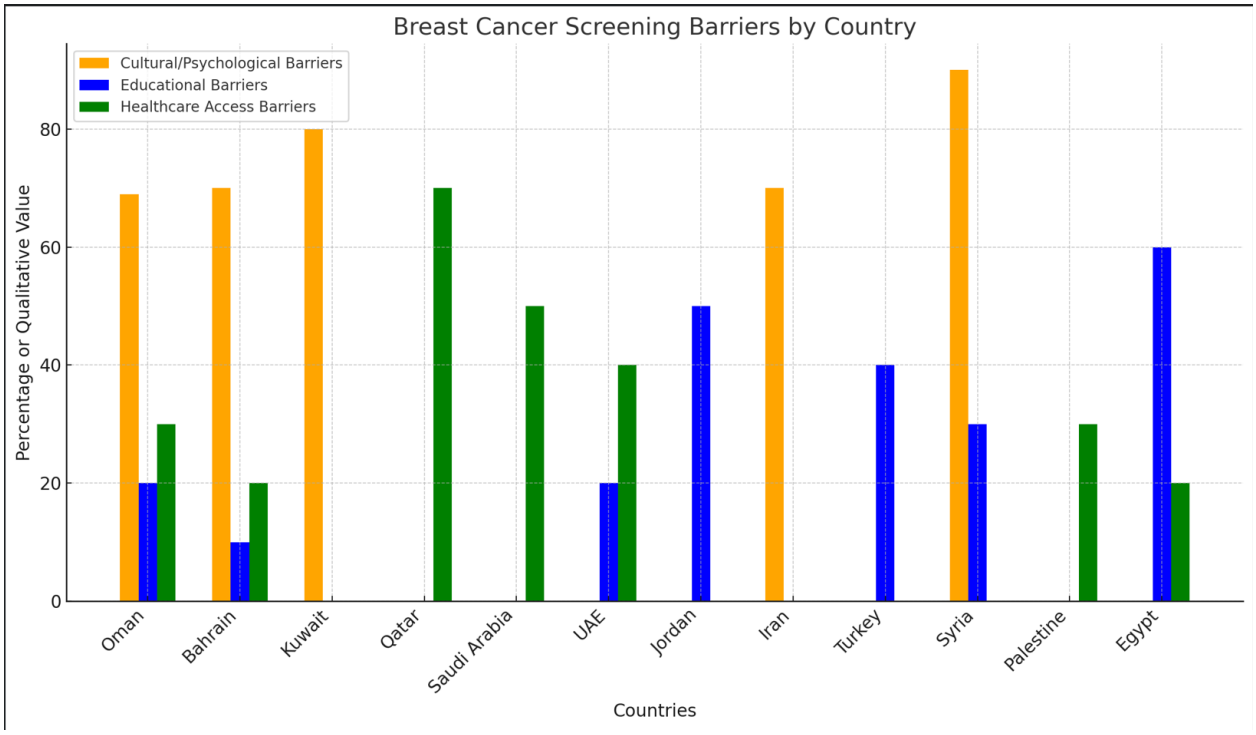

Figure 2: Barrier Summary

Educational Barriers and Misconceptions

Education plays a critical role in shaping breast cancer awareness and practices. In several countries, low levels of education correlate with poor knowledge and misconceptions about breast cancer. For instance, in Oman, targeted educational interventions significantly improved recognition of breast cancer risk factors and reduced barriers to seeking medical help (Al-Hosni et al., 2023). In Jordan, although there is high awareness, actual screening practices remain low, suggesting that awareness does not always translate into action (Al-Najar et al., 2021).

In Turkey, awareness levels are influenced by education and marital status, with educated women showing better awareness of breast cancer risk factors and symptoms (Kayıkçıoğlu, 2023). Similarly, in Syria, higher education levels are associated with better knowledge, although general awareness remains inadequate (Bohsas et al., 2023). In Egypt, education and mass media are identified as critical tools for improving awareness and screening practices (Orabi, 2024).

Healthcare System and Access Barriers

Access to healthcare and the quality of health systems significantly affect breast cancer screening rates in the region. In countries with well-established healthcare systems, such as Qatar and the UAE, there is a higher rate of participation in screening programs when invitations are direct and well-organized (Hamed et al., 2022). However, in countries like Saudi Arabia, logistical challenges and inadequate healthcare infrastructure contribute to low awareness and screening rates (AlRajhi et al., 2023; Elmaghraby et al., 2023).

In Bahrain and the UAE, there is a need for enhanced public health campaigns that leverage both traditional and social media to disseminate information effectively (Abu Awwad et al., 2020; Kharaba et al., 2021). In Palestine, barriers such as a lack of knowledge on how to perform breast self-examinations and the absence of symptoms limit regular screening practices (Jobran et al., 2023).

Impact of Interventions and Campaigns

Interventions and awareness campaigns have shown mixed results in improving breast cancer knowledge and practices. In Oman, an educational program significantly improved recognition of breast cancer risk factors and encouraged early help-seeking behaviors (Al-Hosni et al., 2023). In Bahrain, despite high awareness levels, misconceptions remain, indicating the need for continuous and culturally tailored campaigns (Elgammal, 2023).

In the UAE, efforts to disseminate breast cancer information through health professionals and social media are recommended to overcome barriers (Abu Awwad et al., 2020). In Iran, educational efforts focused on enhancing self-efficacy and motivational factors have been shown to increase screening rates (Emami et al., 2021). However, countries like Lebanon and Syria need more focused campaigns to address specific cultural and financial barriers (Hatem et al., 2021; Rahman et al., 2023).

Discussion

The literature review includes 25 studies focusing on breast cancer awareness, knowledge, and screening practices among women in various Gulf and Middle Eastern countries. Cross-sectional studies were the most prevalent, providing a snapshot of breast cancer awareness, knowledge, and screening behaviors at specific points in time. Notably, the large-scale survey by Hamed et al. (2022) in Qatar collected extensive data, likely due to robust health information infrastructure and higher funding for health research. Moderate sample sizes in other studies, such as Al-Ismaili et al. (2020) in Oman, reflect a balance between resource constraints and the need for representative data. In contrast, smaller sample sizes in qualitative studies, like those by Almajed (2023) in Kuwait and Marzouq Muhanna & Floyd (2018) in Kuwait, provided in-depth insights into specific communities, emphasizing the diversity of experiences and attitudes toward breast cancer across different socio-cultural contexts. This variation in study design and sample size underscores the multifaceted approach needed to understand and improve breast cancer awareness and screening practices in the Gulf and Middle Eastern countries.

Comparison between Middle Eastern Countries

Differences in breast cancer awareness, knowledge, and screening practices across the Gulf and Middle Eastern countries can be attributed to various factors, including cultural, economic, and healthcare system differences. These disparities are evident in the methodologies and sample sizes used in the reviewed studies.

Cultural Attitudes

Cultural attitudes towards breast cancer and health screening significantly impact participation in awareness and screening programs. In more conservative countries, such as Oman and Saudi Arabia, cultural stigmas and taboos surrounding cancer and women's health issues may hinder participation, resulting in moderate participation rates (Al-Azri et al., 2021; AlRajhi et al., 2023). Conversely, in countries with more liberal attitudes, such as Qatar, large-scale studies like Hamed et al. (2022) reported higher participation, with 9,008 women surveyed.

Healthcare Infrastructure and Government Support

The level of healthcare infrastructure and government support for public health campaigns is another critical factor influencing study outcomes. Countries with well-funded healthcare systems, such as Qatar and the UAE, tend to have more extensive and effective breast cancer awareness programs, resulting in larger and more comprehensive studies (Hamed et al., 2022; Al Hosani et al., 2022). In contrast, countries with fewer resources, like Jordan and Syria, tend to conduct more modest studies with limited reach (Oglat et al., 2024; Rahman et al., 2023).

Economic Factors

Economic factors also play a crucial role in shaping breast cancer research and awareness programs. Wealthier countries are better positioned to invest in healthcare research and public health initiatives. For example, the substantial data collection in Qatar (Hamed et al., 2022) and the UAE (Al Hosani et al., 2022) contrasts with the more modest studies in countries with fewer resources, such as Jordan and Syria.

Methodological Differences

Methodological differences, such as the use of cross-sectional, qualitative, and mixed-method approaches, also highlight the varying research capacities across these countries. Cross-sectional studies are more common in countries with established research infrastructures, while qualitative studies may be more feasible in countries with limited resources. For instance, qualitative studies by Almajed (2023) and Marzouq Muhanna & Floyd (2018) in Kuwait provide deep insights despite smaller sample sizes, reflecting a focus on in-depth understanding over breadth.

Educational Levels and Public Awareness Campaigns

Educational levels and public awareness campaigns also influence study outcomes. Higher educational levels correlate with better awareness and participation in health screening programs. Studies like Khonji et al. (2024) in Bahrain targeted female university students, showing a moderate sample size and a focus on knowledge and attitudes toward breast cancer.

Political Stability and Regional Conflicts

Political stability and regional conflicts can impact healthcare delivery and research capabilities. Countries experiencing conflict or political instability, such as Syria, have conducted studies with moderate sample sizes using online surveys, indicating constraints in conducting large-scale, in-person research (Rahman et al., 2023; Bohsas et al., 2023).

Social Dynamics and Women's Roles

Social dynamics, including women's roles and autonomy, influence participation in health research. In more progressive societies where women have greater autonomy, such as the UAE

and Qatar, there is often higher participation in health initiatives, leading to larger and more comprehensive studies (Abu Awwad et al., 2020; Hamed et al., 2022).

Religious Beliefs and Practices

Religious beliefs and practices can also affect health behaviors and attitudes towards breast cancer screening. In some countries, religious beliefs may support proactive health measures, while in others, fatalistic attitudes might prevail, leading to lower screening rates and smaller study samples (Emami et al., 2021).

Public Health Education and Outreach Programs

The availability of public health education and outreach programs significantly impacts breast cancer awareness. Countries with extensive public health campaigns, such as the UAE, demonstrate higher participation in screening programs (Kharaba et al., 2021). In contrast, developing countries face significant challenges in implementing effective public health education due to limited resources and infrastructure.

Comparison with Western Countries

Western countries conduct more extensive and frequent research studies on breast cancer, leading to a comprehensive understanding of the disease. Substantial funding for health research, institutional support from universities and research centers, and strong collaborative networks among researchers, healthcare providers, and policymakers contribute to more robust and reliable findings (Yap et al., 2019). Western countries typically exhibit higher levels of breast cancer awareness and knowledge among women, with significant awareness of symptoms, risk factors, and the importance of early detection through screening programs like mammograms (Wang et al., 2022).

Socio-cultural acceptance of discussing and addressing breast cancer is greater in Western countries, with fewer stigmas associated with breast cancer and its treatment due to open communication, strong support systems, and persistent public awareness campaigns (Anastasi & Lusher, 2019). Public health education systems in Western countries are well-established and utilize multiple media platforms, community engagement, and partnerships with NGOs to disseminate information effectively, which contrasts with the challenges faced by developing countries (Schliemann et al., 2019).

Economic resources in Western countries allow for greater investment in healthcare research and public health initiatives, resulting in more frequent and larger-scale studies compared to developing countries. Political stability and secular societies in Western countries further support

comprehensive public health research efforts, whereas conflict or instability in some developing countries, like Syria, leads to reliance on online surveys (Rahman et al., 2023; Bohsas et al., 2023).

Recommendations

To address the unique cultural barriers to breast cancer awareness and screening in Middle Eastern countries, it is essential to develop culturally tailored public health campaigns. These campaigns should consider local norms, values, and beliefs to effectively communicate the importance of early detection and regular screening. For instance, incorporating culturally sensitive materials and leveraging respected community figures can help overcome stigmas and misconceptions associated with breast cancer (Elgammal, 2023; Al-Ismaili et al., 2020).

Educational initiatives should be enhanced and expanded to improve breast cancer knowledge among women in the region. Schools, universities, and community centers can serve as key venues for delivering comprehensive education on breast cancer symptoms, risk factors, and the benefits of early detection. Programs like those implemented in Oman (Al-Hosni et al., 2023) and the UAE (Kharaba et al., 2021) demonstrate the positive impact of structured educational interventions.

Logistical barriers, such as transportation, childcare, and financial constraints, must be addressed to improve access to breast cancer screening services. Mobile screening units, subsidized screening programs, and partnerships with local organizations can help reach underserved populations (Hamed et al., 2022). Utilizing technology and social media platforms can enhance the reach and impact of breast cancer awareness campaigns, as seen in the UAE (Abu Awwad et al., 2020).

Government support and adequate funding are critical to sustaining breast cancer awareness and screening programs. Policymakers should prioritize funding for public health campaigns, research, and infrastructure improvements, following successful examples from Qatar (Hamed et al., 2022) and the UAE (Al Hosani et al., 2022).

Conclusion

To improve breast cancer outcomes in the Middle East, culturally tailored public health campaigns must be developed, educational initiatives should be enhanced, logistical barriers addressed, and technology leveraged for wider reach. Government support and adequate funding are crucial to sustaining these initiatives. By implementing these evidence-based recommendations, Middle Eastern countries can make significant strides in improving breast cancer awareness, increasing screening rates, and ultimately reducing the burden of breast cancer among women.

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Chapter 2
Breast Cancer in the Middle East: A Comprehensive Review of Risk Factors, Genetic Predispositions, and Prevention Strategies

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Summary

This chapter presents a comprehensive literature review of breast cancer risk factors in Middle Eastern countries. The review includes studies from ten countries, predominantly Egypt, utilizing various study designs and instruments. Key findings emphasize the role of lifestyle, dietary, reproductive, hormonal, genetic, medical, and socioeconomic factors in breast cancer risk. Modifiable risk factors, such as physical inactivity, obesity, and Westernized lifestyles, are significant contributors. Genetic predispositions, particularly BRCA1 and BRCA2 mutations, also play a critical role. The review underscores the importance of targeted interventions and lifestyle modifications to mitigate breast cancer risk in the Middle East.

Introduction

Breast cancer is a significant global health concern and the most common malignancy among women worldwide. The disease's impact varies across different regions, influenced by genetic, environmental, and lifestyle factors. In the Middle East, the incidence of breast cancer has been increasing, making it a pressing public health issue (AlHefdhi et al., 2024). Various risk factors contribute to the development of breast cancer, including genetic predisposition, hormonal influences, lifestyle factors, and environmental exposures. Genetic mutations, particularly in the BRCA1 and BRCA2 genes, significantly increase the risk of breast cancer (Abdel-Razeq et al., 2021). Hormonal factors such as early menarche, late menopause, and hormone replacement therapy can also elevate risk levels. Additionally, lifestyle factors such as obesity, physical inactivity, and poor diet have been linked to higher breast cancer incidence (Al-Jawaldeh & Abbass, 2022).

The Middle East faces unique challenges regarding breast cancer. Cultural and social factors often influence health behaviors, including cancer screening and help-seeking behaviors. For instance, the stigma associated with cancer and the lack of awareness about breast cancer symptoms can lead to delays in diagnosis and treatment (Mjali et al., 2021). Studies have shown that many women in the Middle East present with breast cancer at more advanced stages compared to their counterparts in Western countries, resulting in poorer outcomes (Elobaid et al., 2021). Despite the increasing burden of breast cancer in the Middle East, there are relatively few studies that

comprehensively address the region's specific risk factors, screening outcomes, and genetic predispositions. The available research often highlights the need for more extensive and targeted studies to better understand the epidemiology of breast cancer in this region. The scarcity of data limits the development of effective public health strategies and interventions tailored to the unique needs of Middle Eastern populations.

This study aims to fill the gap in the existing literature by reviewing recent studies on breast cancer in the Middle Eastern region. It focuses on several key areas: the epidemiology of breast cancer, the identification of risk factors, the outcomes of screening programs, and the role of genetic predispositions. By synthesizing findings from recent research, this study seeks to provide a comprehensive understanding of breast cancer in the Middle East and inform future public health initiatives. The ultimate goal is to improve early detection, treatment outcomes, and prevention strategies, thereby reducing the burden of breast cancer in the region.

Breast cancer is a growing public health challenge in the Middle East, with unique cultural, social, and environmental factors influencing its incidence and outcomes. Limited studies in the region highlight the need for more targeted research to better understand the specific risk factors and screening outcomes. This study aims to address these gaps by reviewing recent literature, providing a holistic understanding of breast cancer in the Middle East, and informing future public health strategies. Through comprehensive research and tailored interventions, significant progress can be made in reducing the burden of breast cancer and improving the health and well-being of women in the Middle East.

Methods

This study employs a comprehensive literature review approach to synthesize and analyze recent research findings on breast cancer in the Middle Eastern region. The primary objective is to understand the epidemiology, risk factors, screening outcomes, and genetic predispositions associated with breast cancer among Middle Eastern women.

A systematic literature search was conducted to identify relevant studies published between 2020 and 2024. The following databases were searched: PubMed, Scopus, Web of Science, and Google Scholar. The search terms included "breast cancer," "Middle East," "risk factors," "genetic predispositions," and "epidemiology." Additionally, specific country names within the Middle East were included in the search terms to ensure comprehensive coverage.

Studies were included if they met the following criteria: published in peer-reviewed journals between 2020 and 2024, focused on breast cancer in Middle Eastern countries, addressed epidemiology, risk factors, genetic predispositions, or screening outcomes, and provided primary

data or comprehensive reviews on the specified topics. Studies were excluded if they were not peer-reviewed (e.g., conference abstracts, editorials), focused on regions outside the Middle East, did not provide specific data or analysis relevant to the research objectives, or were published before 2020.

Results

The below table summarizes the results of all studies per country

Table 2: Summary of Studies

Countries	Results of Studies
Saudi Arabia	**AlHefdhi et al. (2024):** Past surgical history, radiotherapy/chemotherapy, maternal problems during pregnancy, breast complaints, lifestyle factors, reproductive and hormonal factors, genetic factors, higher socioeconomic status, medical history. **Babiker et al. (2020):** Significant risk factors: age, marital status, family history, parity, age at first full-term pregnancy, menopausal status, BMI, and breastfeeding. Protective factors: lower BMI, more children, breastfeeding. Chi-square and P-values indicate significant differences.
Iraq	**Mjali et al. (2021):** Lack of physical activity (74.26%), breastfeeding (< 6 months) (30.69%), low vegetable intake (< 3 times/week) (26.73%), obesity (25.74%), high fat diet (> 3 times/week) (23.76%), oral contraceptive use (20.79%). **Hashim et al. (2021):** Mean 5-year risk: 1.3, lifetime risk: 13.4. High risk in Baghdad, Dhi Qar, Maysan, Nineveh.
Egypt	**Abdelaleem et al. (2021):** Significant association between rs1859168 CC genotype, C allele, and increased risk of BC. HOTTIP upregulated and miR-615-3p downregulated in BC patients. **El-Toukhy et al. (2023):** Lower levels of miRNA-145, miRNA-382, and higher levels of miRNA-21 in BC sera. Elevated glutamic acid and HER2 levels in BC patients. **Hussein et al. (2021):** High prevalence of anti-HCV seropositivity in young breast cancer patients (13.4% in patients younger than 45 years). **Kamal et al. (2022):** Significant difference between mean BMI in cancer and non-cancer groups; correlation between breast density (BD) and risk of BC.
Jordan	**Abdel-Razeq et al. (2021):** Significant prevalence of BRCA1 and BRCA2 mutations among young patients. Associated factors: family history, triple-negative breast cancer, high-grade tumors. **Abu-Helalah et al. (2020):** 18%

	prevalence of BRCA1/BRCA2 mutations, two novel pathogenic mutations in BRCA2; delays in diagnosis linked to advanced-stage diagnosis.
United Arab Emirates	**Alharmoodi et al. (2024):** No significant correlation between diabetes and breast cancer stages; Stage II most frequently diagnosed. **Elobaid et al. (2021):** 2-year survival rate of 97%, 5-year survival rate of 89%. Significant prognostic factors: tumor grade, stage of cancer at presentation; no significant effect of age at diagnosis or treatment delay on survival.
Middle East	**Abulkhair & El Saghir (2021):** Prevalence of BRCA mutations in high-risk hereditary BC patients varied from 5.6% to 20% across different Arab countries; family history is a strong predictor for BRCA gene mutations. **El Haidari et al. (2020):** Socio-demographic, clinical, treatment-related, behavioral, and psychosocial factors affect HRQoL.
Lebanon	**Lakkis et al. (2024):** Bca ASIRw increased from 71.0 in 2005 to 115.6 in 2013; high ASIRw among women aged 35-54. Comparable to developed countries.
Iran	**Shamshirian et al. (2020):** Risk factors: family history, HRT, passive smoking, full-term pregnancy at age 30, abortion, sweets consumption, genotype Arg/Arg; protective factors: late menarche, nulliparity, 13-24 months breastfeeding, daily exercise, vegetable consumption. **Sasanfar et al. (2021):** Inverse association between dietary total antioxidant capacity (dTAC) and breast cancer, stronger in postmenopausal women.
Palestine	**El Sharif & Khatib (2021):** Significant risk factors: early menarche, oral contraceptives, HRT, nulliparity, parental consanguinity, positive family history; protective factors: breastfeeding, more children. **Arafat et al. (2021):** Significant risk factors: diabetes mellitus, hypertension, obesity, passive smoking; protective factors: breastfeeding.
North Africa and Middle East (NAME)	**Azadnajafabad et al. (2023):** Age-standardized incidence rate in 2019 was 37.5 per 100,000 (90.9% increase since 1990). High fasting plasma glucose is the most significant risk factor. High burden in years of life lost (YLLs).
Arabian Gulf Countries	**Al-Shamsi et al. (2023):** Consistent increase in BC incidence attributed to Westernized lifestyle, screening uptake, data collection improvements. BC characteristics: early onset, advanced stage, higher pathological grade, aggressive features (HER2+ or TN). UAE 2-year and 5-year survival rates: 97% and 89%, respectively; Saudi Arabia 5-year survival rate: 72%.

Lifestyle Factors

One of the most significant modifiable risk factors for breast cancer is physical inactivity. Studies consistently highlight that insufficient physical activity increases the risk of developing breast cancer. For instance, AlHefdhi et al. (2024) and Mjali et al. (2021) underscore that women who engage in lower levels of physical activity are more susceptible to breast cancer than their more active counterparts. This finding is crucial, suggesting that increasing physical activity could be a key preventative measure against breast cancer.

Obesity, particularly in postmenopausal women, is another prominent risk factor for breast cancer. A higher Body Mass Index (BMI) has been consistently linked to an increased risk of the disease. Research by Kamal et al. (2022), AlHefdhi et al. (2024), and Babiker et al. (2020) confirms that obese women, especially those who are postmenopausal, face a higher likelihood of developing breast cancer, highlighting the importance of weight management as a preventive strategy.

Regular alcohol consumption also poses a significant risk for breast cancer. AlHefdhi et al. (2024) notes that women who consume alcohol regularly have a higher risk of developing breast cancer, suggesting that reducing alcohol intake could be beneficial in lowering this risk.

Smoking is widely recognized as a risk factor for breast cancer, although its impact varies across different populations. Mjali et al. (2021) and Kulhánová et al. (2020) found that smoking increases breast cancer risk, reinforcing the need for smoking cessation programs as part of breast cancer prevention efforts.

The adoption of a Westernized lifestyle, characterized by dietary changes and reduced physical activity, is linked to an increased risk of breast cancer. Al-Shamsi et al. (2023) emphasizes that the shift towards a Western lifestyle contributes significantly to the rising incidence of breast cancer in certain populations, indicating the potential benefits of lifestyle modifications in prevention strategies.

Dietary Factors

Diet plays a crucial role in modulating breast cancer risk. Low vegetable intake is associated with a higher risk of breast cancer. Studies by Mjali et al. (2021) and Sasanfar et al. (2021) highlight that diets low in fruits and vegetables are linked to an increased risk, suggesting that promoting a diet rich in vegetables could help reduce breast cancer incidence.

High-fat diets are also associated with increased breast cancer risk. Frequent consumption of high-fat foods has been shown to elevate risk, indicating that dietary interventions aimed at reducing fat intake could be beneficial (Mjali et al., 2021).

A poor intake of antioxidants from food, reflected in a low dietary total antioxidant capacity, is another risk factor. Sasanfar et al. (2021) found that low antioxidant intake is associated with a higher breast cancer risk, suggesting that diets rich in antioxidants might offer protective benefits against breast cancer.

Unhealthy diets characterized by high consumption of trans fats, sugars, and sodium, and low consumption of fruits and vegetables, significantly contribute to breast cancer risk. Research by Al-Jawaldeh & Abbass (2022) and Zamzam et al. (2024) underscores the importance of healthy dietary patterns in reducing breast cancer risk. Conversely, the Mediterranean diet, known for its high content of fruits, vegetables, and healthy fats, is associated with a reduction in breast cancer risk, highlighting the potential of dietary modifications for prevention.

Reproductive and Hormonal Factors

Reproductive and hormonal factors also play a significant role in breast cancer risk. The use of oral contraceptives has been identified as a risk factor. Studies by AlHefdhi et al. (2024), Mjali et al. (2021), and El Sharif & Khatib (2021) indicate that women who use oral contraceptives face a higher risk of developing breast cancer, suggesting that careful consideration of contraceptive use is important in managing breast cancer risk.

Hormonal replacement therapy (HRT) is similarly linked to an increased risk of breast cancer. Research indicates that women who undergo HRT are at higher risk (AlHefdhi et al., 2024; Mjali et al., 2021; El Sharif & Khatib, 2021), highlighting the need for cautious use and exploring alternative treatments for menopausal symptoms.

Women who have their first pregnancy at a later age also face a higher risk of breast cancer. AlHefdhi et al. (2024) found that delayed first pregnancy increases breast cancer risk, suggesting that earlier pregnancies could have a protective effect.

Shorter duration of breastfeeding is associated with increased breast cancer risk. Studies by AlHefdhi et al. (2024) and Babiker et al. (2020) indicate that longer breastfeeding duration may reduce breast cancer risk, underscoring the benefits of breastfeeding as a preventive measure.

Biological Factors

Recent studies have identified biological markers that could signify increased breast cancer risk. Low levels of specific circulating miRNAs, such as miRNA-145 and miRNA-382, and high levels of miRNA-21 are significant markers for breast cancer risk. El-Toukhy et al. (2023) suggest that these miRNAs could serve as early indicators of breast cancer, offering potential for early diagnosis and targeted interventions.

Metabolite profiling has also emerged as a useful tool in identifying breast cancer risk. Elevated serum glutamic acid levels have been found to be indicative of higher breast cancer risk (El-Toukhy et al., 2023), suggesting that metabolite profiling could be integrated into screening programs to identify high-risk individuals.

Hepatitis C Virus (HCV) infection has been noted to have a high prevalence among breast cancer patients. Hussein et al. (2021) found a significant association between HCV infection and breast cancer, indicating that HCV screening and management could be important in breast cancer prevention strategies.

Genetic and Familial Factors

Family history is a significant non-modifiable risk factor for breast cancer. Studies consistently show that individuals with a family history of breast cancer, particularly those with multiple cases diagnosed at a young age, have a significantly higher risk of developing the disease themselves (AlHefdhi et al., 2024; Abdel-Razeq et al., 2021; El Sharif & Khatib, 2021). The presence of breast cancer in close relatives increases the likelihood of hereditary genetic mutations, thereby elevating the risk.

Mutations in the BRCA1 and BRCA2 genes are particularly notable risk factors for breast cancer. These mutations greatly increase the likelihood of developing breast cancer and are major contributors to hereditary breast cancer cases. Research highlights the importance of genetic testing and counseling for individuals with a family history of breast or ovarian cancer (AbdelHamid et al., 2021; Abdel-Razeq et al., 2021; Abu-Helalah et al., 2020). Identifying these mutations can lead to early interventions and more personalized preventive strategies.

Specific genetic polymorphisms, such as those in the MTHFR gene, also contribute to increased breast cancer risk. Studies by Omran et al. (2021) and Abdelaleem et al. (2021) show that certain genetic variations can predispose individuals to breast cancer, underscoring the complexity of genetic factors and the need for further research to understand their mechanisms fully.

Reproductive and Hormonal Factors

Reproductive and hormonal factors significantly influence breast cancer risk. Early onset of menses (before age 12) is associated with a higher risk due to prolonged exposure to estrogen and other hormones (Mjali et al., 2021). Similarly, late menopause (after age 55) increases risk by extending the period of exposure to hormonal influences that can promote cancer development (Mjali et al., 2021; Lakkis et al., 2024).

Nulliparity, or having no children, is another significant risk factor. The protective effects of pregnancy, particularly early pregnancies, and breastfeeding are well-documented, with women who do not experience these events being at higher risk (Mjali et al., 2021; El Sharif & Khatib, 2021).

Medical and Treatment History

A history of multiple surgeries is identified as a risk factor for breast cancer. Women with such a history are at increased risk, potentially due to various underlying health conditions or increased exposure to medical interventions (AlHefdhi et al., 2024).

Past treatments such as radiotherapy and chemotherapy for other cancers are also linked to higher breast cancer risk due to the damage they cause to breast tissue and DNA, highlighting the need for long-term monitoring of survivors (AlHefdhi et al., 2024).

Exposure to high-dose radiation, particularly to the chest, significantly increases breast cancer risk (Mjali et al., 2021), reinforcing the importance of careful management of radiation exposure in medical treatments.

Socioeconomic and Demographic Factors

Higher socioeconomic status (SES) has been correlated with an increased risk of breast cancer. Women from higher SES backgrounds are more likely to develop breast cancer, possibly due to differences in reproductive behavior, lifestyle factors, and access to healthcare (AlHefdhi et al., 2024).

Frequent exposure to X-rays or radiation treatments for other conditions is another significant risk factor. Women undergoing frequent imaging procedures involving radiation are at higher risk, highlighting the need for careful consideration of cumulative radiation exposure (AlHefdhi et al., 2024).

Figure 3 presents an overview of various lifestyle and dietary risk factors for breast cancer across multiple countries, including Oman, Bahrain, Kuwait, Qatar, Saudi Arabia, the UAE, Jordan, Iran, Turkey, Syria, Palestine, and Egypt. The risk factors are categorized as follows:

1. **Physical Inactivity (Red)**: Insufficient physical activity is a significant modifiable risk factor for breast cancer. Countries like Kuwait, Oman, and Jordan show high levels of physical inactivity, which can increase the risk of developing breast cancer. Promoting physical activity is crucial for prevention.
2. **Obesity (Orange)**: Obesity, especially in postmenopausal women, is another major risk factor. Saudi Arabia, Kuwait, and Egypt show higher obesity levels, which directly

correlates to an increased risk of breast cancer. Weight management is a key preventive strategy.

3. **Alcohol Consumption (Yellow)**: Regular alcohol intake increases breast cancer risk. This factor is less prominent compared to others, but it still plays a role in countries like Saudi Arabia and Oman. Reducing alcohol consumption can help mitigate this risk.

4. **Smoking (Green)**: Smoking has been found to increase the risk of breast cancer. Iran, Jordan, and Kuwait have higher values for smoking as a risk factor, highlighting the need for smoking cessation programs as part of breast cancer prevention efforts.

5. **Westernized Lifestyle (Blue)**: The adoption of a Westernized lifestyle, characterized by changes in diet and reduced physical activity, is linked to increased breast cancer risk. Saudi Arabia, Syria, and Kuwait are among the countries with a higher prevalence of this risk factor, emphasizing the potential benefits of lifestyle modifications to reduce cancer risk.

6. **Dietary Factors (Purple)**: Poor dietary habits, such as low intake of fruits, vegetables, and antioxidants, and high consumption of fats, sugars, and sodium, are associated with an increased risk of breast cancer. Countries like Kuwait, Egypt, and Saudi Arabia have high dietary risk factors, indicating a need for promoting healthier eating patterns to reduce breast cancer incidence.

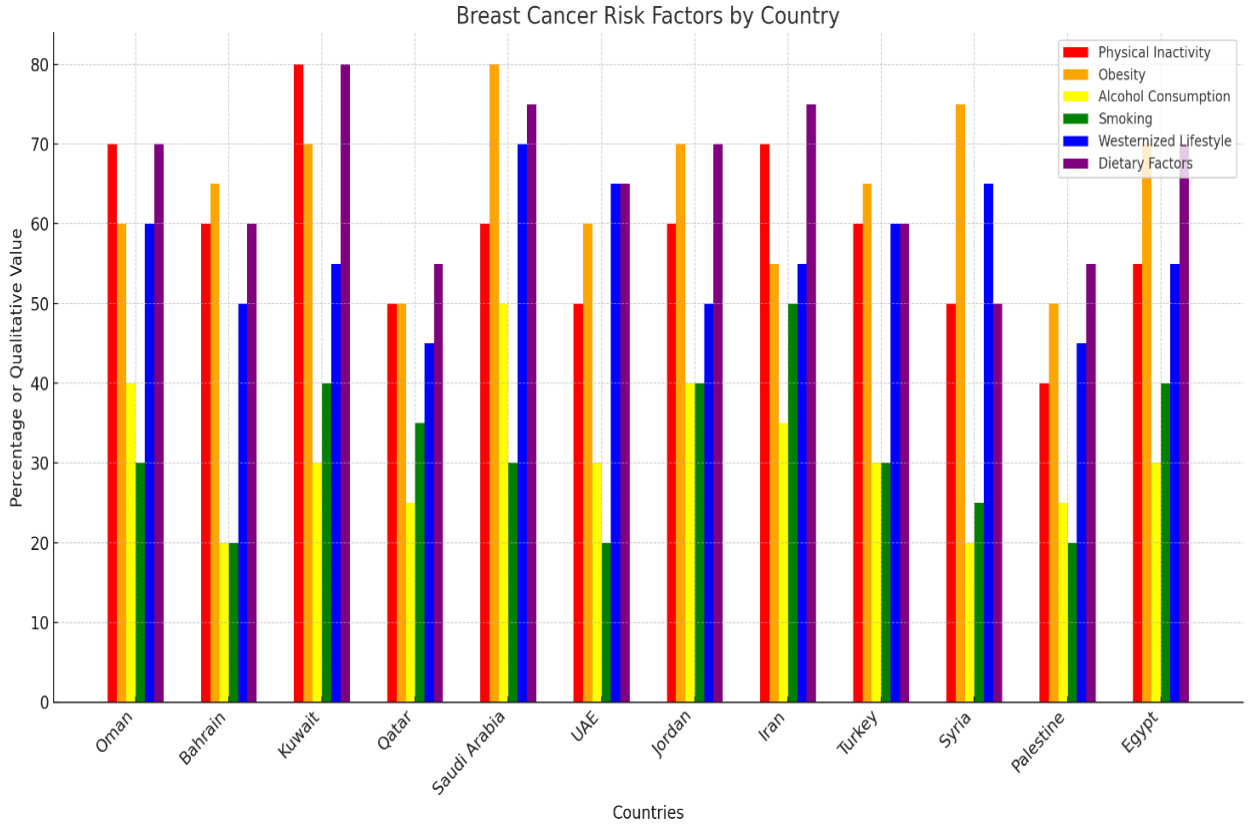

Figure 3

Discussion

The reviewed studies were conducted across ten countries and regions, with the highest number from Egypt, followed by broader Middle Eastern regions, Iran, Saudi Arabia, the United Arab Emirates, Iraq, Jordan, Palestine, Lebanon, and the Eastern Mediterranean Region. These studies employed diverse research designs, including cross-sectional, case-control, retrospective cohort, prospective, comparative studies, literature reviews, systematic reviews, and meta-analyses. Various instruments were utilized, such as mammography, ultrasound, questionnaires, clinical data, quantitative real-time PCR, genetic testing, structured interviewing questionnaires, epidemiological data from national cancer registries, and quality of life (QoL) instruments. The studies often involved large sample sizes, ensuring statistical validity. Systematic reviews and meta-analyses combined data from multiple sources, covering thousands of cases across different regions.

One major modifiable risk factor for breast cancer is physical inactivity. Studies consistently show that insufficient physical activity raises the risk of developing breast cancer. This is particularly relevant in the Middle East, where cultural and lifestyle factors may reduce physical activity levels among women (AlHefdhi et al., 2024; Mjali et al., 2021). Addressing this through public health initiatives to promote physical activity could significantly mitigate breast cancer risk in this population.

Obesity, especially in postmenopausal women, is another significant risk factor. High Body Mass Index (BMI) is consistently linked to an increased risk of breast cancer, particularly in the Middle East, where rising obesity rates due to dietary changes and reduced physical activity are a growing concern (Kamal et al., 2022; AlHefdhi et al., 2024). Interventions focusing on weight management and promoting healthier lifestyles could help reduce this risk.

Regular alcohol consumption also presents a notable risk. Women who consume alcohol regularly face a higher risk of developing breast cancer, which suggests that reducing alcohol intake could be beneficial (AlHefdhi et al., 2024). While alcohol consumption varies across the Middle East due to cultural and religious practices, regions with higher consumption rates are at greater risk. Similarly, smoking is a well-recognized risk factor for breast cancer, reinforcing the need for effective smoking cessation programs (Mjali et al., 2021).

Adopting a Westernized lifestyle, characterized by dietary changes and reduced physical activity, is linked to a higher incidence of breast cancer. This indicates that lifestyle modifications could play a crucial role in prevention efforts (Al-Shamsi et al., 2023).

Diet significantly impacts breast cancer risk. Low intake of fruits and vegetables is associated with an increased risk, suggesting that promoting a diet rich in vegetables could help reduce breast cancer incidence (Mjali et al., 2021; Sasanfar et al., 2021). Similarly, high-fat diets have been linked to increased breast cancer risk, emphasizing the importance of dietary interventions aimed at reducing fat intake (Mjali et al., 2021).

Low intake of antioxidants from food is another risk factor. A diet low in antioxidants is associated with higher breast cancer risk, suggesting that antioxidant-rich diets could offer protective benefits (Sasanfar et al., 2021). Moreover, unhealthy diets characterized by high consumption of trans fats, sugars, and sodium, and low consumption of fruits and vegetables, are major contributors to breast cancer risk. Conversely, adherence to a Mediterranean diet, known for its high content of fruits, vegetables, and healthy fats, is associated with reduced breast cancer risk, highlighting the potential of dietary modifications in prevention (Al-Jawaldeh & Abbass, 2022; Zamzam et al., 2024).

Reproductive and hormonal factors also play a critical role in breast cancer risk. The use of oral contraceptives has been associated with a higher risk of developing breast cancer, suggesting that contraceptive use should be carefully considered (AlHefdhi et al., 2024; Mjali et al., 2021; El Sharif & Khatib, 2021). Similarly, hormone replacement therapy (HRT) has been linked to increased breast cancer risk, highlighting the need for cautious use and alternative treatments for menopausal symptoms (AlHefdhi et al., 2024; Mjali et al., 2021; El Sharif & Khatib, 2021).

A later age at first pregnancy is also associated with a higher risk of breast cancer, suggesting that earlier pregnancies may have a protective effect (AlHefdhi et al., 2024). Additionally, shorter breastfeeding duration is linked to increased breast cancer risk, while longer breastfeeding may offer protective benefits (AlHefdhi et al., 2024; Babiker et al., 2020).

Recent studies have identified specific biological markers that could signify an increased breast cancer risk. Low levels of certain circulating miRNAs and high levels of others serve as significant markers for breast cancer risk. These biomarkers could be used as early indicators, providing potential for early diagnosis and targeted interventions (El-Toukhy et al., 2023). Metabolite profiling has also emerged as a useful tool in identifying breast cancer risk, with elevated serum glutamic acid levels indicating a higher risk, suggesting that such profiling could be integrated into screening programs (El-Toukhy et al., 2023).

Hepatitis C Virus (HCV) infection has been noted to have a high prevalence among breast cancer patients, with a significant association between HCV infection and breast cancer suggesting that HCV screening and management could be important in prevention strategies (Hussein et al., 2021).

Family history remains a significant non-modifiable risk factor for breast cancer. Individuals with a family history, especially those with multiple cases diagnosed at a young age, have a significantly higher risk of developing the disease, emphasizing the critical role of genetics in breast cancer susceptibility (AlHefdhi et al., 2024; Abdel-Razeq et al., 2021; El Sharif & Khatib, 2021).

Mutations in the BRCA1 and BRCA2 genes significantly increase the likelihood of developing breast cancer and are major contributors to hereditary cases. Genetic testing and counseling are essential for individuals with a family history of breast or ovarian cancer, allowing for early interventions and more personalized preventive strategies (AbdelHamid et al., 2021; Abdel-Razeq et al., 2021; Abu-Helalah et al., 2020).

Other genetic polymorphisms, such as those in the MTHFR gene, also contribute to increased breast cancer risk, underscoring the complexity of genetic factors in breast cancer risk and the need for further research (Omran et al., 2021; Abdelaleem et al., 2021).

Reproductive history significantly impacts breast cancer risk. Early onset of menstruation (before age 12) is associated with a higher risk due to prolonged exposure to estrogen and other hormones (Mjali et al., 2021). Late menopause (after age 55) similarly increases breast cancer risk by extending the period of exposure to hormonal influences that can promote cancer development (Mjali et al., 2021; Lakkis et al., 2024).

Nulliparity, or having no children, is another significant risk factor. The protective effects of early pregnancies and breastfeeding are well-documented, with nulliparous women at higher risk (Mjali et al., 2021; El Sharif & Khatib, 2021).

A history of multiple surgeries has been identified as a risk factor for breast cancer. Women with such a history are at increased risk, potentially due to underlying health conditions or increased exposure to medical interventions (AlHefdhi et al., 2024).

Past treatments, such as radiotherapy and chemotherapy for other cancers, are also linked to a higher risk of breast cancer due to the damage they cause to breast tissue and DNA. This underscores the need for long-term monitoring of cancer survivors (AlHefdhi et al., 2024).

Exposure to high-dose radiation, particularly to the chest, significantly increases breast cancer risk, reinforcing the importance of careful management of radiation exposure in medical treatments (Mjali et al., 2021).

Higher socioeconomic status (SES) has been correlated with an increased risk of breast cancer. Women from higher SES backgrounds are more likely to develop breast cancer, possibly due to

differences in reproductive behavior, lifestyle factors, and access to healthcare (AlHefdhi et al., 2024).

Frequent exposure to X-rays or radiation treatments for other conditions is another significant risk factor. Women undergoing frequent imaging procedures involving radiation are at higher risk, highlighting the need for judicious use of diagnostic imaging (AlHefdhi et al., 2024).

The differences in breast cancer risk factors between Middle Eastern countries and other regions can be attributed to genetic diversity, cultural practices, lifestyle differences, and healthcare systems. Genetic predispositions like BRCA mutations are more prevalent in some populations, influencing breast cancer risk. Cultural factors, including dietary habits, reproductive behaviors, and social stigma surrounding cancer, can impact incidence and outcomes. Moreover, the availability and accessibility of healthcare services, including screening and diagnostic tools, play a crucial role in early detection and treatment, contributing to regional differences in breast cancer statistics.

The findings from this literature review highlight the urgent need for government and policy intervention to address the growing burden of breast cancer in the Middle East. Governments should prioritize developing comprehensive national cancer control programs, including public education campaigns about breast cancer risk factors and the importance of early detection. Policies should promote regular screening programs and ensure accessibility to mammography and other diagnostic tools, particularly in rural and underserved areas. Governments should also consider subsidizing healthy lifestyle initiatives to reduce modifiable risk factors like obesity and poor diet.

Community leaders and organizations play a crucial role in shaping public attitudes and behaviors towards breast cancer prevention and care. They should engage in spreading awareness, breaking social stigma, and encouraging participation in regular screening programs. Collaboration between governmental agencies and community organizations can enhance the effectiveness of educational campaigns and broaden their reach.

National hospitals and healthcare providers must adopt evidence-based practices to improve breast cancer diagnosis, treatment, and care. Healthcare providers should be trained in the latest screening techniques and treatment protocols. Genetic counseling and testing services should be enhanced to identify individuals at high risk of breast cancer, particularly those with a family history or known genetic mutations such as BRCA1 and BRCA2. Healthcare providers should also focus on personalized patient care, considering the unique risk factors prevalent in the Middle Eastern population.

Conclusion

This review identifies several areas for future research to address gaps in understanding breast cancer in the Middle East. Researchers should focus on large-scale epidemiological studies to better understand the prevalence and distribution of risk factors specific to the region. Additionally, research should explore the genetic basis of breast cancer in Middle Eastern populations to identify new genetic markers and improve genetic counseling and screening programs. Investigating the effectiveness of public health interventions, such as lifestyle modification programs and educational campaigns, is crucial in reducing breast cancer incidence. Collaborative research efforts across Middle Eastern countries can provide valuable insights and contribute to developing region-specific prevention and treatment strategies.

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Chapter 3:
Breast Cancer in the Middle East: A Comprehensive Analysis of Incidence, Prevalence, Mortality, and DALYs in 2021

Adil Aljarrah Alajmi ; Mahim Albalushi ; Zaid Al-ishaq ; Khalid AlBaimani

Summary

This study analyzes data from the Global Burden of Disease (GBD) database to assess the incidence, mortality, and disability-adjusted life years (DALYs) of female breast cancer in Middle Eastern countries for the year 2021. Utilizing rigorous methods and advanced statistical modeling, we focused on 14 Middle Eastern countries to evaluate breast cancer metrics and compare them with regional and global averages. The results indicate significant variations in breast cancer burden among these countries, influenced by socioeconomic status, healthcare infrastructure, public health policies, and cultural attitudes. Lebanon, Bahrain, and Turkey reported the highest DALYs rates, while Oman and Yemen had the lowest. The study highlights the need for targeted public health interventions to address the growing health challenges among women in the region.

Introduction:

Breast cancer remains a major public health concern worldwide, significantly impacting morbidity and mortality rates among women. It is the most commonly diagnosed cancer and a leading cause of cancer-related deaths globally, presenting substantial challenges to healthcare systems. Addressing breast cancer effectively requires a deep understanding of its burden, particularly in regions with diverse socioeconomic and cultural landscapes (Zahedi et al., 2020; Pineros et al., 2022).

The Middle East, encompassing countries with varying levels of economic development, healthcare infrastructure, and public health policies, presents unique challenges and opportunities in tackling breast cancer. This region's diversity contributes to significant disparities in breast cancer outcomes, with some countries achieving better health metrics due to advanced medical facilities and public health initiatives, while others lag due to resource limitations and cultural barriers (Tanner & Cheung, 2020, Al-Shamsi et al., 2023).

Understanding the burden of breast cancer in the Middle East is crucial for developing effective public health strategies and interventions. Despite global advancements in cancer research and treatment, many Middle Eastern countries face challenges such as late-stage diagnoses, limited access to care, and cultural barriers that hinder early detection and treatment. These factors often lead to higher mortality rates and poorer outcomes compared to global averages (Manzano et al., 2023). The incidence trend of breast cancer in women in the Eastern Mediterranean region from 1998 to 2019 further underscores these challenges (Zahedi et al., 2020).

This study leverages data from the Global Burden of Disease (GBD) database, renowned for its comprehensive and rigorous approach to health metrics, to analyze breast cancer incidence, mortality, and disability-adjusted life years (DALYs) in Middle Eastern countries for the year 2021. The GBD database provides a robust framework for understanding the epidemiology of breast cancer by adjusting for differences in data sources and employing advanced statistical modeling techniques to generate reliable estimates.

By comparing these breast cancer metrics with regional and global averages, this study aims to identify key areas of concern and disparities in the Middle East. The findings will highlight specific challenges faced by different countries within the region and offer insights into potential public health interventions. Ultimately, the goal is to recommend targeted strategies that can improve breast cancer outcomes in the Middle East, reduce disparities, and align regional health metrics more closely with global standards.

Methods:

We analyzed data from the GBD database compiled by the Institute of Health Metrics and Evaluation at the University of Washington, Seattle (www.healthdata.org). The methodology and approach used by the GBD project to collect and analyze data have been extensively described elsewhere. The GBD was selected for its rigorous methods in adjusting for differences in sources and the variety of models used to generate estimates based on the complexity of disease, natural history, and regional data. Additionally, advanced statistical modeling techniques are employed to generate regional estimates. We utilized the GBD 2021 data to extract the incidence, mortality, and disability-adjusted life years (DALYs) of female breast cancer in Middle Eastern countries for the year 2021.

Our analysis focused on the following countries in the Middle East: Bahrain, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Turkey, United Arab Emirates, and Yemen. To estimate the burden of breast cancer in these countries, we evaluated several outcomes, including incidence, mortality, and DALYs. DALYs encompass the sum of years lived with disability (YLDs) and years of life lost (YLLs) due to premature mortality, offering a comprehensive reflection of the burden of suffering caused by the disease, beyond mortality rates alone. The data were analyzed in the context of social development as reflected by the SDI, with comparisons made to regional and global averages.

Data were initially downloaded into Microsoft Excel and subsequently analyzed using SPSS statistical software (IBM SPSS, Inc., Chicago, 2021). By leveraging the comprehensive data from the GBD 2021, this study provides valuable insights into the current state of breast cancer in the Middle East, identifies key areas of concern, and underscores the need for targeted public health interventions to address the growing health challenges among women in the region.

Results:

Breast Cancer Metrics for 2021 in the Middle East Countries

DALYs

Lebanon has the highest DALYs rate at 697, followed by Bahrain at 639, and Turkey at 490. The United Arab Emirates and Iraq follow with DALYs rates of 488 and 427, respectively. Egypt (413), Jordan (389), and Qatar (384) have DALYs rates above the North Africa and Middle East average of 356 and the global average of 515. Saudi Arabia, with a DALYs rate of 333, and Iran (365) are slightly lower, while Kuwait (304) and Yemen (150) have the lowest rates among the listed countries. Oman reports the lowest DALYs rate at 90, significantly below the regional and global averages (see table 1).

Table 1: Breast Cancer Metrics for 2021 in the Middle East Countries, North Africa and Middle East, and Worldwide

Country/Region	DALYs	Mortality Rate	Incidence	Prevalence	YLDs	YLLs
Bahrain	639	17	93	865	63	576
Egypt	413	12	40	351	27	386
Iran (Islamic Republic of)	365	10	59	563	41	324
Iraq	427	11	47	427	31	396
Jordan	389	11	52	485	35	353
Kuwait	304	7	55	531	38	266
Lebanon	697	24	111	1056	75	622
Oman	90	2	13	121	9	81
Qatar	384	9	68	622	46	338
Saudi Arabia	333	8	39	352	26	307
Syrian Arab Republic	383	11	46	447	32	351
Turkey	490	15	69	654	47	443
United Arab Emirates	488	12	55	483	36	452
Yemen	150	4	10	88	7	143
North Africa and Middle East	356	10	42	392	29	327
Global	515	17	53	517	37	478

Rate per 100000

Incidence

Lebanon has the highest incidence rate at 111, significantly surpassing both the North Africa and Middle East average of 42 and the global average of 53. Bahrain follows with an incidence rate of 93. Turkey (69), Qatar (68), and Iran (59) also report higher incidence rates. Kuwait and the United Arab Emirates each have an incidence rate of 55, while Jordan reports 52. Iraq (47), the Syrian Arab Republic (46), and Egypt (40) are higher than the regional and global averages. Saudi Arabia (39) and Yemen (10) report lower incidence rates, with Oman at the lowest with 13. See figure 4

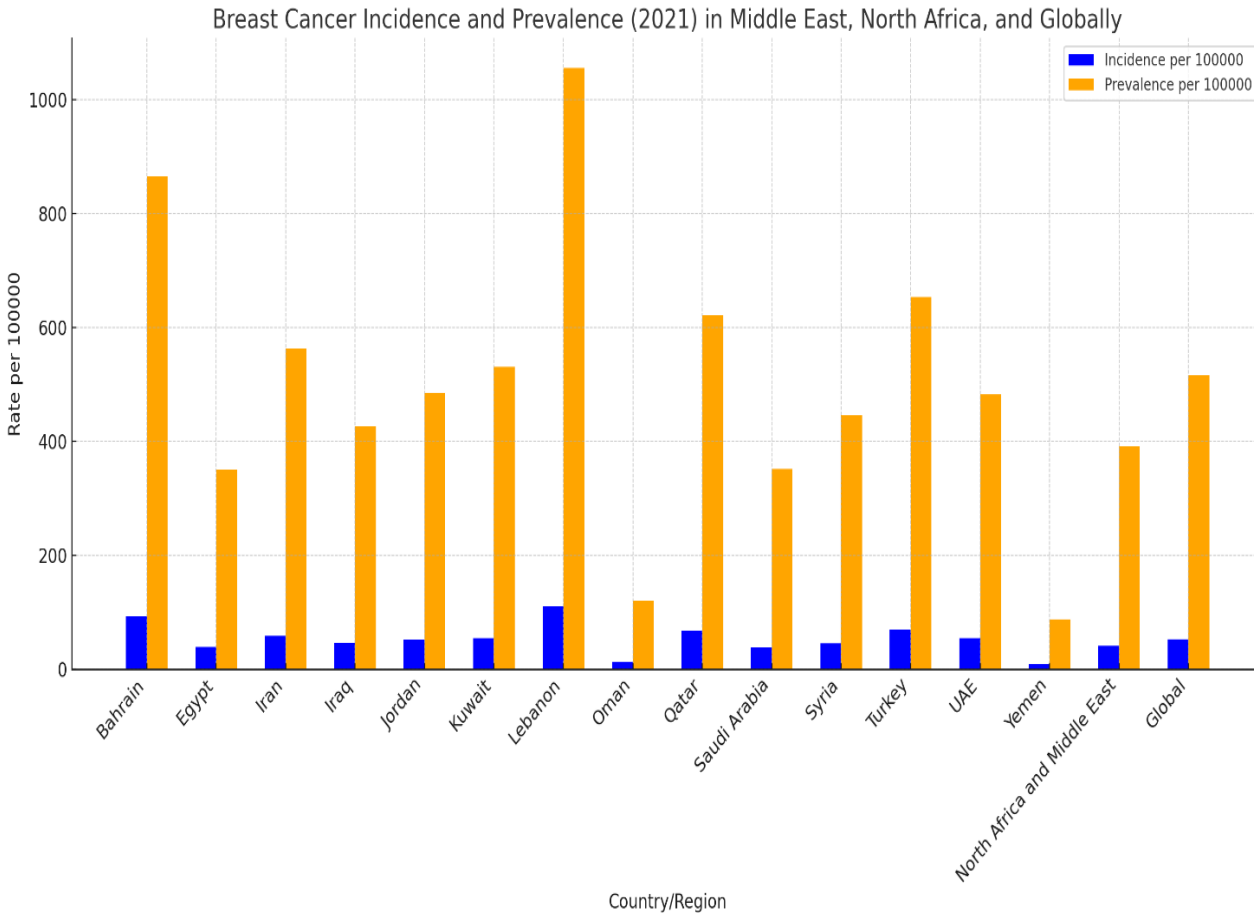


Figure 4

Prevalence

Lebanon again leads with the highest prevalence rate at 1056, followed by Bahrain at 865. Turkey (654) and Qatar (622) also show high prevalence rates. Iran (563), Kuwait (531), and the United Arab Emirates (483) report higher rates compared to the regional average of 392 and the global average of 517. Jordan (485), Syrian Arab Republic (447), and Iraq (427) have prevalence rates close to the regional average. Egypt (351) and Saudi Arabia (352) are lower, with Oman (121) and Yemen (88) reporting the lowest prevalence rates (see figure 4).

Mortality Rate

Lebanon has the highest mortality rate with 24 deaths, followed by Turkey with 15 deaths, and Bahrain and Global both at 17 deaths. The United Arab Emirates and Jordan each have a mortality rate of 12, while Iraq, Syrian Arab Republic, and Egypt each have 11 deaths. Qatar (9), Saudi Arabia (8), and Kuwait (7) follow. Iran and the North Africa and Middle East region each report 10 deaths. Oman and Yemen have the lowest mortality rates at 2 and 4 deaths, respectively.

Breast Cancer Metrics for 2021 in the Middle East Countries according to age groups (Young Vs Senior Women)

For the age group 20-54 years, the average DALYs rate across the countries is approximately 424. For those aged 55 and above, the average DALYs rate is significantly higher, around 1618. For the age group 20-54 years, Qatar leads with a DALYs rate of 2466, followed closely by the United Arab Emirates at 2491, and Bahrain at 2489. Lebanon has a DALYs rate of 2032, significantly higher than the North Africa and Middle East average of 1162 and the global average of 1374. For those aged 55 and above, Qatar again leads with a DALYs rate of 2466, followed by the United Arab Emirates at 2491, and Bahrain at 2489 (see table 2).

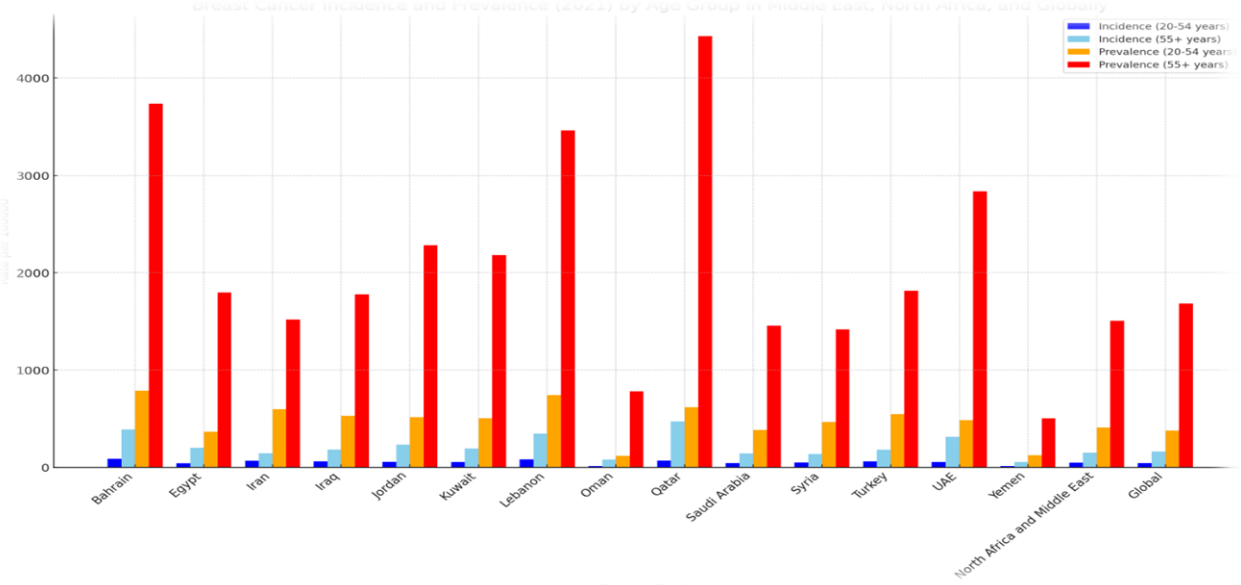
Table 2: Breast Cancer Metrics (2021) in the Middle East Countries, , North Africa and Middle East, and Worldwide according to age groups (Young Vs Senior *Women*)

Country/Region	DALYs		Mortality rate		Incidence		Prevalence		YLDs		YLLs	
	20-54 years	55+ years	20-54 years	55+ years	20-54 years	55+ years	20-54 years	55+ years	20-54 years	55+ years	20-54 years	55+ years
Bahrain	639	2489	13	89	88	390	789	3736	59	265	580	2224
Egypt	481	1889	10	70	43	203	366	1798	28	136	452	1753
Iran (Islamic Republic of)	410	901	8	34	66	145	597	1521	45	103	365	798
Iraq	588	1503	12	55	62	183	530	1780	40	125	548	1378
Jordan	461	1602	9	59	58	234	516	2281	39	160	422	1442
Kuwait	320	1016	6	37	56	194	505	2178	38	142	282	874
Lebanon	584	2032	12	90	84	347	743	3461	56	239	528	1794
Oman	99	507	2	18	13	79	119	784	9	56	90	451
Qatar	407	2466	8	85	70	472	620	4430	47	316	359	2150
Saudi Arabia	427	882	9	29	45	143	386	1458	30	102	397	780
Syrian Arab Republic	457	1045	10	38	52	137	469	1420	35	97	422	948
Turkey	479	1189	10	48	61	180	545	1812	41	125	438	1064
United Arab Emirates	527	2491	11	91	56	312	485	2835	37	205	490	2286
Yemen	242	691	5	26	15	55	125	503	10	36	232	655
North Africa and Middle East	425	1162	9	44	47	153	411	1504	31	106	394	1056
Global	503	1374	11	59	44	161	380	1680	29	114	474	1260

Rate per 100000

The average incidence rate for the age group 20-54 years is around 48. For those aged 55 and above, the average incidence rate is approximately 196. In the age group 20-54 years, Bahrain reports the highest incidence rate at 88, followed by Lebanon at 84, and Qatar at 70. The North Africa and Middle East average is 47, while the global average is 44. For those aged 55 and above, Qatar has the highest incidence rate at 472, followed by Bahrain at 390, and Lebanon at 347. These rates are significantly higher than the regional average of 153 and the global average of 161.

The average prevalence rate for the age group 20-54 years is about 462. For those aged 55 and above, the average prevalence rate is significantly higher, around 2104. In the age group 20-54 years, Bahrain has the highest prevalence rate at 789, followed by Lebanon at 743, and Qatar at 620. The North Africa and Middle East average is 411, while the global average is 380. For those aged 55 and above, Qatar has a prevalence rate of 4430, followed by Bahrain at 3736, and Lebanon at 3461. These figures are much higher than the regional average of 1504 and the global average of 1680 (see figure 5).



The average mortality rate for the age group 20-54 years is about 9. For those aged 55 and above, the average mortality rate jumps to 53. This stark increase highlights the higher mortality risk in the older age group. In the age group 20-54 years, Lebanon and Iraq have the highest mortality rate at 12, followed by the United Arab Emirates at 11. The North Africa and Middle East average is 9, while the global average is 11. For those aged 55 and above, Lebanon reports the highest mortality rate at 90, followed by the United Arab Emirates at 91, and Qatar at 85, all higher than the regional average of 44 and the global average of 59.

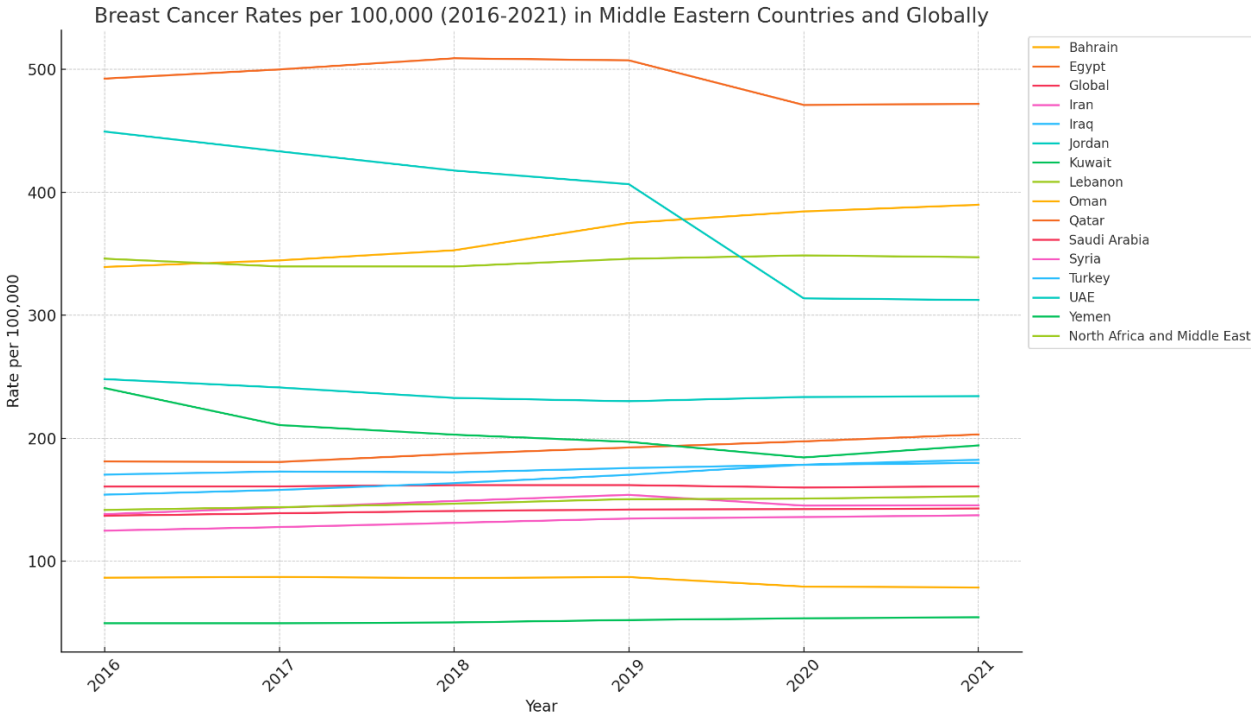
Incident Rate among Young Women the Middle East Countries (2016-2021)

The regional average for the North Africa and Middle East shows a gradual increase in incidence rates from 141.81 in 2016 to 152.92 in 2021. This indicates a worsening situation in terms of disease burden among young women in this region. In contrast, the global incidence rate has remained relatively stable, with only a slight increase from 160.83 in 2016 to 160.96 in 2021. Compared to the global average, many countries in the Middle East have higher incidence rates, indicating a more significant health burden in this region (see table 3).

Table 3: Incident Rate among Young Women the Middle East Countries, North Africa and Middle East, and Worldwide (2016-2021)

Country/Region	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Bahrain	339.27	344.65	352.85	375.07	384.41	389.82
Egypt	181.22	180.8	187.31	192.54	197.54	203.14
Global	160.83	161.01	161.97	161.99	160.03	160.96
Iran (Islamic Republic of)	138.35	143.64	149.09	154.08	145.3	145.45
Iraq	154.2	158.04	163.58	170.34	178.59	182.54
Jordan	248.14	241.34	232.82	230.16	233.58	234.27
Kuwait	240.85	210.8	202.97	197.11	184.44	194.22
Lebanon	346.04	339.67	339.68	345.93	348.68	347.22
Oman	86.77	87.29	86.47	87.24	79.52	78.79
Qatar	492.38	499.82	508.9	507.22	470.97	471.88
Saudi Arabia	137.1	139.04	140.96	142.1	142.49	142.95
Syrian Arab Republic	124.98	127.85	131.31	134.8	136.02	137.43
Turkey	170.54	173.06	172.36	175.83	178.51	179.96
United Arab Emirates	449.33	433.25	417.66	406.55	313.78	312.41
Yemen	49.68	49.68	50.35	52.33	53.7	54.58
North Africa and Middle East	141.81	144.07	146.88	150.6	150.95	152.92
Global	160.83	161.01	161.97	161.99	160.03	160.96

Rate per 100000



Several countries in the Middle East have shown improvements in the incidence rates of diseases among young women (aged 20-54 years) over the years. In Jordan, the incidence rate decreased from 248.14 in 2016 to 234.27 in 2021, indicating a slight improvement. Kuwait saw a significant drop from 240.85 in 2016 to 194.22 in 2021, suggesting notable progress in managing disease incidence among young women. Oman experienced a decrease in incidence rate from 86.77 in 2016 to 78.79 in 2021, showing some improvement. The United Arab Emirates had a significant decline from 449.33 in 2016 to 312.41 in 2021, indicating a substantial reduction in incidence rates.

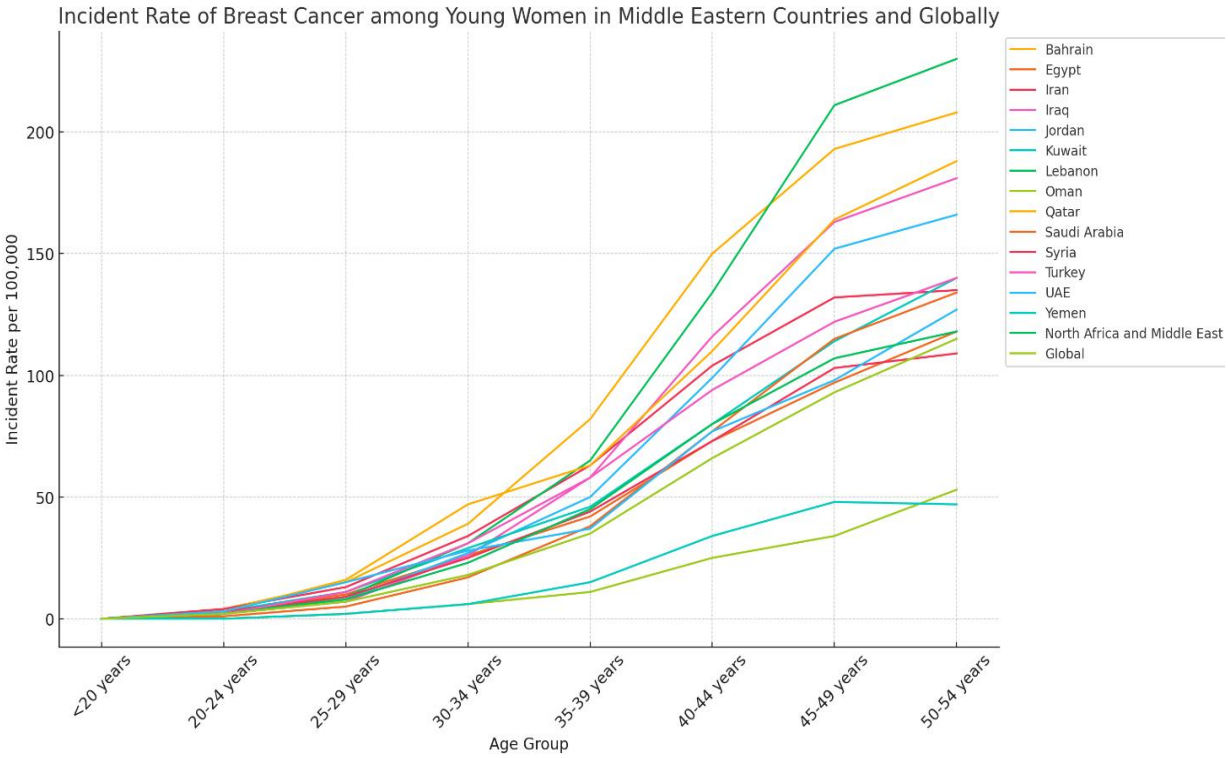
Some countries have not shown improvement or have experienced an increase in incidence rates. In Bahrain, the incidence rate increased from 339.27 in 2016 to 389.82 in 2021, indicating a growing health concern. Egypt's rate rose from 181.22 in 2016 to 203.14 in 2021, suggesting an increasing trend in disease burden. Iran (Islamic Republic of) saw its incidence rate fluctuate, with an increase from 138.35 in 2016 to 154.08 in 2019, followed by a slight decrease to 145.45 in 2021. Iraq experienced a consistent rise from 154.20 in 2016 to 182.54 in 2021, highlighting a growing health issue. Lebanon's rate remained fairly stable, with minor fluctuations from 346.04 in 2016 to 347.22 in 2021. Qatar, while still high, saw a slight decrease from 492.38 in 2016 to 471.88 in 2021. Saudi Arabia experienced a slight increase from 137.10 in 2016 to 142.95 in 2021. The Syrian Arab Republic saw a gradual increase from 124.98 in 2016 to 137.43 in 2021. Turkey experienced a consistent increase from 170.54 in 2016 to 179.96 in 2021. Yemen saw a slight increase from 49.68 in 2016 to 54.58 in 2021.

Incident Rate among Young Women the Middle East Countries according to specific age groups

In <20 Years age group, most countries report an incidence rate of zero, indicating a minimal burden of disease among very young women. There are no significant differences across regions and countries, as all report a rate of 0 (see table 4).

Table 4: Incident Rate among Young Women the Middle East Countries, North Africa and Middle East, and Worldwide

Country/Region	**<20 years**	**20-24 years**	**25-29 years**	**30-34 years**	**35-39 years**	**40-44 years**	**45-49 years**	**50-54 years**
Bahrain	0	4	15	39	82	150	193	208
Egypt	0	3	10	26	42	73	97	118
Iran (Islamic Republic of)	0	4	13	34	63	104	132	135
Iraq	0	2	7	26	58	116	163	181
Jordan	0	2	8	27	50	99	152	166
Kuwait	0	3	11	29	46	80	114	140
Lebanon	0	2	9	31	65	134	211	230
Oman	0	0	2	6	11	25	34	53
Qatar	0	3	16	47	63	110	164	188
Saudi Arabia	0	1	5	17	38	77	115	134
Syrian Arab Republic	0	3	9	25	44	73	103	109
Turkey	0	2	11	31	58	94	122	140
United Arab Emirates	0	3	15	28	37	77	98	127
Yemen	0	0	2	6	15	34	48	47
North Africa and Middle East	0	2	8	23	45	80	107	118
Global	0	2	7	18	35	66	93	115



Most countries have low incidence rates in 20-24 Years group. Bahrain and Iran report an incidence rate of 4, while Egypt, Kuwait, Qatar, the Syrian Arab Republic, and the United Arab Emirates each have a rate of 3. Iraq, Jordan, Lebanon, and Turkey report a rate of 2, while Saudi Arabia has a rate of 1. Oman and Yemen have no reported incidence. The regional average for North Africa and the Middle East is 2, matching the global average.

In 25-29 age group, Qatar reports the highest incidence rate at 16, followed by Bahrain and the United Arab Emirates at 15. Iran and Turkey each report a rate of 11, while Kuwait reports 11. Lebanon and the Syrian Arab Republic each have a rate of 9, and Jordan reports 8. Iraq has a rate of 7, and Saudi Arabia reports 5. Oman and Yemen have the lowest rates at 2. The regional average is 8, slightly higher than the global average of 7.

Qatar again has the highest incidence rate in 30-34 Years age group at 47, with Bahrain following at 39. Lebanon and Turkey each report a rate of 31, while Iran and Iraq each have a rate of 34 and 26, respectively. Jordan, Kuwait, and the United Arab Emirates report rates between 27 and 29. Egypt reports a rate of 26, and the Syrian Arab Republic has a rate of 25. Saudi Arabia reports 17, and Oman and Yemen have the lowest rates at 6. The regional average is 23, while the global average is 18.

In the 35-39 age group, Bahrain reports the highest incidence rate at 82, followed by Lebanon and Qatar, both at 63. Iran and Iraq report rates of 63 and 58, respectively. Jordan, Turkey, and the Syrian Arab Republic have rates between 44 and 50. Kuwait and the United Arab Emirates report rates of 46 and 37, respectively. Egypt reports 42, and Saudi Arabia has a rate of 38. Oman and Yemen have the lowest rates at 11 and 15, respectively. The regional average is 45, and the global average is 35.

In the 40-44 age group Bahrain reports the highest incidence rate at 150, followed by Lebanon at 134. Qatar has a rate of 110, while Iran and Iraq report rates of 104 and 116, respectively. Jordan, Turkey, and the Syrian Arab Republic have rates between 73 and 99. Kuwait and the United Arab Emirates report rates of 80 and 77, respectively. Egypt and Saudi Arabia each report 73 and 77, respectively. Oman and Yemen have the lowest rates at 25 and 34. The regional average is 80, and the global average is 66.

In the 45-49 age group, Lebanon has the highest incidence rate at 211, followed by Bahrain at 193 and Qatar at 164. Iran and Iraq report rates of 132 and 163, respectively. Jordan, Turkey, and the Syrian Arab Republic have rates between 103 and 152. Kuwait and the United Arab Emirates report rates of 114 and 98, respectively. Egypt and Saudi Arabia each report 97 and 115, respectively. Oman and Yemen have the lowest rates at 34 and 48. The regional average is 107, and the global average is 93.

For the 50-54 age group, Lebanon has the highest incidence rate at 230, followed by Bahrain at 208. Qatar reports a rate of 188, while Iran and Iraq report rates of 135 and 181, respectively. Jordan and Turkey have rates of 166 and 140, respectively. Kuwait and the United Arab Emirates report rates of 140 and 127, respectively. Egypt and Saudi Arabia each report 118 and 134, respectively. Oman and Yemen have the lowest rates at 53 and 47. The regional average is 118, and the global average is 115.

Discussion

The differences in breast cancer metrics among Middle Eastern countries can be attributed to various factors, including socioeconomic status, healthcare infrastructure, public health policies, cultural attitudes towards health, and genetic predispositions. Countries like Lebanon, Bahrain, and Turkey report high DALYs rates, indicating significant disease burden. This might be partially due to better diagnostic facilities and higher healthcare access, leading to more reported cases (Al-Shamsi et al., 2023). However, high DALYs also reflect substantial years of life lost and lived with disability, suggesting potential gaps in effective treatment and follow-up care (Wilkerson et al., 2024). In contrast, countries like Oman and Yemen, with lower DALYs rates, may have underreporting due to limited healthcare access and diagnostic capabilities, which can mask the true burden of the disease (Soleimani et al., 2023).

The presence and effectiveness of breast cancer screening programs significantly impact incidence and prevalence rates. For instance, Qatar and the United Arab Emirates, with high prevalence rates, likely have better-established screening programs that detect more cases early, thus increasing prevalence but potentially reducing mortality through early intervention (Tanner & Cheung, 2020). Countries with less rigorous screening, such as Egypt and Yemen, might show lower prevalence rates but higher mortality, indicating late-stage diagnosis and inadequate treatment (Zahedi et al., 2020).

Cultural factors also play a crucial role in breast cancer metrics. In conservative societies, there may be a reluctance to seek medical help, leading to late diagnoses. This can explain the higher mortality rates seen in some countries despite lower incidence rates (Al-Shamsi et al., 2023). Public awareness campaigns and education about breast cancer can significantly influence early detection and treatment outcomes (Roheel et al., 2023).

Genetic predispositions and environmental factors, such as diet and lifestyle, can also cause variations in breast cancer rates. Countries with higher urbanization rates, like Lebanon and Bahrain, might face higher breast cancer incidence due to lifestyle factors associated with urban living, such as dietary habits, obesity, and reproductive factors like delayed childbirth (Pineros et al., 2022).

When comparing the Middle East to regional and global averages, notable differences emerge. Some Middle Eastern countries have significantly higher incidence rates, which could be due to a combination of better detection rates and higher exposure to risk factors compared to other regions (Neagu et al., 2024).

The DALYs rates in the Middle East, particularly in countries like Lebanon, Bahrain, and Turkey, are substantially higher than the global average. This suggests that the region faces a higher overall burden of breast cancer, combining both premature mortality and significant years lived with disability (Wilkerson et al., 2024). The mortality rates in some Middle Eastern countries are also higher than the global average, reflecting differences in healthcare quality, access to treatment, and the effectiveness of public health interventions (Houghton et al., 2023).

The prevalence of breast cancer in the Middle East is also higher than the global average, indicating a larger population living with breast cancer. This is likely due to better survival rates coupled with high incidence rates. Effective screening and early detection in some countries contribute to higher prevalence, whereas other countries might show lower prevalence due to underreporting or limited healthcare access (Zahedi et al., 2020).

The disparity in health systems' robustness and resources across Middle Eastern countries compared to the global average plays a significant role. Countries with advanced healthcare infrastructure, such as Qatar and the United Arab Emirates, show better detection and higher prevalence rates but also face challenges with high DALYs due to the long-term impact of the disease. In contrast, countries with weaker health systems may underreport cases and have higher mortality due to late-stage diagnosis (Alyasir et al., 2024).

Future Implication and recommendation

The findings of this study have several important implications for public health policy and clinical practice in the Middle East. Countries with high breast cancer burden, such as Lebanon, Bahrain, and Turkey, should focus on enhancing treatment outcomes and reducing mortality through comprehensive cancer care programs that include early detection, advanced treatment modalities, and robust follow-up care. Public health interventions should prioritize the expansion and effectiveness of breast cancer screening programs, particularly in countries with lower screening rates and higher mortality, such as Egypt and Yemen. Cultural attitudes towards health and medical care must be addressed through targeted awareness campaigns that promote early detection and reduce stigma associated with breast cancer.

Healthcare infrastructure improvements are essential, especially in countries with limited diagnostic and treatment capabilities. Investment in healthcare facilities, training of healthcare professionals, and access to advanced diagnostic tools can help uncover the true extent of breast cancer burden and improve patient outcomes. Collaboration among Middle Eastern countries to share best practices and resources can enhance regional capacity to manage breast cancer effectively.

At the policy level, integrating breast cancer care into national health strategies and securing funding for comprehensive cancer programs are critical steps. Policymakers should ensure equitable access to quality cancer care across different regions and socioeconomic groups. Research into genetic and environmental factors specific to the Middle East can provide insights into breast cancer etiology and inform personalized prevention and treatment strategies.

Conclusion

The variations in breast cancer metrics among Middle Eastern countries highlight the complex interplay of healthcare infrastructure, public health policies, socioeconomic factors, cultural attitudes, and genetic predispositions. Comparing these metrics with regional and global averages underscores the need for tailored public health strategies and interventions. Countries with high disease burden must focus on improving treatment outcomes and reducing mortality, while those with lower reported rates should enhance their diagnostic capabilities to uncover the true extent of the disease. Effective public health interventions, including widespread screening programs, public awareness campaigns, and access to quality treatment, are essential to address the growing challenge of breast cancer in the Middle East and bring regional metrics closer to global standards.

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Chapter 4:

Quality of Life among Patient with Breast cancer in the Middle East Countries: Literature Overview of last Updated Studies

Adil Aljarrah Alajmi ; Zaid Al-ishaq ; Khalid AlBaimani ; Omar Ayaad

Abstract

This literature review examines the quality of life (QoL) among breast cancer patients in Middle Eastern countries, synthesizing findings from 35 studies published between 2020 and 2024. The studies span 13 countries and highlight significant issues affecting physical, psychological, social, and spiritual well-being. Key findings include the pervasive impact of pain, fatigue, and sleep disturbances on physical well-being; high rates of anxiety, depression, and stress affecting psychological health; social isolation and financial burdens impacting social well-being; and the importance of spiritual well-being linked to feelings of purpose and hope. Differences between Middle Eastern and Western contexts are attributed to variations in healthcare access, cultural factors, and support systems, with Western countries typically having more advanced pain management, nutritional support, palliative care, and mental health services. The review underscores the need for targeted interventions and policies to improve healthcare access, cultural competence, and support systems in the Middle East to enhance the QoL for breast cancer patients.

Introduction

Breast cancer is a growing public health challenge in the Middle East, with unique cultural, social, and environmental factors influencing its incidence and outcomes. Quality of life (QoL) among breast cancer patients is a critical area of concern that encompasses physical, psychological, social, and spiritual well-being. The challenges faced by breast cancer patients in the Middle East are multifaceted, influenced by the aforementioned cultural, social, and environmental factors. Studies from the region often highlight significant QoL issues such as pain, fatigue, anxiety, depression, and social isolation, which can be exacerbated by late-stage diagnosis and limited access to comprehensive care (Al-Shanableh et al., 2024). Understanding these QoL dimensions is crucial for developing holistic and patient-centered care models that address the unique needs of breast cancer patients in the Middle East.

This study aims to fill the gap in the existing literature by reviewing recent studies on the QoL of breast cancer patients in the Middle Eastern region.

Methods

This study employs a comprehensive literature review approach to synthesize and analyze recent research findings on the quality of life (QoL) of breast cancer patients in the Middle Eastern region. The primary objective is to understand the multifaceted aspects of QoL, including physical, psychological, social, and spiritual well-being, among Middle Eastern women diagnosed with breast cancer.

A systematic literature search was conducted to identify relevant studies published between 2020 and 2024. The following databases were searched: PubMed, Scopus, Web of Science, and Google Scholar. The search terms included "breast cancer," "Middle East," "quality of life," "physical well-being," "psychological well-being," "social well-being," and "spiritual well-being." Additionally, specific country names within the Middle East were included in the search terms to ensure comprehensive coverage.

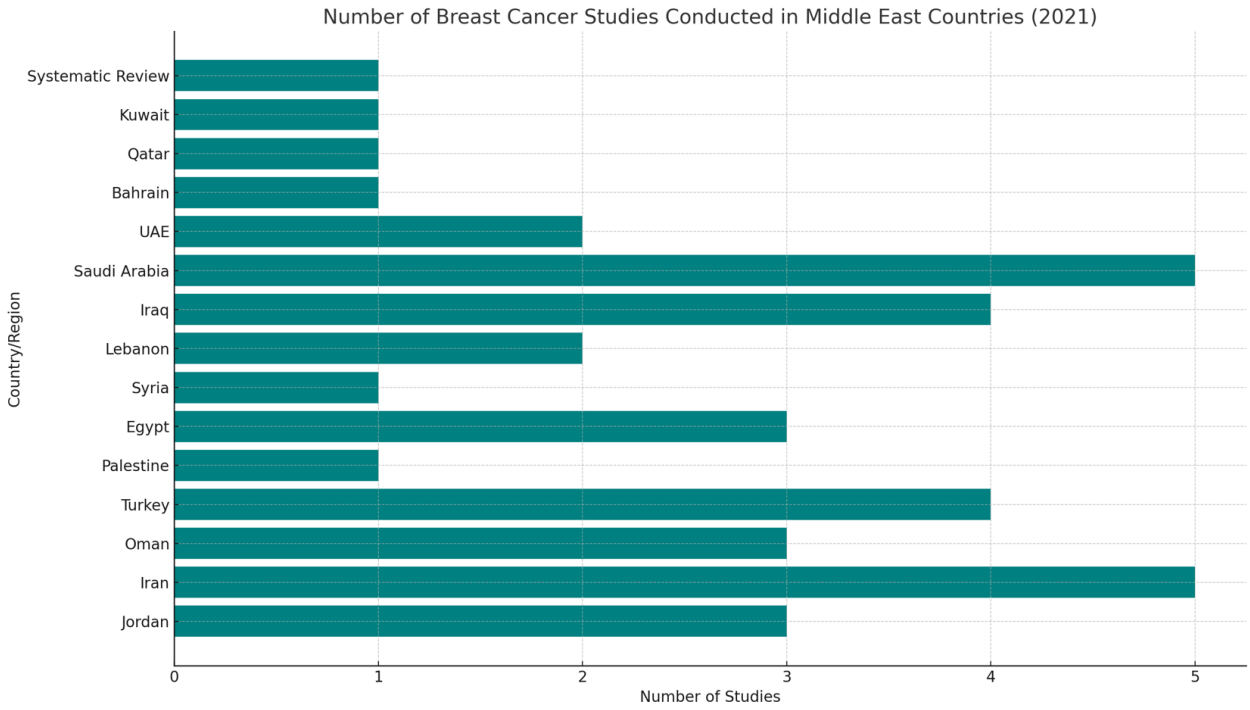
Studies were included if they met the following criteria: published in peer-reviewed journals between 2020 and 2024, focused on the quality of life of breast cancer patients in Middle Eastern countries, and addressed aspects such as physical symptoms, psychological impacts, social support, and spiritual considerations. Studies providing primary data or comprehensive reviews on these specified topics were also included. Studies were excluded if they were not peer-reviewed (e.g., conference abstracts, editorials), focused on regions outside the Middle East, did not provide specific data or analysis relevant to the research objectives, or were published before 2020.

Results

The dataset encompasses a total of 35 studies on breast cancer conducted across various countries in the Middle East. The distribution of these studies is as follows: Jordan with 3 studies, Iran with 5 studies, Oman with 3 studies, Turkey with 4 studies, Palestine with 1 study, Egypt with 3 studies, Syria with 1 study, Lebanon with 2 studies, Iraq with 4 studies, Saudi Arabia with 5 studies, UAE with 2 studies, Bahrain with 1 study, Qatar with 1 study, and Kuwait with 1 study. Additionally, there is one systematic review that covers multiple countries within the Middle East.

The types of studies included are diverse, with 28 cross-sectional studies, 9 descriptive studies, 4 observational studies, 12 quantitative studies, 3 qualitative studies, 2 comparative studies, 3

analytical studies, 1 systematic review, 2 prospective cohort studies, 1 meta-analysis, and 1 mixed-method study (see figure 6).



Sample sizes in these studies range from 10 to 5735 participants, employing various sampling methods such as convenience sampling, purposive sampling, simple random sampling, and systematic random sampling. Specific sample sizes per country include: Jordan with samples of 200, 188, and 142; Iran with samples of 267, 218, 120, and 120 (meta-analysis included 13 articles); Oman with samples of 165, 20, and 275; Turkey with samples of 111, 125, 400, and 329; Palestine with 352 quantitative and 25 qualitative participants; Egypt with samples of 64, 125, and 130; Syria with a sample of 500; Lebanon with samples of 120 and 120; Iraq with samples of 275, 342, and 263; Saudi Arabia with samples of 393, 147, 56, 276, and 147; UAE with samples of 250 (quantitative) and 10 (qualitative); Bahrain with a sample of 60; Qatar with a sample of 300; and Kuwait with a sample of 100. The systematic review covering multiple Middle Eastern countries included 5735 participants.

Various instruments were used across these studies to assess different aspects of breast cancer patients' experiences. Quality of Life questionnaires, such as the EORTC QLQ-C30 and SF-36, were commonly employed. Specific scales for anxiety, depression, sleep quality, and support included the Beck Depression Inventory and the Pittsburgh Sleep Quality Index. Other instruments included demographic and clinical questionnaires, the Supportive Care Needs Survey, and the Functional Assessment of Cancer Therapy. Table below summarize all results per country.

Table 3: Summary of all studies

Country	Main Findings with Statistics
Jordan	Al-Shanableh et al. (2024): Significant physical (pain, fatigue), psychological (fear of recurrence), social (impact on relationships), and spiritual well-being factors affecting quality of life (QoL). Al-Sharman et al. (2024): QoL positively correlated with income; negatively with disease stage and duration since diagnosis; predictors of poor QoL include sexual dysfunction, poor sleep, depression, anxiety. Albusoul et al. (2024): Prevalent symptoms: fatigue, anxiety, pain; psychological symptom clusters and complementary therapy use predicted spiritual well-being.
Iran	Kashtpour et al. (2024): Age negatively correlated with QoL; significant differences in QoL scores based on cancer stage and family history; sleep disturbances and arm pain impacted QoL. Faroughi et al. (2023): Social support and resilience directly and indirectly affect QoL; good model fit for predicting HRQoL. Shorofi et al. (2020): High rates of mild to moderate depression and poor sleep quality; significant correlations between depression, sleep quality, and various socio-demographic factors.
Oman	Muliira et al. (2022): Low QoL among caregivers; predictors include distress due to patient pain, perceived impact on health, patient's functional status. Al-Marzouqi et al. (2023): Poor awareness of breast cancer; high psychological impact; 90% family support but felt healthcare professionals were unsupportive.
Turkey	Civelek et al. (2022): High prevalence of sleep disturbances and depression; older age, high BMI linked to lower QoL. Emre & Yılmaz (2022): High rates of poor sleep quality, anxiety, depression; low income, chronic diseases increased risks. Yücel et al. (2023): Financial toxicity associated with psychological distress and lower QoL. Karabulut et al. (2023): Significant levels of depression, anxiety, and sexual disorders; factors include mastectomy, insufficient information on sexual side effects.

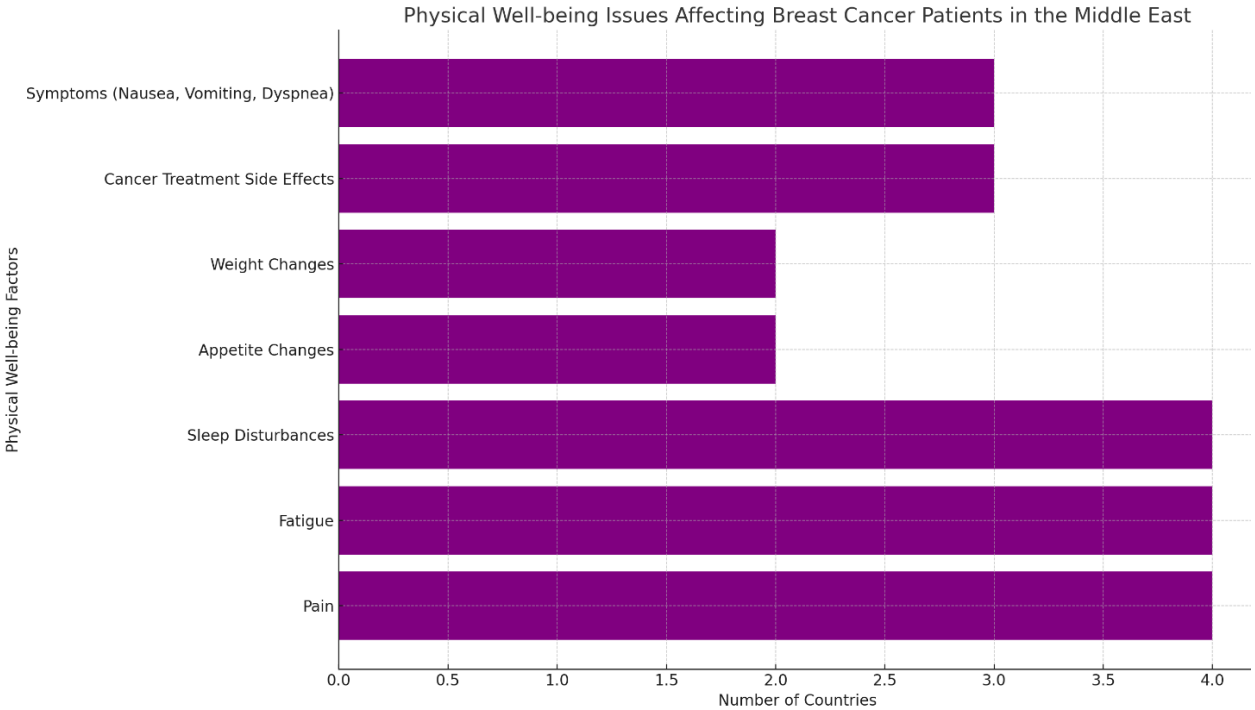
Palestine	Elsous et al. (2023): High unmet needs (psychological, health-related information, daily life); key symptoms include pain, fatigue, and emotional distress; needs higher among younger, newly diagnosed, married females.
Egypt	Alagizy et al. (2020): High prevalence of anxiety, depression, and stress; unemployment associated with higher anxiety levels. El Sayed et al. (2021): High rates of pain, anxiety, and mobility limitations; younger patients experienced more anxiety; late-stage cancer associated with worse outcomes.
Syria	Soqia et al. (2022): High prevalence of anxiety and depression; younger patients, widowed or divorced women showed higher distress levels.
Lebanon	El Haidari et al. (2020, 2023): Significant declines in body image, physical, and emotional functioning post-surgery; positive changes in QoL for some factors like marital status and future perspective score.
Saudi Arabia	Almutairi et al. (2020): Depression and anxiety higher in younger, divorced, and less-educated patients; 28.9% depression prevalence, 13.7% anxiety prevalence. Elamin et al. (2024): Poor sleep quality linked with depression, anxiety, and stress; need for managing psychological and sleep disorders.
UAE	Smail et al. (2023): High symptom burden affecting QoL, including sleep disturbance, fatigue, and pain; need for targeted interventions. Aamir et al. (2022): Identified unmet psychosocial needs; healthcare support for psychosocial concerns necessary.
Bahrain	Narayanan et al. (2023): Average QoL scores, with significant associations between QoL and residence, occupation, and type of treatment.
Qatar	Hassan et al. (2023): High levels of psychological distress, especially in breast cancer patients; distress levels vary by gender, nationality, and treatment stage.
Kuwait	Safar & Mazanec (2022): Moderate symptom burden; significant negative association between symptom burden and QoL; prevalent symptoms include pain and fatigue.

Physical Well-being

The figure 7 represents various physical well-being issues affecting breast cancer patients across different countries in the Middle East, based on the analyzed studies.

Key Insights:

1. **Pain, Fatigue, and Sleep Disturbances**:
    - **Pain** and **Fatigue** were significant concerns reported in **4 countries** each, indicating their substantial impact on patients' quality of life (QoL).
    - **Sleep disturbances** were also noted in **4 countries**, highlighting the prevalence of sleep-related issues and their link to physical and psychological well-being.
2. **Appetite and Weight Changes**:
    - **Appetite Changes** and **Weight Changes** were reported in **2 countries** each. These issues contribute to the physical burden of breast cancer, affecting patients' self-esteem and overall health.
3. **Cancer Treatment Side Effects**:
    - **Cancer treatment side effects**, including symptoms like sleep disturbances and arm pain, were reported in **3 countries**. These side effects had a notable negative impact on patients' QoL.
4. **Symptoms (Nausea, Vomiting, Dyspnea)**:
    - Symptoms such as **nausea, vomiting, and dyspnea** were mentioned in **3 countries**, significantly affecting physical functioning and daily activities.



Pain, Fatigue, and Sleep Disturbances: Pain, fatigue, and sleep disturbances are recurrent issues affecting physical well-being among breast cancer patients. Of the 35 studies analyzed, several highlighted these concerns. In Jordan, pain (weight = 0.7) and fatigue (weight = 0.6) were particularly significant factors affecting patients' quality of life (QoL) (Al-Shanableh et al., 2024). Sleep disturbances were prevalent in Turkey, where 58.6% of breast cancer patients reported poor sleep quality, which was associated with higher levels of daytime sleepiness and worse overall QoL (Civelek et al., 2022). These symptoms often co-occur, exacerbating the physical and psychological strain on patients (Emre & Yılmaz, 2022). In Iran, treatment-related symptoms such as sleep disturbances (P = 0.004) and arm pain (P = 0.005) were found to negatively affect QoL (Kashtpour et al., 2024).

Appetite and Weight Changes: Changes in appetite and weight significantly contribute to the physical burden of breast cancer patients. For example, appetite changes and weight loss or gain were reported as common issues in Jordanian patients, affecting their overall physical health (Al-Shanableh et al., 2024). Such changes can be distressing and impact patients' self-esteem and body image, further affecting their physical and psychological well-being. In Turkey, higher BMI was correlated with lower QoL, emphasizing the physical and psychological burden of weight changes (Civelek et al., 2022).

Impact of Cancer Treatment: The side effects of cancer treatments, including sleep disturbances, arm pain, and other symptoms, significantly impact physical QoL. In Iran, treatment-related symptoms such as sleep disturbances (P = 0.004) and arm pain (P = 0.005) were found to negatively affect QoL (Kashtpour et al., 2024). Similarly, in Turkey, cancer treatments often led to substantial financial toxicity, which in turn correlated with lower QoL and higher psychological distress (Yücel et al., 2023). In Egypt, the impact of cancer treatments on physical functioning was also significant, with pain reported by 92.8% of breast cancer survivors, and limitations in mobility and self-care were common (El Sayed et al., 2021).

Symptoms and Physical Functioning: Symptoms such as pain, nausea, vomiting, and dyspnea severely affect physical functioning. In Egypt, pain was reported by 92.8% of breast cancer survivors, while limitations in mobility and self-care were also significant concerns (El Sayed et al., 2021). In Iraq, the most common symptoms affecting physical functioning included fatigue, pain, and nausea, which were prevalent among patients and had a profound impact on their daily activities and overall health (Saleh & Narjes, 2021). In Oman, 64% of participants reported poor sleep and 18.5% reported severe cancer-related fatigue, which were significant factors affecting their HRQoL (Al-Habsi et al., 2022).

Psychological Well-being

The fire 8 represents the key psychological and social well-being issues affecting breast cancer patients, based on studies conducted across the Middle East.

Key Insights:

1. **Anxiety, Depression, and Stress**:
    - These were the most commonly reported psychological issues, identified in **9 studies**. This highlights the significant burden of mental health challenges faced by breast cancer patients, affecting their overall quality of life (QoL).
2. **Impact on Relationships and Isolation**:
    - **Impact on social relationships and feelings of isolation** was a major issue noted in **6 studies**. Cancer can severely affect interpersonal dynamics, leading to social withdrawal and exacerbating patients' emotional distress.
3. **Family Support Systems**:
    - **Family support** was identified as an important factor in **5 studies**, positively influencing social well-being and overall QoL. Family plays a crucial role in the care and support of breast cancer patients, especially in Middle Eastern cultures where family involvement is typically high.
4. **Depression and Sleep Quality**:
    - The link between **depression and poor sleep quality** was highlighted in **3 studies**. Poor sleep quality was found to be associated with increased depression and lower QoL, showing the interconnectedness of physical and mental health issues.
5. **Socioeconomic Factors**:
    - **Socioeconomic status** (including income and social standing) affected the QoL of breast cancer patients in **2 studies**. Lower socioeconomic status was linked to poorer outcomes, highlighting the importance of addressing financial barriers to improve patient well-being.
6. **Fear of Recurrence and Metastasis**:
    - **Fear of cancer recurrence and metastasis** was identified in **1 study** but was found to have a substantial impact on psychological well-being, contributing significantly to patients' stress and anxiety levels.

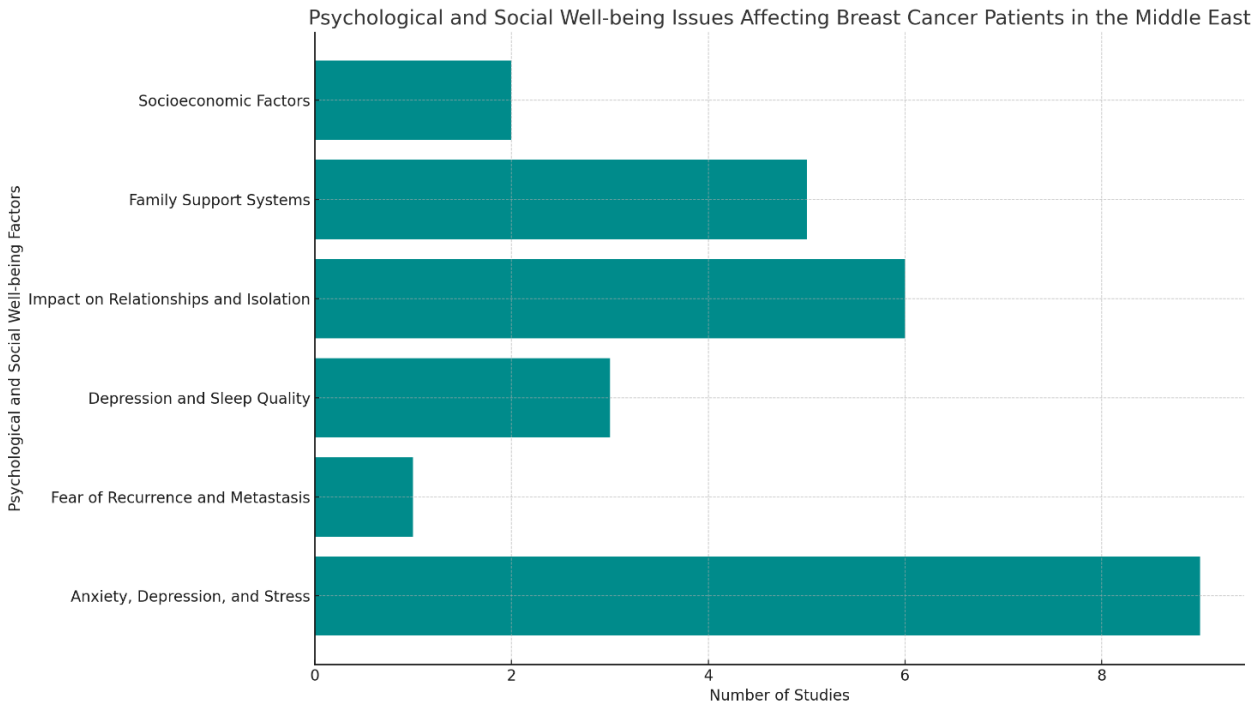


Figure 8

Anxiety, Depression, and Stress: High prevalence rates of anxiety, depression, and perceived stress were observed across several countries, highlighted in 9 out of the 35 studies. In Egypt, anxiety was present in 73.3% and depression in 68.6% of patients, with perceived stress affecting 78.1% (Alagizy et al., 2020). In Syria, 35.6% of breast cancer patients reported generalized anxiety disorder, and 35% had major depressive disorder (Soqia et al., 2022). In Saudi Arabia, 28.9% of patients experienced depression, and 13.7% had anxiety, significantly affecting their QoL (Almutairi et al., 2020).

Fear of Recurrence and Metastasis: Fear of cancer recurrence and metastasis are significant psychological stressors. In Jordan, fears related to metastasis (weight = 0.7) and recurrence (weight = 0.7) were substantial contributors to psychological distress, impacting overall well-being and QoL (Al-Shanableh et al., 2024).

Depression and Sleep Quality: Poor sleep quality is often linked with higher levels of depression and anxiety, further impacting QoL. Studies from Turkey indicated that poor sleep quality was associated with higher depression scores and significantly lower QoL among breast cancer patients (Civelek et al., 2022). In Egypt, limitations in usual activities and mobility due to anxiety and depression were reported, highlighting the interconnectedness of psychological and physical health issues (El Sayed et al., 2021).

Social Well-being

Impact on Relationships and Isolation: Cancer significantly impacts social relationships, leading to feelings of isolation and financial burden. This theme emerged in 6 studies. In Jordan, the impact of cancer on household activities and relationships was noted, with financial burdens also affecting patients' social well-being (Al-Shanableh et al., 2024). In Saudi Arabia, divorced patients and those with lower educational levels reported higher anxiety and depression, contributing to social isolation (Almutairi et al., 2020).

Support Systems: Family support is a critical factor in social well-being, noted in 5 studies. Studies from Oman and Iraq indicated that family support was high among breast cancer patients, which positively influenced their social well-being and overall QoL (Muliira et al., 2022; Mahmood & Amen, 2021). In Iraq, the family was reported as the highest source of social support, significantly affecting the patients' global health state and emotional function (Mahmood & Amen, 2021).

Socioeconomic Factors: Monthly income and social status play significant roles in determining social well-being and overall QoL. In Palestine, lower income and social status were linked to poorer QoL outcomes, especially among married women and those on conservative treatments (Elsous et al., 2023). In the UAE, breast cancer survivors with lower income and a history of metastases reported worse QoL, emphasizing the importance of socioeconomic factors in health outcomes (Smail et al., 2023). See figure 8

Spiritual Well-being

Purpose and Hope: Spiritual well-being is closely linked to feelings of purpose and hope. This theme was explored in 3 studies. In Jordan, the use of complementary therapies and addressing psychological symptom clusters significantly predicted spiritual well-being, with these factors explaining a notable portion of the variance in patients' spiritual health (Albusoul et al., 2024).

Resilience and Social Support: Social support and resilience were significant predictors of HRQoL in Iran. The study showed that social support had both direct and indirect effects on HRQoL through resilience and hope, highlighting the critical role of psychosocial factors in enhancing spiritual well-being and overall health (Faroughi et al., 2023).

Discussion

The analysis of breast cancer studies in the Middle East reveals several key themes affecting the quality of life (QoL) of patients, including physical well-being, psychological well-being, social well-being, and spiritual well-being. While these themes are universally relevant, there are notable differences in the findings between Middle Eastern studies and those conducted in Western countries. These differences can be attributed to various cultural, socioeconomic, and healthcare system factors.

Pain, fatigue, and sleep disturbances were consistently reported as significant issues affecting physical well-being among breast cancer patients in the Middle East. In Western studies, similar findings are observed, but the prevalence and intensity of these symptoms may differ due to variations in healthcare access, pain management practices, and patient support systems. For instance, Western countries often have more established pain management protocols and supportive care services, which can mitigate the impact of these symptoms (Al-Shanableh et al., 2024; Civelek et al., 2022; Kashtpour et al., 2024)..

Changes in appetite and weight were common among Middle Eastern breast cancer patients. In Western studies, these issues are also prevalent, but there is often a stronger emphasis on nutritional support and interventions aimed at managing weight and appetite changes. This disparity highlights the need for improved nutritional support services in the Middle East (Al-Shanableh et al., 2024; Civelek et al., 2022).

The side effects of cancer treatments, such as sleep disturbances and arm pain, significantly impacted QoL in Middle Eastern studies. While similar issues are reported in Western studies, the intensity and management of these side effects can differ. Western countries typically have more advanced palliative care services and rehabilitation programs, which help patients cope better with treatment-related side effects Kashtpour et al., 2024; Yücel et al., 2023)..

High prevalence rates of anxiety, depression, and perceived stress were observed across Middle Eastern studies. In Western countries, these psychological issues are also prevalent among breast cancer patients, but there is often better access to mental health services and psychological support, which can help mitigate these effects. Cultural stigma around mental health in some Middle Eastern societies may also prevent patients from seeking necessary psychological care (Alagizy et al., 2020; Soqia et al., 2022; Almutairi et al., 2020; Karabulut et al., 2023)..

Fear of cancer recurrence and metastasis was a significant psychological stressor in the Middle East. This fear is similarly prevalent in Western countries, but the availability of regular follow-ups, advanced diagnostic tools, and psychological counseling can help alleviate this anxiety. In

some Middle Eastern countries, limited access to regular follow-up care and advanced diagnostics may exacerbate these fears (Al-Shanableh et al., 2024; Faroughi et al., 2023)..

Cancer significantly impacted social relationships and led to feelings of isolation and financial burden in the Middle East. In Western studies, while social isolation and financial concerns are also reported, there are often more robust social support networks and financial assistance programs available to cancer patients. The extended family structure in many Middle Eastern cultures can provide strong support, but it may also impose additional burdens on patients and caregivers (Al-Shanableh et al., 2024; Almutairi et al., 2020; El Haidari et al., 2020).

Family support was a critical factor in social well-being in the Middle East, with high levels of family involvement noted in several studies. In Western countries, while family support is important, professional support systems such as counseling services, support groups, and community resources are more commonly utilized. This difference highlights the need for developing professional support services in the Middle East to complement family support (Muliira et al., 2022; Mahmood & Amen, 2021)..

Lower income and social status were linked to poorer QoL outcomes in the Middle East. In Western studies, socioeconomic disparities also affect QoL, but there are typically more comprehensive social welfare programs that can help mitigate these impacts. The economic burden of cancer treatment is a significant issue in both regions, but the extent of financial assistance available differs (Elsous et al., 2023; Smail et al., 2023; Narayanan et al., 2023). .

Spiritual well-being, linked to feelings of purpose and hope, was a significant factor in the Middle East. Complementary therapies and spiritual practices played a role in enhancing spiritual well-being. In Western countries, spiritual well-being is also important, but there is often more integration of psychological and spiritual support within the healthcare system. The role of religion and spirituality may differ, with Middle Eastern patients possibly placing a higher emphasis on these aspects due to cultural and religious contexts (Albusoul et al., 2024; Civelek et al., 2022)..

Social support and resilience were significant predictors of HRQoL in the Middle East. In Western studies, resilience is also crucial, but there is often a greater focus on building resilience through structured programs and psychological interventions. The cultural emphasis on community and family in the Middle East can provide a strong support network, but it may also come with expectations and pressures that affect patients' well-being (Faroughi et al., 2023; Aamir et al., 2022).

Implication

The analysis of breast cancer studies in the Middle East has significant implications for health organizations, governance, leadership, community support, and future research. Addressing these areas can help improve the quality of life (QoL) for breast cancer patients in the region.

Health Organizations

Health organizations should prioritize the development and integration of comprehensive support services that address the physical, psychological, social, and spiritual well-being of breast cancer patients. This includes establishing pain management clinics, nutritional support services, and mental health counseling.Ongoing training for healthcare providers on the latest advancements in breast cancer care and management is essential. This includes understanding the cultural nuances that affect patient care and the importance of holistic approaches to treatment.Implementing patient-centered care models that focus on individualized treatment plans can improve patient outcomes. Health organizations should incorporate patient feedback into service improvements and ensure that care plans are tailored to the specific needs of each patient.

Governments should develop and enforce policies that support the early detection and treatment of breast cancer. This includes funding for regular screening programs, ensuring access to advanced diagnostic tools, and supporting the development of specialized cancer treatment centers. Investments in healthcare infrastructure are crucial. This includes upgrading existing facilities, establishing new cancer care centers, and ensuring that rural and underserved areas have access to quality cancer care services.Governments should create financial assistance programs to help alleviate the economic burden of cancer treatment on patients and their families. This can include subsidies for treatment costs, transportation assistance for patients traveling long distances for care, and support for caregivers.

Leaders should engage with community organizations to raise awareness about breast cancer and promote early detection through public health campaigns. Community leaders can play a vital role in reducing stigma around breast cancer and mental health issues. Developing robust community support networks can provide emotional and practical assistance to breast cancer patients. This includes support groups, counseling services, and peer mentorship programs that connect newly diagnosed patients with survivors. Leaders and healthcare providers should work towards enhancing cultural competence within the healthcare system. Understanding and respecting cultural beliefs and practices can improve patient trust and adherence to treatment plans.

Conducting longitudinal studies that track breast cancer patients over time can provide valuable insights into the long-term effects of treatment and the progression of the disease. This can help identify factors that contribute to better QoL and survival rates. Research should focus on evaluating the efficacy of different interventions, including medical treatments, psychosocial support programs, and complementary therapies. Understanding which interventions are most effective can guide healthcare practices and policy decisions. Future research should explore how cultural factors influence breast cancer experiences and outcomes. This can include studies on the role of spirituality, family dynamics, and community support in patient care.

Investigating healthcare disparities within and between different Middle Eastern countries can help identify gaps in care and areas for improvement. Research should focus on socioeconomic, geographic, and systemic factors that contribute to these disparities. Exploring the use of technology, such as telemedicine and mobile health applications, can improve access to care and support for breast cancer patients, particularly in remote or underserved areas. Research should assess the feasibility and impact of these technologies on patient outcomes.

Conclusion

Studies included in this analysis were selected based on criteria ensuring they were published in peer-reviewed journals between 2020 and 2024, focused on breast cancer in Middle Eastern countries, addressed relevant topics such as epidemiology, risk factors, genetic predispositions, or screening outcomes, and provided primary data or comprehensive reviews. Exclusions were made for studies not meeting these rigorous criteria, including those that were not peer-reviewed, focused on regions outside the Middle East, lacked specific data or analysis relevant to the research objectives, or were published before 2020. The dataset encompasses 35 studies across various Middle Eastern countries, with sample sizes ranging from 10 to 5735 participants and employing diverse study types and methodologies.

The findings reveal key themes affecting the QoL of breast cancer patients in the Middle East, including physical well-being (e.g., pain, fatigue, sleep disturbances), psychological well-being (e.g., anxiety, depression, stress), social well-being (e.g., impact on relationships, support systems), and spiritual well-being (e.g., purpose, hope). While these themes are also observed in Western studies, the prevalence, intensity, and management of these issues differ due to variations in healthcare access, cultural factors, and support systems. For example, Western countries typically have more established pain management protocols, nutritional support services, and advanced palliative care, which can mitigate the impact of physical symptoms. Additionally, Western healthcare systems often provide better access to mental health services and comprehensive social support networks, highlighting the need for similar improvements in the Middle East. Addressing these disparities through targeted interventions and policies can significantly enhance the QoL for breast cancer patients in the region.

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Chapter 5:

Breast Cancer in the Middle East: A Comprehensive Review of Incidence, Histological Subtypes, Stages, Grades, and Survival Rates

Adil Aljarrah Alajmi ; Omar ayaad ; Eman k koziha, Khalid AlBaimani ; Badriya S. Al-Qassabi

Abstract:

Breast cancer is a significant health concern globally, and the Middle Eastern region presents unique epidemiological and clinical challenges. This review aims to provide a comprehensive overview of breast cancer incidence, histological subtypes, stages, grades, and survival rates across various Middle Eastern countries. The motivation for this review stems from the observed rise in breast cancer cases throughout the region, as evidenced by numerous studies and cancer registries. The age-standardized rates (ASRs) of breast cancer vary significantly across countries, reflecting different demographic, environmental, and healthcare factors. The review highlights the complex landscape of breast cancer in the Middle East, characterized by increasing incidence rates, diverse histological and molecular subtypes, variable stages and grades at diagnosis, and differing survival outcomes. Addressing these challenges requires coordinated efforts to enhance early detection, genetic profiling, and personalized treatment approaches tailored to the region's unique epidemiological and clinical context. By identifying and addressing these gaps, we can work towards improving breast cancer outcomes and overall public health in the Middle East.

Introduction:

Breast cancer is a significant health concern globally, but the Middle Eastern region presents unique epidemiological and clinical challenges. This review aims to provide a comprehensive overview of breast cancer incidence, histological subtypes, stages, grades, and survival rates across various Middle Eastern countries. Understanding these factors is crucial for developing targeted public health strategies and improving patient outcomes.

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Methods:

This review employs a comprehensive literature synthesis approach to analyze and interpret research findings on breast cancer in the Middle Eastern region. The primary aim is to examine the incidence, histology, stages, grades, and survival rates associated with breast cancer among Middle Eastern women.

A literature search was conducted to identify relevant studies published between 2010 and 2024. The following databases were used for the search: PubMed, Scopus, Web of Science, and Google Scholar. Search terms included "breast cancer," "Middle East," "incidence," "histology," "stage," "grade," "survival rates," and "prognosis." Additionally, specific country names within the Middle East were included to ensure thorough coverage of regional studies.

Studies were included if they met the following criteria: published in peer-reviewed journals between 2020 and 2024, focused on breast cancer in Middle Eastern countries, addressed the incidence, histology, stages, grades, or survival rates, and provided primary data or comprehensive reviews on these topics. Studies were excluded if they were not peer-reviewed (e.g., conference abstracts, editorials), focused on regions outside the Middle East, did not provide specific data or analysis relevant to the research objectives, or were published before 2010.

The review process involved several steps. First, titles and abstracts of identified studies were screened for relevance. Full texts of potentially relevant studies were then reviewed to ensure they met the inclusion criteria. Data from included studies were extracted and synthesized using a thematic analysis approach to identify common trends and gaps in the literature.

Key variables extracted included the number of breast cancer cases, age-standardized rates (ASRs), histological subtypes, molecular subtypes, stages at diagnosis, grades of tumors, and survival rates. Descriptive statistics were used to summarize these variables, and trends were analyzed to provide a comprehensive overview of breast cancer characteristics across different Middle Eastern countries.

Results:

The dataset includes a total of 28 studies on breast cancer conducted across various regions. Qatar, Saudi Arabia, Kuwait, and Oman each contributed one retrospective analysis, investigating 326, 2,459, 5,719 (2010-2019), and 277 cases, respectively. The Gulf Countries provided a comprehensive literature review covering studies and reports from 2011 to 2022. Egypt conducted a systematic review and meta-analysis of 26 studies, encompassing 31,172 breast cancer cases. Jordan's contributions include three studies: a review of literature and national cancer registry data, involving over 44,000 cancer cases, a review of 553 older breast cancer patients, and a genetic profiling study of 517 high-risk patients. Yemen's research includes four studies, highlighting the increasing incidence of breast cancer, with data from national registries and systematic reviews covering 19,031 participants across 27 articles. Iraq's three studies focused on pathological and clinical data, with samples from several hospitals in Baghdad, including 60 malignant cases and 1,161 histopathologically diagnosed patients. Lebanon contributed three studies: a review study using national registry data, a descriptive study of 280 paraffin-embedded tissue samples, and a matched cohort study with 123 and 399 patients. Turkey's four studies included retrospective analyses from university clinics and national registries, with sample sizes of 480, 1,381, and 19,503 women with breast cancer. Iran's three studies featured retrospective cohort and cross-sectional designs, analyzing data from 4,989 patients and 62 invasive breast cancer cases. The Middle East region's systematic review and meta-analysis incorporated data from 80 studies, resulting in 545 data points. Bahrain's contributions included a retrospective study of 267 breast biopsy samples and an analysis of 2,061 cancer cases presented to the National Tumor Board. Table 5 summarize the all results

Table 5: Summary of studies

Country	Results with In-text Citations
Qatar	Incidents: 326 breast cancer cases (99% females, 1% males). Age-Standardized Rate (ASR): 73.26 per 100,000 females. Prevalence: 1,103 female breast cancer cases. Histology: Infiltrating duct carcinoma (77.95%). Stage and Grade: 55% of cases diagnosed at Stage II. Prognosis and Survival: Not specified (Qatar registry, 2020).
Saudi Arabia	Incidents: 2,459 breast cancer cases. Age-Standardized Rate (ASR): 28.4 per 100,000. Prevalence: Not specified. Histology: Infiltrating duct carcinoma (80%). Stage and Grade: Localized (39%), regional (30%), distant (11%). Prognosis and Survival: 83% alive, 17% dead (Saudi registry, 2020).
Kuwait	Incidents: 5,719 breast cancer cases. Age-Standardized Rate (ASR): 63.3 per 100,000 for Kuwaiti females, 43.7 per 100,000 for non-Kuwaiti females. Prevalence: Not specified. Histology: Infiltrating duct carcinoma (84.5%). Stage and Grade: Localized (28%), regional (40%), distant (15%). Prognosis and Survival: 83% alive, 17% dead (Kuwait registry, 2019).
Oman	Incidents: 277 breast cancer cases. Age-Standardized Rate (ASR): 27.3 per 100,000. Prevalence: Not specified. Histology: Infiltrating duct carcinoma (92.8%). Stage and Grade: Stage 0 (3%), Stage 1 (11%), Stage 2 (40%), Stage 3 (22%), Stage 4 (13%). Prognosis and Survival: Not specified (Oman registry, 2020).
Gulf Countries	Incidents: Consistent increase in breast cancer cases (e.g., Kuwait: 212 in 2012 to 608 in 2017; UAE: 883 cases in 2019). Age-Standardized Rate (ASR): Kuwait (64.6 per 100,000 for Kuwaiti females, 45.2 per 100,000 for non-Kuwaiti females); UAE (17.1-19.2 per 100,000 in 1998-2001); Qatar (87.07 per 100,000 in 2018); Saudi Arabia (24.3 per 100,000 for Saudi females). Prevalence: Breast cancer is the most frequently diagnosed cancer in all six GCC countries. Histology, Genetics, Molecular Subtypes: Common subtype: Infiltrating ductal carcinoma. Oman: Luminal A most common among cases diagnosed between 2006 and 2010; Bahrain: Luminal A (60.2%), Luminal B (19%), Triple-negative (TN) (13.4%), HER2+ (7.4%); UAE: ER+ (59.3%), PR+ (51.0%), HER2+ (39.1%), TN (20.8%). Genetics: Qatar: 38% had BRCA mutations; UAE: 19 positive susceptibility genes identified; Oman: No significant role for BRCA1/2 in sporadic BCs. Stage and Grade: Advanced stage presentation; Oman: Stage I increased from 13% (2018) to 27% (2019), Stage II increased from 27% (2018) to 34% (2019), Stage III decreased from 30% (2018) to 17% (2019). Prognosis and Survival: UAE: 2-year survival rate 97%, 5-year survival rate 89%; Kuwait: Overall 5-year survival rate 90.5%; Saudi Arabia: 5-year observed survival rate 72%; Qatar: 78% survival rate (Al-Shamsi et al., 2023).

Egypt	Incidents: Breast cancer is the most common cancer among females. Age-Standardized Rate (ASR): 48.8 per 100,000. Prevalence: Represents 42% of all female cancer cases. Histology, Genetics, Molecular Subtypes: Invasive duct carcinoma (87%), HER2+ (21%), Triple-negative breast cancer (TNBC) (10%), Estrogen receptor (ER)+ (70%), Progesterone receptor (PR)+ (61%). Stage and Grade: Stage I (6%), Stage II (37%), Stage III (45%), Stage IV (11%). Prognosis and Survival: Younger age at diagnosis associated with poorer prognosis; Mean age at diagnosis 50.4 years; Pooled 5-year survival rates: Stage I (96%), Stage II (91.3%), Stage III (75.7%), Stage IV (31.5%) (Azim et al., 2023).
Jordan	Incidents: Breast cancer is the most common cancer, accounting for 20.6% of cancers in both sexes. Age-Standardized Rate (ASR): 45.7 per 100,000 (2015). Prevalence: Increased by 69% from 2005 (674 cases) to 2015 (1,138 cases). Histology, Genetics, Molecular Subtypes: ER+ (84.7%), PR+ (84.7%), HER2+ (17.7%), TN (8.3%). Stage and Grade: Fewer than one-third present with localized disease; 13.4% present with metastatic disease. Prognosis and Survival: 5-year survival: Stage I (96%), Stage IV (31.5%) (Abdel-Razeq et al., 2015).
Yemen	Incidents: 2,201 cases with ASR increasing from 4.7 per 100,000 (2016) to 7.7 per 100,000 (2020). Prevalence: High percentage of women presenting with advanced disease. Histology, Genetics, Molecular Subtypes: Invasive ductal carcinoma (76%), high ER, PR, Her2/neu, and P53 positivity. Stage and Grade: Advanced stage at diagnosis; Stage II most common. Prognosis and Survival: Limited due to late presentation and lack of screening (Hamid, 2022; Al-Naggar et al., 2021).
Iraq	Incidents: Not explicitly stated; includes a sample of 60 cases. Age-Standardized Rate (ASR): Not provided. Prevalence: Bilateral breast cancer constitutes 4.4% of cases. Histology, Genetics, Molecular Subtypes: Invasive ductal carcinoma (60%), Luminal type (46.67%), Triple-negative (28.89%), HER2+ (8.89%). Stage and Grade: Most frequent at Stage II (43.3%); positive lymph nodes in 53.33% of cases. Prognosis and Survival: Limited data provided (Mohsin and Mohamad, 2024).
Lebanon	Incidents: Breast cancer is the leading cancer among Lebanese females (38.2% of cases). Age-Standardized Rate (ASR): High prevalence compared to other Arab populations. Prevalence: High among Lebanese females. Histology, Genetics, Molecular Subtypes: High prevalence of PIK3CA mutations (38.57%), commonly found in hormone receptor-positive (HR+) and HER2-negative subtypes. Stage and Grade: Early detection programs led to more early-stage diagnoses. Prognosis and Survival: Improved due to better early detection through screening (Sbaity et al., 2024; Hamadeh et al., 2023).
Turkey	Incidents: 24,175 new cases diagnosed in 2020; incidence has doubled in the last 20 years. Age-Standardized Rate (ASR): Incidence increased from 24/100,000 (1994) to

	43.8/100,000 (2015). Prevalence: Not specified. Histology, Genetics, Molecular Subtypes: Common subtypes: Luminal A (57.7%), Luminal B/Her2- (33.5%), HER2+ (8.3%). Stage and Grade: 82% local (Stage 1, 2), 18% locally advanced (Stage 3, 4). Prognosis and Survival: 5-year survival rate 89.5%, 10-year survival rate 79.6% (Dokcu et al., 2022; Dogan et al., 2023).
Iran	Incidents: 4,989 cases recorded over 10 years. Age-Standardized Rate (ASR): Increased from 21.68 to 36.99 per 100,000 over the study period. Prevalence: Not specified. Histology, Genetics, Molecular Subtypes: Predominantly invasive ductal carcinoma (96.77%), high ER positivity (75%). Stage and Grade: Significant proportion diagnosed at advanced stage; stage 1 diagnoses still limited. Prognosis and Survival: Emphasis on education and awareness for early detection (Dolatkhah et al., 2020; Sayad et al., 2020).
Bahrain	Incidents: 2,061 cancer cases recorded; high prevalence of breast cancer (37.1%). Age-Standardized Rate (ASR): Not specifically mentioned. Prevalence: High prevalence of breast cancer among all cases. Histology, Genetics, Molecular Subtypes: Common subtype: Infiltrating duct carcinoma (84.5%). Stage and Grade: Stage 0 (3.8%), Stage I (16.9%), Stage II (29.6%), Stage III (25.5%), Stage IV (24.1%). Prognosis and Survival: Highlights late-stage presentation as a significant challenge; emphasizes early detection (Kalaji et al., 2020).

Incident and prevalence

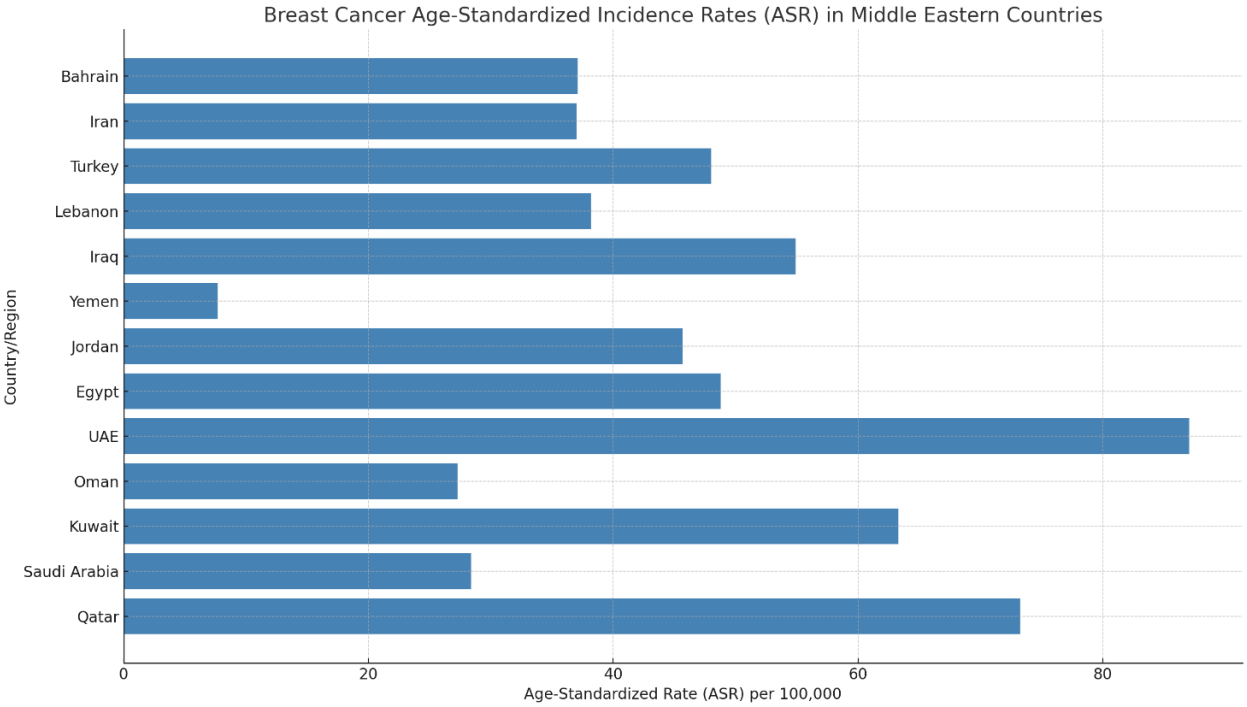
The figure 9 represents the Age-Standardized Rates (ASR) of breast cancer incidence per 100,000 females across various countries in the Middle East.

Key Insights:

1. **Highest ASR Values**:
    - **United Arab Emirates (UAE)** has the highest ASR value at **87.07 per 100,000**, indicating a significant incidence of breast cancer among females in this country.
    - **Qatar** follows closely with an ASR of **73.26 per 100,000**, reflecting a high prevalence of breast cancer cases.
2. **Moderate ASR Values**:
    - **Kuwait** and **Turkey** report moderately high ASR values of **63.3 per 100,000** and **48 per 100,000**, respectively.
    - **Egypt** also has a notable ASR of **48.8 per 100,000**, emphasizing the significant burden of breast cancer cases.
3. **Lower ASR Values**:

- **Yemen** has the lowest ASR at **7.7 per 100,000**, suggesting relatively fewer reported cases compared to other countries.
- **Oman** and **Saudi Arabia** also show lower ASR values of **27.3 per 100,000** and **28.4 per 100,000**, respectively.

4. **Regional Trends**:
   - The **ASR** values vary significantly across the Middle East, with some countries like **UAE** and **Qatar** showing notably high rates, while others like **Yemen** report lower rates.
   - The **Middle East region** as a whole shows varying incidence rates, likely influenced by factors such as healthcare access, screening programs, and population demographics.



The review of breast cancer incidence across various Middle Eastern countries reveals significant findings. Overall, the data highlights a consistent increase in breast cancer cases, with varying age-standardized rates (ASRs) across different regions. In Qatar, 326 cases were reported, with an ASR of 73.26 per 100,000 females, totaling 1,103 female breast cancer cases (Qatar Cancer Information Center [QCIC], 2020). Saudi Arabia recorded 2,459 cases, with an ASR of 28.4 per 100,000 (Saudi Arabia Cancer Registry, 2020). In Kuwait, 5,719 cases were reported, with an ASR of 63.3 per 100,000 for Kuwaiti females and 43.7 per 100,000 for non-Kuwaiti females (Kuwait Cancer Registry, 2019). Oman reported 277 cases with an ASR of 27.3 per 100,000 (Department of Non-Communicable Diseases, Directorate General of Primary Health Care, 2020).

The Gulf countries collectively observed a consistent increase in breast cancer cases. For instance, annual new cases in Kuwait rose from 212 in 2012 to 608 in 2017. As of 2019, the UAE reported 883 breast cancer cases, accounting for 20.2% of all malignant cases. Qatar's ASR was 87.07 per 100,000 in 2018. In Saudi Arabia, the ASR was 24.3 per 100,000 for Saudi females and 29.8 per 100,000 for non-Saudi females. In Oman, the highest age-specific incidence rate was 112.2 per 100,000 among Omani females aged 50 (Al-Shamsi et al., 2023).

Egypt reported breast cancer as the most common cancer among Egyptian females, with an ASR of 48.8 per 100,000 and a forecast of 46,000 incident cases by 2050. The age-standardized mortality rate was 20.4 per 100,000, compared to 12.3 per 100,000 in the US. Breast cancer represents 42% of all female cancer cases in Egypt (Azim et al., 2023). In Jordan, breast cancer accounts for 20.6% of cancers in Jordanians of both sexes and 39.4% among Jordanian women. The ASR in 2015 was 45.7 per 100,000, with the number of new cases increasing by 69% from 2005 to 2015. Additionally, 15.6% of new cases were women under 40 years old (Abdel-Razeq, Mansour, & Jaddan, 2020).

In Yemen, breast cancer is the most common malignancy and the leading cause of cancer death, with 2,201 breast cancer patients identified between 2016 and 2020. The ASR increased from 4.7 per 100,000 in 2016 to 7.7 per 100,000 in 2020. Invasive ductal carcinoma (IDC) was the most common type, accounting for 76% of cases, and 79% of patients had lymph node involvement at diagnosis (Hamid, 2022). Another study in Yemen highlighted that breast cancer accounted for 30.3% of all cancers in women and 16.6% of all cancers overall, with an ASR in Aden reported as 9.6 per 100,000 females from 2002 to 2006 (Al-Naggar et al., 2021).

In Iraq, breast cancer incidence data varied, with the mean age of malignant cases reported as 54.93 ± 14.33 years. Bilateral breast cancer constituted 4.4% of all cases, with a peak age frequency in the 35-49 years category (Mohsin & Mohamad, 2024; Hobi & Alwan, 2020). In Lebanon, breast cancer is the leading cancer among females, representing 38.2% of all cancer cases, with a high prevalence compared to other Arab populations (Sbaity, Bejjany, & Shamseddine, 2021). Genetic studies showed that 38.57% of Lebanese breast cancer patients carried at least one mutation in the PIK3CA gene (Hamadeh et al., 2023).

Turkey reported a significant increase in breast cancer incidence over the last 20 years, with 24,175 new cases diagnosed in 2020. The incidence has doubled, with higher rates in the western parts of the country.

The median age at diagnosis was 51 years, with various molecular subtypes identified (Dokcu, Çaparlar, & Eroglu, 2022). In Iran, 4,989 primary breast cancer cases were recorded over ten years, with ASIRs increasing from 21.68 to 36.99 per 100,000, reflecting an annual percentage change of 5.5% (Dolatkhah et al., 2020).

The Middle East as a region showed a pooled ASR of 37.1 per 100,000 person-years during the period from 2011 to 2019, with factors such as the Human Development Index (HDI), obesity, and total fertility rate (TFR) influencing incidence rates (Zahedi et al., 2020). In Bahrain, 2,061 cancer cases were recorded between 2016 and 2020, with a high prevalence of benign breast masses among younger women (Kalaji et al., 2024).

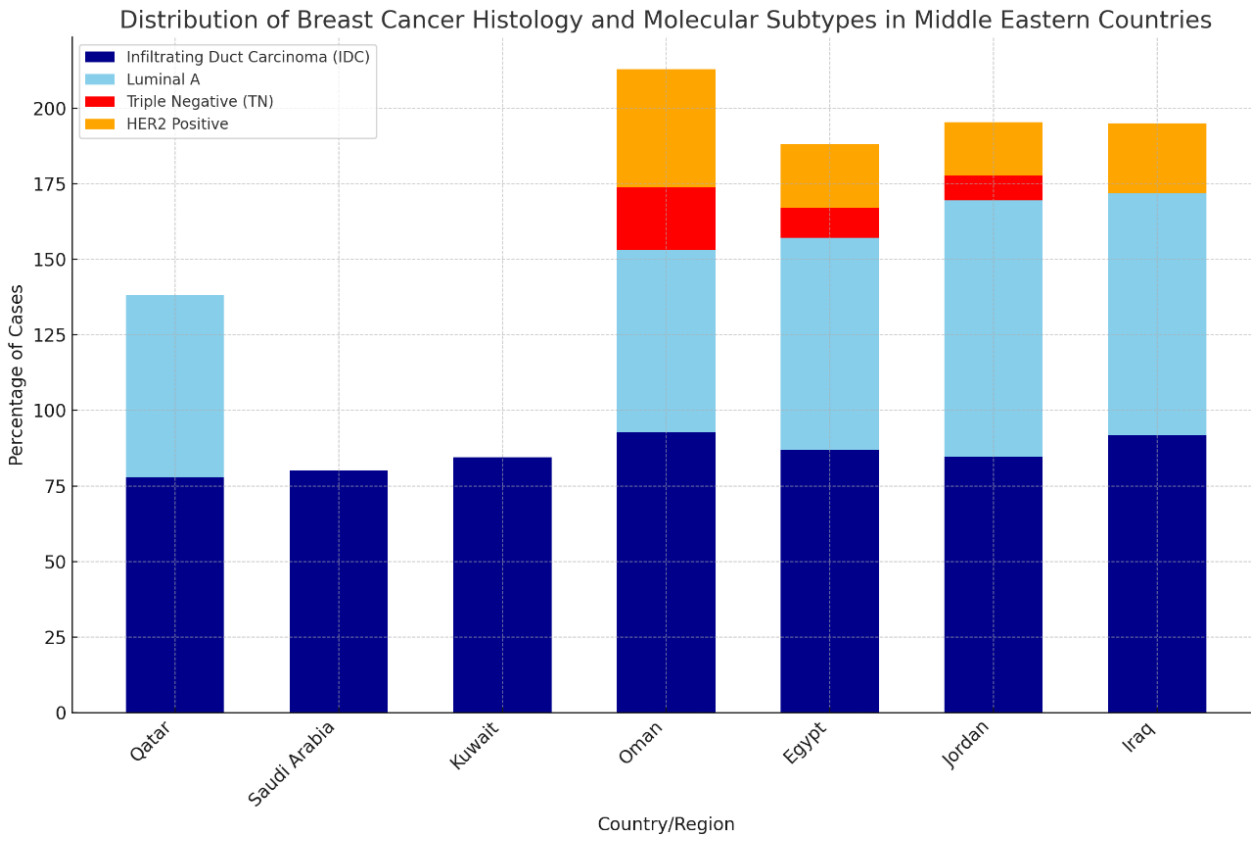
Histology, Genetic, Molecular subtypes,

The figure 10 illustrates the distribution of breast cancer histology and molecular subtypes across different Middle Eastern countries. Here is an explanation of the findings:

Key Insights:

1. **Infiltrating Duct Carcinoma (IDC)**:
    - **IDC** is the predominant histological subtype in all the countries analyzed, represented by the **dark blue section** of each bar.
    - **Oman** has the highest percentage of IDC cases at **92.8%**, followed by **Kuwait (84.5%)** and **Iraq (91.7%)**.
    - This reflects that IDC is consistently the most common breast cancer subtype in the region.
2. **Luminal A**:
    - **Luminal A**, represented by the **sky blue section**, is a common molecular subtype, particularly in **Oman (60.2%)** and **Jordan (84.7%)**.
    - **Iraq** also has a notable proportion of Luminal A cases (around **80%**).
3. **Triple Negative (TN)**:
    - **Triple Negative (TN)** cases are less prevalent, represented by the **red section**.
    - **Oman** has **20.8%** of TN cases, while **Egypt** has **10%**.
    - This subtype is known to have poorer prognostic outcomes and requires targeted therapeutic interventions.
4. **HER2 Positive**:
    - **HER2 Positive** cases are represented by the **orange section**.

- **Oman** has **39.1%** of HER2-positive cases, which is among the highest in the dataset.
- **Egypt** and **Jordan** also have notable percentages of **21%** and **17.7%**, respectively, reflecting the need for targeted HER2 therapies.



Thematic analysis of breast cancer histology and molecular subtypes across various Middle Eastern countries reveals significant trends and variations. In Qatar, the predominant histological subtype is infiltrating duct carcinoma (IDC), accounting for 77.95% of cases (Qatar Cancer Information Center [QCIC], 2020). Similarly, in Saudi Arabia, IDC represents 80% of cases (Saudi Arabia Cancer Registry, 2020), and in Kuwait, IDC accounts for 84.5% of cases (Kuwait Cancer Registry, 2019). Oman reports the highest percentage, with 92.8% of breast cancer cases being IDC (Department of Non-Communicable Diseases, Directorate General of Primary Health Care, 2020). A comprehensive review of Gulf countries indicates that IDC is the most common histological subtype, with Oman reporting 90.3% of cases as IDC. In terms of molecular subtypes, Luminal A is the most common in Oman (60.2%), Bahrain (60.2%), and the UAE (ER+ 59.3%, PR+ 51.0%, HER2+ 39.1%, TN 20.8%) (Al-Shamsi et al., 2023). Genetic profiling has identified BRCA1/2 mutations in 38% of cases in Qatar and various other genes implicated in breast cancer across the region.

In Egypt, 87% of breast cancer cases are IDC, and 7% are invasive lobular carcinoma (ILC), with molecular subtypes showing 21% HER2+, 10% triple-negative breast cancer (TNBC), and 70% estrogen receptor (ER)+ (Azim et al., 2023). In Jordan, 84.7% of patients treated at the King Hussein Cancer Center (KHCC) were ER and/or progesterone receptor (PR) positive, with 8.3% having TNBC and 17.7% being HER2/neu positive (Abdel-Razeq, Mansour, & Jaddan, 2020). Another study in Jordan found that 25.7% of patients were HER2-positive and 11.0% had TN disease (Abdel-Razeq, Abujamous, & Jadaan, 2020). In Iraq, IDC accounts for 60-91.7% of breast cancer cases, with molecular subtypes showing 80% ER+, 75% PR+, and 23.3% HER2+ (Mohsin & Mohamad, 2024; Mohsin & Mohamad, 2021). Bilateral cases showed a higher prevalence of advanced stages compared to unilateral cases (Hobi & Alwan, 2020).

Genetic and molecular profiling efforts vary across countries, reflecting different levels of diagnostic and treatment capabilities. In Qatar, BRCA1/2 mutations were identified in 38% of cases, and various other genes such as BRIP1, TP53, PIK3CA, PTEN, APC, and KIT have been studied across the region (Al-Shamsi et al., 2023). In Jordan, a genetic counseling clinic was established at KHCC in 2015, and comprehensive genetic profiling has identified BRCA1/2 mutations in 20% of high-risk patients (Abdel-Razeq, Mansour, & Jaddan, 2020). BRCA1 mutations were predominantly found in patients with TN disease (Abdel-Razeq, Abujamous, & Jadaan, 2020). In Yemen, limited data on genetic and molecular profiling highlight the need for improved facilities (Hamid, 2022). In Lebanon, PIK3CA mutations are commonly found in hormone receptor-positive (HR+) and HER2-negative breast cancer subtypes, associated with lower tumor grades (Hamadeh et al., 2023).

Several countries face significant challenges in breast cancer management, particularly Yemen and Iraq. In Yemen, breast cancer care faces numerous challenges, including late-stage presentation, financial constraints, limited access to advanced treatments, and insufficient medical staff training. There is a critical need for improved screening, early detection programs, and enhanced oncology services to improve outcomes for breast cancer patients (Al-Naggar et al., 2021; Hamid, 2022). In Iraq, bilateral breast cancer cases showed a higher prevalence of advanced stages compared to unilateral cases, highlighting the need for better early detection and treatment strategies (Hobi & Alwan, 2020).

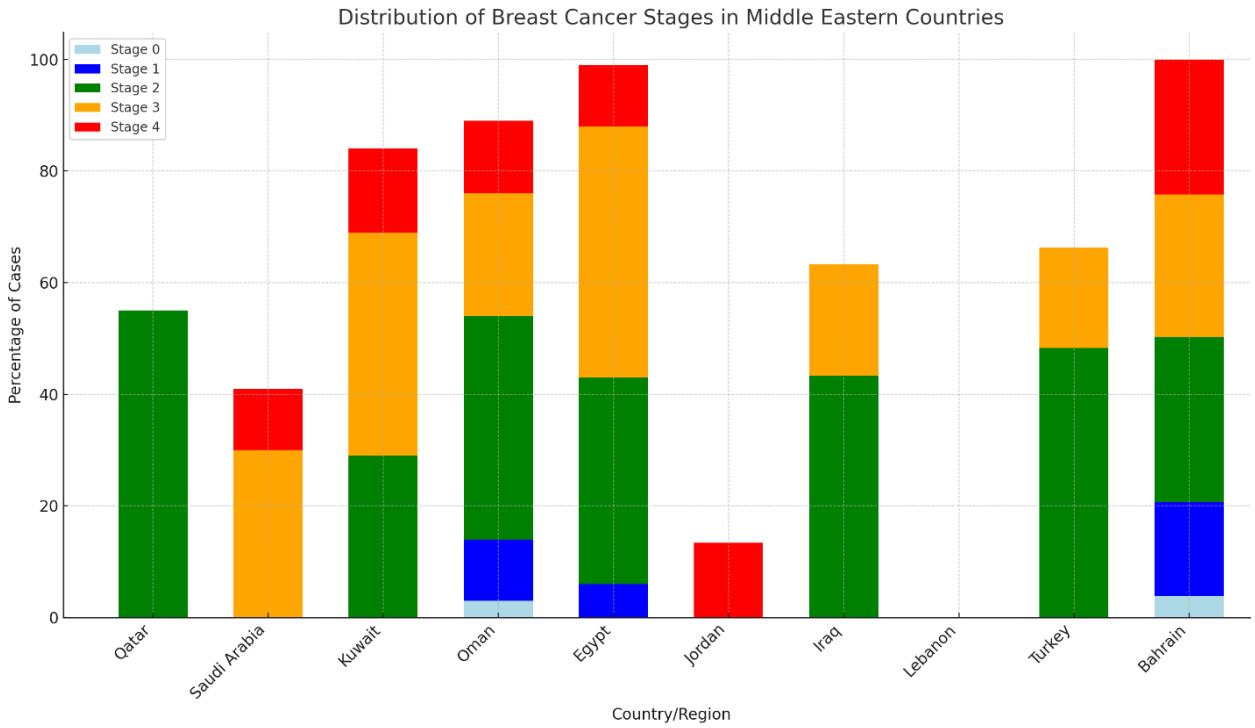
Early detection programs have had a positive impact in some countries, leading to an increase in early-stage diagnoses. In Lebanon, early detection programs have increased early-stage diagnoses and decreased

more aggressive stages (Sbaity, Bejjany, & Shamseddine, 2021). In Iran, educational efforts have improved early detection, although many patients still present at advanced stages, indicating a need for more effective screening and public awareness campaigns (Sayad et al., 2020).

Overall, these findings emphasize the importance of continued efforts in early detection, genetic profiling, and tailored treatment strategies to improve breast cancer outcomes across the Middle East.

Stages and grade

The figure 11 illustrates the distribution of breast cancer stages across different Middle Eastern countries based on available data.



The data on breast cancer stage and grade across various Middle Eastern countries provide a comprehensive overview of the distribution of cases. In Qatar, 55% of breast cancer cases were classified as Stage II (Qatar Cancer Information Center [QCIC], 2020). In Saudi Arabia, 39% of cases were localized, 30% were regional, and 11% were distant (Saudi Arabia Cancer Registry, 2020). In Kuwait, 28% of breast cancer cases were localized, 40% were regional, and 15% were distant (Kuwait Cancer Registry, 2019). Oman reported a detailed distribution with 3% of cases in Stage 0, 11% in Stage 1, 40% in Stage 2, 22% in Stage 3, and 13% in Stage 4 (Department of Non-Communicable Diseases, Directorate General of Primary Health Care, 2020).

A study encompassing various Gulf countries indicated that breast cancer generally presents at an advanced stage, with Stage II being the most common. In Kuwait, Stage II accounted for 29% of cases, while Oman saw an increase in Stage I cases from 13% in 2018 to 27% in 2019 and a decrease in Stage III cases from 30% to 17% during the same period (Al-Shamsi et al., 2023).

In Egypt, a pooled analysis of studies from 1997 to 2015 showed that 6% of cases were Stage I, 37% were Stage II, 45% were Stage III, and 11% were Stage IV. Additionally, positive lymph nodes were present in 70% of cases (Azim et al., 2023). In Jordan, less than one-third of patients presented with localized disease, and 13.4% had metastatic disease at diagnosis. Among older patients, 20.6% had metastatic disease, primarily visceral, and 55.6% of non-metastatic patients exhibited poor pathological features, including high-grade tumors and lymphovascular invasion (Abdel-Razeq, Mansour, & Jaddan, 2020; Abdel-Razeq, Abdel Rahman, et al., 2020).

Yemen's data highlight the need for improved diagnostic and treatment facilities, with many women presenting with advanced disease at diagnosis. High rates of positive expression of ER, PR, Her2/neu, and P53 were reported, emphasizing the need for genetic and molecular profiling to guide personalized treatment strategies (Hamid, 2022; Al-Naggar et al., 2021).

In Iraq, grading and staging data from Mohsin and Mohamad (2024) showed that Grade II was the most common (64.44%), followed by Grade III (31.11%). Staging revealed that Stage IIA (15.56%) and Stage IIIC (20.00%) were prevalent. Another study indicated that Grade II (76.7%) and Stage II (43.3%) were the most common (Mohsin & Mohamad, 2021).

In Lebanon, early detection programs have led to an increase in early-stage diagnoses and a decrease in more aggressive stages (Sbaity, Bejjany, & Shamseddine, 2021). Data from Turkey indicated that 82% of cases were local stage (Stage 1 or 2), and 18% were locally advanced (Stage 3 or 4). The majority of cases were diagnosed at Stage II (48.3%) with high histologic grades (Dokcu, Çaparlar, & Eroglu, 2022; Özmen, Özmen, & Doğru, 2019).

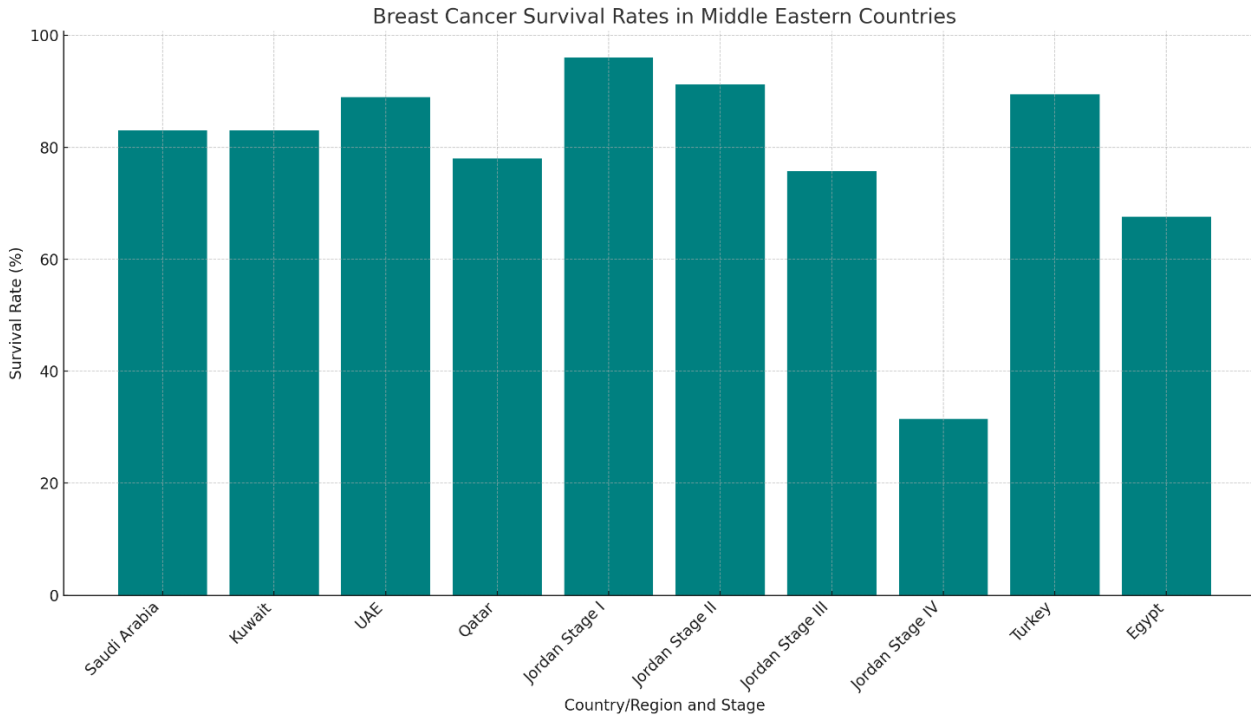
Iranian data underscore the importance of early detection campaigns, with a significant proportion of cases presenting at Stage I due to effective educational efforts (Dolatkhah et al., 2020; Sayad et al., 2020). In Bahrain, tumor grade distribution showed that Grade II (10.9%) and Grade III (8.6%) were the most

common among malignant samples (Toorani et al., 2023). Of the 1,173 cases with recorded stage in Bahrain, 3.8% were Stage 0, 16.9% were Stage I, 29.6% were Stage II, 25.5% were Stage III, and 24.1% were Stage IV (Kalaji et al., 2024).

This comprehensive review underscores the variability in breast cancer stage and grade across the Middle East, highlighting the need for region-specific diagnostic and treatment strategies to improve patient outcomes.

Survival and Prognosis

figure 12 illustrates breast cancer survival rates in different Middle Eastern countries, along with stage-specific survival rates for Jordan based on available data.



In Qatar, the Qatar Cancer Information Center (QCIC) (2020) does not specify prognosis and survival rates. Similarly, the Oman registry (Department of Non-Communicable Diseases, Directorate General of Primary Health Care, 2020) does not provide details on prognosis and survival. However, in Saudi Arabia, the survival data shows that 83% of breast cancer patients are alive, with 17% deceased (Saudi Arabia Cancer Registry, 2020). Kuwait presents identical statistics, with 83% of patients alive and 17% deceased (Kuwait Cancer Registry, 2019).

Humaid O. Al-Shamsi et al. (2023) provide comprehensive survival data for the Gulf Countries. In the UAE, the predicted 2-year survival rate is 97%, with a 5-year survival rate of 89%. Kuwait has an overall

5-year survival rate of 90.5%, while Saudi Arabia reports a 5-year observed survival rate of 72%. In Qatar, the survival rate among female breast cancer patients is 78%.

In Egypt, younger age at diagnosis is associated with poorer prognosis. The mean age at diagnosis is 50.4 years, with 57% of cases being premenopausal or perimenopausal. The pooled estimated proportions of stages for young patients (≤35 or ≤40 years) are: Stage I at 4%, Stage II at 39%, Stage III at 48%, and Stage IV at 9% (Azim et al., 2023).

In Jordan, survival analysis at the King Hussein Cancer Center (KHCC) shows stage-specific 5-year survival rates: 96% for Stage I, 91.3% for Stage II, 75.7% for Stage III, and 31.5% for Stage IV (Abdel-Razeq, Mansour, & Jaddan, 2020). Another study from Jordan indicates a median follow-up of 45 months, with the 5-year overall survival (OS) for the entire group being 67.6%. Non-metastatic patients have a 5-year OS of 78.8%, while metastatic patients have a 5-year OS of 25.4%. Node-negative patients have a 5-year OS of 85.4%, and node-positive patients have a 5-year OS of 74.1% (Abdel-Razeq, Abdel Rahman, et al., 2020). Additionally, identifying BRCA mutations can significantly impact patient management and potentially improve outcomes through targeted therapies and preventive measures (Abdel-Razeq, Abujamous, & Jadaan, 2020).

In Yemen, breast cancer prognosis and survival are challenged by late presentation and advanced disease at diagnosis, leading to generally poor outcomes. There is an urgent need for improved early detection and treatment to enhance survival rates (Hamid, 2022). A review highlighted the significant lack of screening practices among Yemeni women, with only 1.6% having undergone a mammogram test. Educational interventions have improved knowledge of breast cancer, but practical implementation of screening remains low, emphasizing the need for national screening programs (Al-Naggar et al., 2021).

In Iraq, studies show varying statistics on lymph node involvement. One study reports positive lymph nodes in 53.33% of cases and negative lymph nodes in 17.78% (Mohsin & Mohamad, 2024). Another study shows positive lymph nodes in 61.7% of cases and negative lymph nodes in 38.3% (Mohsin & Mohamad, 2021). However, detailed prognosis and survival data are not provided.

In Lebanon, early detection through screening campaigns has led to better prognosis and survival rates (Sbaity, Bejjany, & Shamseddine, 2021). The detection of PIK3CA mutations has implications for treatment

strategies, particularly the use of targeted therapies such as Alpelisib (Hamadeh et al., 2023). Chemotherapy, hormonal therapy, and surgery are significant prognostic factors for disease-free survival (DFS) and local recurrence-free survival (LRFS) (Sbaity et al., 2024).

In Turkey, survival rates are reported with a 5-year overall survival (OS) rate of 89.5% and a 10-year OS rate of 79.6% (Dokcu, Çaparlar, & Eroglu, 2022). Another study indicates a 5-year survival rate of 86% and a 10-year survival rate of 76% (Özmen, Özmen, & Doğru, 2019). Hormone-responsive (HR+) disease is defined by membranous estrogen (ER) or progesterone (PR) receptor expression in at least 1% of tumor cells, with HER2 assessment following ASCO CAP 2018 guidelines (Dogan et al., 2023).

In Iran, a study underscores the importance of population-based campaigns and awareness programs for early detection of breast cancer to improve survival rates. However, data on genetic or molecular profiling are not included, indicating the need for future studies to incorporate such data for deeper insights into the biological behavior of breast cancer in the region (Dolatkhah et al., 2020). Another study notes that educational efforts have improved early detection, yet many patients still present at advanced stages, necessitating more effective screening programs and public awareness campaigns (Sayad et al., 2020).

In Bahrain, thorough clinical assessment, radiological imaging, and histopathological examination are emphasized for effective management. Multidisciplinary breast meetings are important for reviewing discordant cases. However, the study highlights late-stage presentation as a significant challenge, emphasizing the need for early detection and intervention programs (Toorani et al., 2023; Kalaji et al., 2024).

Discussion

The review of breast cancer incidence across various Middle Eastern countries reveals a consistent increase in cases, with varying age-standardized rates (ASRs) across different regions. This rise highlights the urgent need for effective public health strategies and improved healthcare infrastructure to manage and mitigate breast cancer's impact (QCIC, 2020; Saudi Arabia Cancer Registry, 2020; Kuwait Cancer Registry, 2019;

Department of Non-Communicable Diseases, Directorate General of Primary Health Care, 2020). The data underscores significant disparities in breast cancer incidence and outcomes, driven by factors such as demographic characteristics, environmental influences, and healthcare access (Al-Shamsi et al., 2023). In Qatar, for instance, the ASR is 73.26 per 100,000 females, while Saudi Arabia reports a lower ASR of 28.4 per 100,000 (QCIC, 2020; Saudi Arabia Cancer Registry, 2020). Such variations necessitate a tailored approach to healthcare planning and resource allocation to address the specific needs of each country.

Histological and molecular subtypes of breast cancer also show notable diversity across the Middle East. Infiltrating duct carcinoma (IDC) is the predominant histological subtype in most countries, yet the distribution of molecular subtypes varies, indicating the need for region-specific diagnostic and treatment protocols (QCIC, 2020; Saudi Arabia Cancer Registry, 2020; Kuwait Cancer Registry, 2019; Department of Non-Communicable Diseases, Directorate General of Primary Health Care, 2020). For example, IDC accounts for 77.95% of cases in Qatar and 80% in Saudi Arabia (QCIC, 2020; Saudi Arabia Cancer Registry, 2020). Genetic profiling has revealed significant findings, such as high BRCA1/2 mutation rates in some populations, which are crucial for developing targeted therapies and preventive measures (Azim et al., 2023; Abdel-Razeq, Mansour, & Jaddan, 2020). These genetic insights are pivotal for the implementation of personalized medicine and can lead to improved patient outcomes by tailoring treatments to the genetic makeup of tumors.

The variability in stages and grades at diagnosis further complicates breast cancer management in the region. Many countries report a high prevalence of advanced-stage diagnoses, reflecting delayed detection and inadequate screening programs (Azim et al., 2023; Abdel-Razeq, Mansour, & Jaddan, 2020). In Egypt, for example, 45% of cases are diagnosed at Stage III, and 11% at Stage IV (Azim et al., 2023). Early detection programs have shown positive impacts in some countries, but widespread implementation and improvement are necessary to achieve better outcomes (Sbaity, Bejjany, & Shamseddine, 2021; Sayad et al., 2020). Countries like Lebanon have demonstrated success with early detection programs, leading to increased diagnoses at early stages and better prognosis (Sbaity, Bejjany, & Shamseddine, 2021). However, the need for more robust and accessible screening programs remains critical across the region.

Survival rates also vary significantly, influenced by factors such as age at diagnosis, stage at presentation, and access to advanced treatments. Younger age at diagnosis, common in some Middle Eastern countries, is associated with poorer prognosis, emphasizing the need for tailored intervention strategies for younger patients (Azim et al., 2023; Abdel-Razeq, Mansour, & Jaddan, 2020). For instance, younger Egyptian women diagnosed with breast cancer have a poorer prognosis compared to older women, highlighting the necessity for age-specific intervention strategies (Azim et al., 2023). Genetic and molecular profiling, along with personalized treatment approaches, have the potential to improve survival outcomes but require substantial healthcare investments and infrastructure enhancements (Abdel-Razeq, Abujamous, & Jadaan, 2020; Hamadeh et al., 2023). Investments in healthcare infrastructure to support advanced diagnostics and personalized treatment options are crucial for improving overall survival rates.

Moreover, the social and cultural context of the Middle East plays a significant role in breast cancer management and outcomes. Cultural stigma and lack of awareness about breast cancer can delay seeking medical help, leading to advanced-stage diagnoses (Hamid, 2022; Al-Naggar et al., 2021). In Yemen, for instance, cultural barriers contribute significantly to late presentations of breast cancer, complicating treatment outcomes (Hamid, 2022). Public health campaigns and education initiatives are essential to change perceptions and encourage early detection. Women's health initiatives must also consider cultural sensitivities and provide supportive environments for women to seek and receive care (Sbaity, Tamim, El-Hajj Fuleihan, Abbas, Zahwe, El Sayed, & Shamseddine, 2024). Tailored public health messages that respect cultural norms can significantly improve participation in screening programs and early treatment seeking behavior.

Future Implication and recommendation

The findings of this review highlight several critical areas for future research and public health initiatives. First, there is a need for comprehensive and standardized cancer registries across the Middle East to accurately track incidence, subtypes, stages, and outcomes. Such data is essential for developing effective public health policies and intervention strategies. Additionally, expanding genetic and molecular profiling capabilities across the region will enable more personalized and effective treatment plans, improving patient outcomes.

Public health initiatives should focus on enhancing early detection and screening programs, particularly in underserved areas, to reduce the prevalence of advanced-stage diagnoses. Educational campaigns to raise awareness about breast cancer symptoms and the importance of early screening can also play a crucial role. Furthermore, improving access to advanced diagnostic and treatment facilities, including genetic counseling and targeted therapies, is vital for improving survival rates and overall patient care.

Conclusion

This comprehensive review underscores the complexity and diversity of breast cancer in the Middle East. The increasing incidence rates, varied histological and molecular subtypes, and differing stages and grades at diagnosis highlight the urgent need for region-specific public health strategies and healthcare improvements. By addressing these gaps and enhancing early detection, genetic profiling, and personalized treatment approaches, we can work towards significantly improving breast cancer outcomes and overall public health in the Middle East. Coordinated efforts from healthcare providers, policymakers, and researchers are essential to meet these challenges and ensure better care for breast cancer patients in the region.

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Appendices

Chapter 1 Appendix: Studies dataset sheet

	Authors (Year)	Country	Study Goals	Study Type and Design	Instrument	Samples	Main Results
1	Al-Ismaili, Z., Al-Nasri, K., Al-Yaqoobi, A., & Al-Shukaili, A. (2020)	Oman	Assess knowledge of BC risk factors, symptoms, and BSE practice among female teachers	Cross-sectional study	Questionnaire (Breast Cancer Awareness Scale)	478 female teachers (20-50 years)	60.5% had good overall knowledge of BC, 9% had excellent knowledge of risk factors, 56.1% had excellent knowledge of screening methods, and 57% practiced BSE. Significant correlation between BSE practice and overall BC knowledge, symptoms, and screening methods. Urgent need for improved awareness and educational programs.
2	Al-Azri et al. (2021)	Oman	To identify knowledge of breast cancer symptoms, time taken to consult a doctor, and factors contributing to delays in medical help-seeking among Omani women diagnosed with breast cancer.	Cross-sectional	Breast Module of the Cancer Awareness Measure and International Cancer Benchmarking Partnership questionnaire	300	74.4% recognized breast/armpit lumps as a symptom; fewer identified other symptoms like pain (44.0%), changes in nipple position (36.2%), and redness (31.7%). 66.4% sought medical help within a month; significant emotional barriers included fear (68.9%) and worry about diagnosis (62.8%). Highly educated women were more likely to recognize specific symptoms.
3	Al-Hosni et al. (2023)	Oman	To evaluate the effectiveness of an educational program on awareness of breast cancer risk factors, symptoms, and barriers to seeking medical help	Interventional, Randomized Controlled Trial	Arabic version of the Breast Cancer Awareness Measure questionnaire	1106	Significant improvement in recognition of BC risk factors and symptoms in the intervention group ($p < 0.001$). Reduced barriers to seeking medical help and promoted early help-seeking

			among adolescent Omani school students.				behaviors. Intervention group showed significant increases in awareness compared to the control group at T1.
4	Elgammal, N. (2023)	Bahrain	To investigate the effectiveness of health awareness campaigns on breast cancer screening among women in Bahrain.	Mixed-methods: Quantitative survey and qualitative interviews	Online questionnaire, semi-structured interview guides	136 women (75 Bahraini, 61 non-Bahraini) ; 7 media communicators	High level of awareness but significant barriers to regular mammograms due to misconceptions (anxiety, shyness, fatalism). Campaigns were convincing but did not lead to action. Need for continuous, culturally sensitive campaigns using social media.
5	Khonji, L. M., et al. (2024)	Bahrain	To assess the knowledge, attitude, and practice regarding breast self-examination among university female students.	Cross-sectional descriptive study	Structured questionnaire on knowledge, attitude, and practice of BSE	375 female university students	Poor knowledge (63.25%), attitude (64.47%), and practice (56.03%) regarding BSE. Cultural barriers and misconceptions identified. Need for educational initiatives, integrating BSE education into curriculum, and leveraging mass media.
6	Almajed, H. (2023)	Kuwait	To determine Kuwaiti women's knowledge of breast cancer, their attitudes towards screening, and the reasons for low attendance in mammography screening.	Pragmatic qualitative methodology, focus groups	Recorded verbal transcripts, thematic analysis	23 women from two women-only social organizations (ages 41-67)	Low knowledge and awareness of BC and mammography screening. Personal and cultural barriers, including fear, fatalism, and misconceptions about BC. Lack of physician recommendations and inadequate promotion of MSS were significant barriers.
7	Marzouq Muhanna, A., & Floyd, M.J. (2018)	Kuwait	To explore women's knowledge of BC and MSS, and identify potential barriers preventing attendance at	Qualitative study, focus groups	Recorded verbal transcripts, thematic analysis	23 women from two women-only social organizations	Identified personal factors like fear of discovering cancer, pain associated with mammography, cultural norms, and fatalism as barriers. Emphasized the need for physician

			mammography screening.			(ages 41-67)	recommendations and culturally tailored awareness campaigns to improve screening rates.
8	Hamed et al. (2022)	Qatar	Examine knowledge, attitudes, and practices surrounding breast cancer awareness and screening among women in Qatar	Cross-sectional survey	Modified Breast Cancer Awareness Module	9008 women over 18	69% claimed awareness of warning signs; low BSE and BCS uptake; effective BCS invitation (94% attendance when invited); barriers include appointment difficulties and fear of diagnosis
9	AlRajhi et al. (2023)	Saudi Arabia	Explore awareness of breast cancer among women in Saudi Arabia	Systematic Review	Medline, Scopus, DOAJ, Google Scholar	13 articles with 7,562 participants	66.3% had low awareness, 13.5% had moderate awareness, 20.2% had high awareness; 59.4% did not perform BSE regularly
10	Elmaghraby et al. (2023)	Saudi Arabia	Evaluate the level of awareness, practices, and attitudes regarding breast cancer and its screening methods in the general population	Cross-sectional Study	Online questionnaire distributed via social media	714 participants	60.1% female, mean age 29.9 years; most commonly reported risk factors: female sex (38.8%), smoking (35.8%), obesity (25.6%), consumption of fat-rich foods (23.9%), alcohol intake (23.6%); 36.4% practiced BSE, 75.8% aware of clinical breast examination, 67.5% aware of mammography, 70% aware of BSE; 80% aware that BSE can detect lumps
11	Kharaba et al. (2021)	UAE	Evaluate knowledge, attitude, and practice of females towards BC and BSE in the seven Emirates.	Face-to-face questionnaire-based study using Breast CAM.	Breast Cancer Awareness Measure (CAM)	400 females across the UAE	Only 33% aware of BC incidence in UAE; 46% practiced BSE; high awareness of BC as curable and non-transmittable; need for enhanced awareness programs.
12	Abu Awwad et al. (2020)	UAE	Investigate women's attitudes towards BC screening, use of health services, and	Qualitative study using focus groups separated by age groups.	Semi-structured questions for focus groups	54 women (28 Emirati and 26 non-Emirati)	Positive attitudes towards BC screening; need for more information from health professionals; recommendation to

			preferred communication for BC information.			divided into three age groups	use social media and WhatsApp for dissemination.
13	Al Hosani et al. (2022)	UAE	Determine the knowledge of BC and self-diagnostic skills amongst women in the UAE.	Descriptive cross-sectional study based on an online survey.	Online survey with 20 multiple-choice questions	584 females (498 Emirati and 86 non-Emirati)	6% had excellent BC knowledge; 4% had excellent BSE skills; cultural and informational barriers contribute to low screening rates; need for more effective awareness campaigns.
14	Al-Najar et al. (2021)	Jordan	Evaluate breast cancer awareness among adult women	Descriptive cross-sectional	Questionnaire	400 women	High awareness (99.50%) but low practice of BSE (52.75%) and mammography (14.50%). Major source of information: media (70%).
15	Oglat et al. (2024)	Jordan	Assess awareness of breast cancer risk factors and screening	Cross-sectional	Self-administered questionnaire	1110 women	Good knowledge of risk factors (45.58%), but misconceptions persist. High knowledge of mammography, barriers include pain.
16	Emami et al. (2021)	Iran	To investigate the beliefs, fear, and awareness about breast cancer and mammography screening practices of women in Iran.	Descriptive-correlational study	Sociodemographic questionnaire, Champion's Breast Cancer Fear Scale, Champion's Health Belief Model Scale for Mammography Screening, Breast Cancer Awareness Scale, Powe Fatalism Inventory	152 women aged 40 years and older	38.2% had a mammogram within the last 24 months. Self-efficacy, susceptibility, motivation, and lower perceived barriers were significantly associated with screening. Neither fatalistic belief nor awareness towards breast cancer was significant.
17	Mohebi et al. (2023)	Iran	To examine the level of knowledge and attitude of female high school students in Fasa regarding breast cancer screening.	Cross-sectional study	Questionnaire on knowledge and attitude	311 female high school students	87% were unaware or had incorrect information regarding breast cancer screening. Most students were aware of the risk of breast cancer but uninformed about its symptoms, risk factors, and prevention strategies. Students with a family

							history of breast cancer had higher mammography knowledge scores, though not significantly higher.
18	Kayıkçıoğlu (2023)	Turkey	Assess breast cancer awareness, risk factors, symptoms, and attitudes among economically well-off female patients	Cross-sectional	Survey	189 women	41.2% had risk awareness. Most recognized risk factors: smoking, family history. Common symptoms: palpable lumps (36.4%), redness of breast skin (16.9%). Screening methods: mammography (23.3%), ultrasonography (19%). Education and marital status influenced awareness.
19	Rahman et al. (2023)	Syria	To assess breast cancer awareness among females in the Syrian Coast	Online cross-sectional survey	Cancer Research UK questionnaire, modified	1305 female participants	Significant correlations between breast cancer awareness and smoking, family history of cancer, and marital status; 28.8% obtained information from the internet; 36.7% were smokers; 82.8% had a family history of breast cancer
20	Bohsas et al. (2023)	Syria	To investigate the knowledge of Syrian women about breast cancer risk factors, warning signs, and barriers	Online cross-sectional survey	Adapted Breast Cancer Awareness Scale (BCAM)	1336 female participants	Inadequate knowledge of breast cancer risk factors, warning signs, and barriers; Higher education levels linked to better knowledge; Only 16.4% expressed strong confidence in detecting changes in their breasts
21	Hatem, G., Ghanem, D., Kellen, E., AlZaim, I., & Goossens, M. (2021)	Lebanon	Assess knowledge and beliefs of cancer risk factors and early symptoms among Lebanese adults	Cross-sectional survey	Questionnaire (face-to-face interviews)	726 adults	High recognition of carcinogens like smoking (97.5%) but poor recognition of others such as HPV (32.6%). Financial barriers (57%) and fear of illness (53.7%) were significant obstacles to seeking care.

22	Elshami, M., Usrof, F. D., Alser, M., Al-Slaibi, I., Okshiya, H. M., Ghithan, R. J., ... & Bottcher, B. (2022)	Palestine	Assess awareness of breast cancer risk factors among Palestinian women	National cross-sectional study	Modified BC Awareness Measure (BCAM) questionnaire	5,257 women	Only 3.3% recognized age-related risk, 27.9% recognized lifetime risk of BC. Good awareness (38.4%) was higher in Gaza Strip (42%) compared to West Bank and Jerusalem (35.2%). Age ≥ 40 years and higher education were associated with better awareness.
23	Jobran, A. W., Banat, M. A., Awad, B. Y., Warasna, H. J., Taqatqa, Y. R., Jawabreh, M., ... & Salman, S. (2023)	Palestine	Assess knowledge and practice of breast self-examination among Palestinian females	Cross-sectional study	Self-administered questionnaire (online survey)	467 women	31.7% had good knowledge of BC, only 4.1% practiced BSE regularly. Major barriers included not knowing how to perform BSE and not having any breast problems.
24	Manzour, A. F., & Gamal Eldin, D. A. (2019)	Egypt	Assess knowledge, attitude, and practice regarding breast cancer and mammogram awareness	Cross-sectional study	Questionnaire	381 women (18-70 years)	Most participants had correct information about mammography but poor knowledge about risk factors. Only 8.1% were advised by doctors for mammography. Need for health education programs to improve knowledge about breast cancer and screening.
25	Orabi, E. E. E. (2024)	Egypt	Evaluate the knowledge, attitude, and practice of breast self-examination among women	Cross-sectional study	Structured questionnaire	420 females (≥20 years)	Only 24.3% had satisfactory knowledge, 27.4% had positive attitude, and 22.9% practiced BSE correctly. Higher education and professional occupation correlated with better knowledge and practice. Emphasized the need for regular health education programs and the role of mass media as a source of information.

Chapter 2 Appendix: Studies dataset sheet

	Authors (Year)	Country or Region	Study Type and Design	Instrument	Samples	Main Risk Factor Results with Statistics
1	AlHefdhi et al. (2024)	Saudi Arabia	Cross-sectional study	Mammography and ultrasound	331 women	Past surgical history, past radiotherapy/chemotherapy, maternal problems during pregnancy, breast complaints, lifestyle factors, reproductive and hormonal factors, genetic factors, higher socioeconomic status, medical history.
2	Mjali et al. (2021)	Iraq	Retrospective, descriptive study	Questionnaire and clinical data	101 female patients	Lack of physical activity (74.26%), breastfeeding (< 6 months) (30.69%), low vegetable intake (< 3 times/week) (26.73%), obesity (25.74%), high fat diet (> 3 times/week) (23.76%), oral contraceptive use (20.79%), and other factors.
3	Abdelaleem et al. (2021)	Egypt	Case-control study	Quantitative real-time PCR (RT-qPCR)	151 BC patients, 139 FA patients, 143 controls	Significant association between rs1859168 CC genotype, C allele, and increased risk of BC. HOTTIP upregulated and miR-615-3p downregulated in BC patients.
4	El-Toukhy et al. (2023)	Egypt	Comparative study	qRT-PCR, LC/MS/MS, ELISA	30 BC patients, 30 benign patients, 20 controls	Lower levels of miRNA-145, miRNA-382, and higher levels of miRNA-21 in BC sera. Elevated glutamic acid and HER2 levels in BC patients. High sensitivity and specificity in early BC prediction.
5	Abdel-Razeq et al. (2021)	Jordan	Cross-sectional study	Genetic testing	149 young BC patients	Significant prevalence of BRCA1 and BRCA2 mutations among young patients. Associated factors

						include family history, triple-negative breast cancer, and high-grade tumors.
6	Omran MH, Fotouh BE, Shousha WG, Ismail A, Ibrahim NE, Ramadan SS. (2021)	Egypt	Case-control study	Genotyping of MTHFR polymorphisms C677T (rs1801133) and A1298C (rs1801131) using Restriction Fragment Length Polymorphisms (RFLP) and Sequencing assays	100 Egyptian females with breast cancer and 60 healthy matched controls	Strong significant association between MTHFR polymorphisms and breast cancer susceptibility; P-value (0.001)
7	Hussein O, El-Ghitany EM, Omran M, et al. (2021)	Egypt	Retrospective study	Anti-HCV serology using third-generation enzyme-linked immunosorbent assay (ELISA)	405 breast cancer patients	High prevalence of anti-HCV seropositivity in young breast cancer patients; 13.4% in patients younger than 45 years; P = 0.003
8	AbdelHamid, S. G., Zekri, A.-R. N., AbdelAziz, H. M., & El-Mesallamy, H. O. (2021)	Egypt	Mutational screening	High Resolution Melting analysis followed by direct sequencing	103 Egyptian female breast cancer patients	8 pathogenic variants, 1 likely pathogenic and 11 variants of unknown significance identified; 28.15% mutation prevalence
9	Ismail HM, Mokhtar S, El-Mansy H. (2021)	Egypt	Cross-sectional study	Structured interviewing questionnaire, clinical characteristics from medical records	400 women with pathologically confirmed BC	47.5% diagnosed at late stages; significant risk factors include unmarried females (p=0.012), non-luminal molecular subtypes (p<0.001), non-palpable lumps or non-breast symptoms (p=0.024, p=0.002), patient delay >3 months (p<0.001), provider delay >1 month (p<0.001)

10	Saleh B, Elhawary MA, Mohamed ME, et al. (2021)	Egypt	Cross-sectional study	Modified Gail model risk assessment	7009 women from urban and rural areas across 40% of Egyptian provinces	Mean 5-year risk: 0.86 (±0.67), mean lifetime risk: 11.26 (±5.7); significant associations with marital status, method of feeding, physical activity, contraceptive use, menopause, and number of children
11	Kamal RM, Mostafa S, Salem D, et al. (2022)	Egypt	Population-based screening program	BMI and BD measurements, 2013 ACR BI-RADS breast density classification, WHO BMI classification	30,443 screened females	Significant difference between mean BMI in cancer and non-cancer groups (p: .027); positive insignificant correlation between BD and risk of BC in premenopausal group (OR: 1.062, p: .919), negative significant correlation in postmenopausal group (OR: 0.234, p < .001)
12	Al-Shamsi, H. O., Abdelwahed, N., Abyad, A., Abu-Gheida, I., Afrit, M., Abu ElFuol, T., et al. (2023)	Arabian Gulf Countries	Literature review	Review of epidemiological studies, national cancer registries, and systematic reviews	Multiple sources including GLOBOCAN, national cancer registries, PubMed/Medline, Google Scholar, ASCO, ESMO	Consistent increase in BC incidence attributed to Westernized lifestyle, screening uptake, data collection improvements. BC characteristics: early onset (<50), advanced stage, higher pathological grade, aggressive features (HER2+ or TN). UAE 2-year and 5-year survival rates: 97% and 89%, respectively; Saudi Arabia 5-year survival rate: 72%.
13	Abulkhair, O., & El Saghir, N. S. (2021)	Middle East	Snapshot of BRCA studies	Review of BRCA studies in Arab countries	Various	Prevalence of BRCA mutations in high-risk hereditary BC patients varied from 5.6% to 20% across different Arab countries. Family history emerged as a strong predictor for BRCA gene mutations.
14	Kulhánová, I., Znaor, A., Shield, K. D., Arnold, M.,	Eastern Mediterranean Region	Quantitative assessment	Prevalence data from WHO, IARC, FAO, and meta-analyses	22 countries in the Eastern Mediterranean Region	33% of new cancer cases in adults aged 30+ attributable to modifiable risk factors. Infections and smoking major contributors among

	Vignat, J., Charafeddine, M., et al. (2020)					men; insufficient physical activity and infections among women.
15	Alharmoodi, F., Al Ameri, M. A., Alblooshi, M., Shanbhag, N. M., Almheiri, M. H., & Sumaida, A. B. (2024)	United Arab Emirates	Retrospective cohort study	Anonymized medical records	131 breast cancer patients	No significant correlation between diabetes and breast cancer stages (χ^2 = 3.07, p = 0.381). Stage II most frequently diagnosed.
16	Al-Jawaldeh, A., & Abbass, M. M. (2022)	Eastern Mediterranean Region	Review	Various sources (Global health observatory, nutrition surveys, etc.)	Population data from 22 EMR countries	Significant increase in obesity, diabetes, hypertension, high fasting blood glucose. UAE and Jordan showed the highest increases in risk factors.
17	Hashim, H. T., Ramadhan, M. A., Theban, K. M., Bchara, J., El-Abed-El-Rassoul, A., & Shah, J. (2021)	Iraq	Cross-sectional study	Gail Model, self-administered questionnaire	1093 Iraqi women	Mean 5-year risk: 1.3, lifetime risk: 13.4. High risk in Baghdad, Dhi Qar, Maysan, Nineveh.
18	Lakkis, N. A. et al. (2024)	Lebanon	Epidemiological study, cohort design	Lebanese National Cancer Registry data (2005-2016)	Female population in Lebanon	Bca ASIRw increased significantly from 71.0 in 2005 to 115.6 in 2013 (P < .05), then decreased to 96.8 in 2016. High ASIRw among women aged 35-54. Bca ASIRw in Lebanon is comparable to developed countries.

19	Shamshirian, A. et al. (2020)	Iran	Systematic review and meta-analysis	PubMed, Scopus, Web of Science, Persian databases	39 studies included	Family history (OR: 1.80), HRT (OR: 5.48), passive smoking (OR: 1.68), full-term pregnancy at age 30 (OR: 3.41), abortion (OR: 1.84), sweets consumption (OR: 1.71), and genotype Arg/Arg (OR: 1.59). Protective factors: late menarche (OR: 0.58), nulliparity (OR: 0.68), 13-24 months breastfeeding (OR: 0.68), daily exercise (OR: 0.59), and vegetable consumption (OR: 0.28).
20	Safiri, S. et al. (2022)	Middle East and North Africa (MENA)	Descriptive study using secondary data	Global Burden of Disease (GBD) 2019 study data	Female population in MENA (1990-2019)	Age-standardized incidence rate in 2019 was 37.5 per 100,000 (90.9% increase since 1990). Death rate: 15.2 per 100,000 (24.0% increase since 1990). DALY rate in 2019: 472.7 per 100,000 (19.5% increase since 1990). High fasting plasma glucose contributed 6.9% to the attributable DALYs.
21	Babiker, S. et al. (2020)	Saudi Arabia	Prospective study; Logistic regression analysis	Questionnaire and patient records	135 cases, 270 controls	Significant risk factors: age, marital status, family history, parity, age at first full-term pregnancy, menopausal status, BMI, and breastfeeding. Higher risk in women aged 41-50, married, BMI > 30, fewer children, not breastfeeding, first pregnancy ≥30, menopausal status 46-50. Protective factors: lower BMI, more children, breastfeeding. Chi-square and P-values indicate significant differences (e.g., $\chi 2 = 18.968$, $P < 0.001$ for age group).

22	El Sharif, N., & Khatib, I. (2021)	Palestine	Case-control study	Structured questionnaire	237 cases, 237 controls	Significant risk factors: early menarche, use of oral contraceptives and HRT, nulliparity, parental consanguinity, positive family history. Protective factors: breastfeeding, more children. Higher risk associated with late menarche (≥13 years), use of HRT, and parental consanguinity. Adjusted Odds Ratio (AOR) = 2.03, 95% CI: 1.21–4.37 for menarche after 13 years; AOR = 5.02, 95% CI: 1.93–13.06 for HRT use.
23	Elobaid, Y., Aamir, M., Grivna, M., Suliman, A., Attoub, S., Mousa, H., ... & Oulhaj, A. (2021)	United Arab Emirates	Retrospective cohort study	Patient records and follow-up	988 patients	2-year survival: 97%, 5-year survival: 89%. Significant prognostic factors: tumor grade and stage of cancer at presentation. No significant effect of age at diagnosis or treatment delay on survival. Higher 5-year survival for tumor grade I (99%) compared to grade III (85%). Hazard Ratio (HR) for grade III vs. grade I: 10.24; HR for stage 3 vs. stage 1: 4.85.
24	El Haidari, R., Abbas, L. A., Nerich, V., & Anota, A. (2020)	Middle East	Systematic review	Various QoL instruments (e.g., EORTC QLQ-C30, FACT-B)	33 studies, 8764 women	Socio-demographic factors, clinical factors, treatment-related factors, behavioral factors, and psychosocial factors affect HRQoL. Inconsistent results on age. Higher education, employment, and having children are associated with better HRQoL. Chemotherapy negatively influences HRQoL, whereas hormone therapy and breast reconstruction

						surgery positively influence HRQoL.
25	Azadnajafabad, S., Saeedi Moghaddam, S., Mohammadi, E., Rezaei, N., Rashidi, M. M., Rezaei, N., & GBD 2019 NAME Breast Cancer Collaborators. (2023)	North Africa and Middle East (NAME)	Systematic analysis for GBD Study 2019	GBD 2019 database	21 countries	In 2019, 835,576 female and 10,938 male prevalent cases of BC. Major contributor to BC incidence increase is the increase in age-specific incidence rates. High fasting plasma glucose is the most significant risk factor. High burden in years of life lost (YLLs).
26	Arafat, H. M., Omar, J., Muhamad, R., Al-Astani, T. A. D., Shafii, N., Al Laham, N. A., & Jebril, M. A. A. R. (2021)	Palestine	Systematic review and meta-analysis	Various questionnaires	7 case-control studies, 2032 participants	Diabetes mellitus (OR = 4.97), hypertension (OR = 3.21), obesity (OR = 2.90), passive smoking (OR = 1.50). Breastfeeding is protective (OR = 0.37). Non-modifiable factors: reached menopause (OR = 3.74), family history of BC (OR = 2.63), age ≥40 years (OR = 2.49).
27	Abu-Helalah, M., Azab, B., Mubaidin, R., Ali, D., Jafar, H., Alshraideh, H., & Awidi, A. (2020)	Jordan	Cross-sectional study	NGS/Ion PGM System, Sanger sequencing	200 patients (192 BC, 8 ovarian)	18% prevalence of BRCA1/BRCA2 mutations. Two novel pathogenic mutations identified in BRCA2. Higher prevalence of mutations compared to neighboring regions. Positive patients diagnosed at advanced stages, indicating preventable delays in diagnosis.

28	Sasanfar, B., Toorang, F., Maleki, F., Esmaillzadeh, A., & Zendehdel, K. (2021)	Iran	Hospital-based case–control study	168-item validated FFQ, FRAP assay	412 women with breast cancer, 456 controls	Inverse association between dTAC and breast cancer: OR=0.61 (95% CI: 0.38, 0.99, P<0.05); stronger in postmenopausal women: OR=0.28 (95% CI: 0.11, 0.72, P<0.05)
29	Zamzam, S., Said, S., Yaghi, J., Faisal, F. S., Hassan, D., Abdul Majeed, S., & Tayyem, R. (2024)	Middle East	Scoping review	PubMed, ProQuest, Cochrane databases	Various studies from 2000 to 2023	Mediterranean, Plant-based, DASH diets associated with decreased BC risk; Western, unhealthy diets associated with increased BC risk
30	Tanner, L. T. A., & Cheung, K. L. (2020)	Gulf Cooperation Council (GCC)	Systematic review	MEDLINE, Web of Science, PubMed	17 studies on obesity and physical inactivity	High prevalence of obesity (up to 45.6% in Kuwait) and physical inactivity (up to 74.6% in Kuwait); mixed results on BC risk association, one study found OR=2.29

Chapter 4: Studies dataset sheet

	Reference	Country	Design	Study Type	Sampling and Sample Size	Instruments	Main Findings with Statistics
1	• (Al-Shanableh et al., 2024)	Jordan	Cross-sectional design	Secondary analysis	Convenience sample of 200 women undergoing breast cancer treatment	The Quality of Life Instrument–Breast Cancer Patient Version (QOL-BC) questionnaire, consisting of 46 items focusing on physical, psychological, social, and spiritual QoL, with responses on a scale from 0 (highest QoL) to 10 (lowest QoL) using a visual analogue scale	**Physical Well-being:** Pain (weight = 0.7), fatigue (weight = 0.6), changes in appetite (weight = 0.6), sleep (weight = 0.6), appearance (weight = 0.6), weight (weight = 0.6), overall physical health (weight = 0.6). **Psychological Well-being:** Fear of metastasis (weight = 0.7), fear of recurrence (weight = 0.7), fear of future diagnostic tests (weight = 0.7), coping with breast cancer treatment (weight = 0.7), presence of anxiety (weight = 0.6), effect of cancer on household activity (weight = 0.6), overall physical well-being (weight = 0.6). **Social Well-being:** Impact of cancer on relationships (weight = 0.7), household activity (weight = 0.6), financial burden (weight = 0.6), feelings of depression

							(weight = 0.5), feeling isolated (weight = 0.6), effects of cancer on sexuality (weight = 0.5). **Spiritual Well-being:** Feeling of purpose in life (weight = 0.7), feeling hopeful (weight = 0.7), feeling of uncertainty (weight = 0.7).
2	• (Al-Sharman et al., 2024)	Jordan	Cross-sectional	Quantitative	Convenience sample of 188 women with breast cancer	Quality of Life Index-Cancer (QLI-c), Pittsburgh Sleep Quality Index (PSQI), Female Sexual Function Index (FSFI), Modified Fatigue Impact Scale (MFIS), Hospital Anxiety and Depression Scale (HADS), International Physical Activity Questionnaire (IPAQ)	**Positive Correlations:** Monthly income (r = 0.17, p = 0.016) with QoL. **Negative Correlations:** Disease stage (r = -0.221, p = 0.002) and duration since first diagnosis (r = -0.280, p = 0.004) with QoL. Poor sleep quality, sexual dysfunction, fatigue, depression, and anxiety had significant negative correlations with QoL (p < 0.01). **Regression Analysis:** Sexual dysfunction, poor sleep quality, depression, and anxiety were significant predictors of QoL (p ≤ 0.05). Mean scores: QLI-c (20.22 ± 4.33), PSQI (8.16 ±

							4.62), FSFI (10.9 ± 10.01), MFIS (39.92 ± 17.74), HADS-Depression (7.88 ± 4.4), HADS-Anxiety (7.7 ± 4.2).
3	• (Albusoul et al., 2024)	Jordan	Cross-sectional	Quantitative	Convenience sample of 142 women with breast cancer	Memorial Symptom Assessment Scale (MSAS), Functional Assessment of Chronic Illness Therapy-Spiritual Well-being (FACIT-Sp) scale, and socio-demographic questionnaire	**Most Prevalent Symptoms:** Fatigue, anxiety, tension, and pain (prevalence > 50%). **Symptom Clusters Identified:** 1. Treatment-related (8 symptoms) 2. Gastrointestinal (7 symptoms) 3. Psychological (5 symptoms) **Predictors of Spiritual Well-being:** Psychological symptom cluster ($t(141) = -3.049$; $p < 0.01$). **Regression Analysis:** Psychological SC and complementary therapy use explained 15.5% of variance in spiritual well-being ($R = 0.393$; $R^2 = 0.155$; $F = 3.020$; $p < 0.01$).

4	• (Kashtpour et al., 2024)	Iran	Cross-sectional descriptive-analytical	Quantitative	Simple random sampling of 267 nonmetastatic breast cancer patients	EORTC Core Quality of Life questionnaire (EORTC QLQ-C30)	**Correlation Coefficient:** Age (r = -0.281, P < 0.001). **Significant Differences in QoL Scores:** - Stage T groups (P = 0.007) - Family history of the disease (P = 0.006) **Non-significant Differences in QoL Scores:** - Education level (P = 0.605) - Occupational groups (P = 0.096) - Marital status (P = 0.442) **Symptom Impact on QoL:** - Sleep disturbances (P = 0.004) - Arm pain (P = 0.005) - Constitutional symptoms (P = 0.020) **Highest QoL Score:** Emotional functioning. **Lowest QoL Scores:** Cognitive function and role play. **Key Factors Affecting QoL:** Age and severity of fatigue.
5	• (Muliira, Kizza, &	Oman	Descriptive cross-sectional	Quantitative	Convenience sample of 165 family caregivers (FCGs) of adult	Measures of caregiver reaction, knowledge	**QoL Score:** Low (58.44 ± 17.95). **Impact on QoL:**

	Al-Kindi, 2022)				patients with cancer pain	about cancer pain, self-efficacy for cancer pain and other symptom management, QoL, and patient functional status	Support and positive adaptation (55.2%). **Associated Factors with Low QoL:** - Low self-rated health - Low confidence in controlling patient's pain - Low self-efficacy - High perceived distress due to patient pain - High impact of caregiving on physical health **Significant Predictors of Overall QoL:** - Level of caregiver distress due to patient's pain ($p < 0.01$) - Patient's functional status ($p < 0.01$) - Perceived impact of caregiving on health ($p < 0.05$). **Conclusion:** Enhancing skills and self-efficacy in cancer pain and symptom management, along with health promotion programs, can improve the QoL of Omani family caregivers.

6	• (Al-Marzouqi, Al-Suraihi, & Al-Dhoani, 2023)	Oman	Descriptive cross-sectional	Qualitative	Purposive sampling of 20 women with breast cancer	Interviews, reflective records, socio-demographic questionnaire	**Main Themes Identified:** "Knowing Breast Cancer" and "Being a Woman with Breast Cancer". **Awareness of Breast Cancer:** 60% lacked knowledge of risk factors and warning signs. **Breast Self-Examination (BSE):** 80% understood its importance but did not practice it regularly. **Support Systems:** 90% received family support; 95% felt healthcare professionals were unsupportive. **Psychological Impact:** High levels of anxiety and worry about health and work. **Statistical Analysis:** Not applicable due to qualitative nature of the study.
7	• (Civelek, Akinci, & Dalyan, 2022)	Turkey	Cross-sectional	Descriptive	111 women with BCRL	Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale, Beck Depression Questionnaire, Lymphedema Quality of Life Questionnaire-arm	**Main Findings:** - 58.6% had sleep disturbances. - 29.7% had depression. - Sleep disturbances and depression associated with older age ($p < 0.001$). - Sleep disturbance

							linked with higher day-time sleepiness and worse QOL (p < 0.001). - Higher BMI correlated with lower QOL (p < 0.001). - Depression correlated with worse QOL scores (p < 0.001). **Statistical Analysis:** - Descriptive statistics - Pearson and Spearman correlation analyses - p-values for significant findings: p < 0.05.
8	• (Emre & Yılmaz, 2022)	Turkey	Cross-sectional	Comparative	125 patients with breast cancer, 125 healthy controls	Sleep quality subscale, anxiety and depression scales, QOL questionnaire	**Main Findings:** - 60.8% of breast cancer patients had poor sleep quality. - Higher anxiety and depression scores in breast cancer patients compared to controls (p < 0.05). - Lower QOL (physical subcomponent) in breast cancer patients compared to controls (p < 0.05). - Low income, chronic diseases, anxiety, and depression increased the risk of poor sleep quality (p < 0.05). **Statistical**

							Analysis: - Descriptive statistics - Comparative analysis with control group - p-values for significant findings: $p < 0.05$.
9	• (Yücel et al., 2023)	Turkey	Cross-sectional	Descriptive	400 cancer patients receiving chemotherapy	Comprehensive Score for Financial Toxicity (COST), Patient Health Questionnaire for Depression and Anxiety (PHQ-4), Functional Assessment of Cancer Therapy-General (FACT-G)	**Main Findings:** - Median COST score: 22 (SD = 10.1; range: 1–44). - Financial toxicity correlated with lower education level ($p < 0.001$), lower monthly income ($p < 0.001$), being a woman ($p = 0.021$), living in another city ($p = 0.012$), and previous cancer surgery ($p = 0.02$). - Negative correlation between financial toxicity and quality of life ($r = −0.139$; $p = 0.005$). - Negative correlation between financial toxicity and psychological distress ($r = −0.398$; $p < 0.001$).

10	• (Karabulut et al., 2023)	Turkey	Cross-sectional	Descriptive	329 breast cancer patients post-surgery	Sociodemographic Information Form, Beck Depression and Anxiety Scale, Arizona Sexual Experiences Scale	**Main Findings:** - 33.1% experienced moderate to severe depression. - 18.2% reported severe anxiety. - 82.7% scored above 11 on the sexual scale. - Factors linked to higher scores: mastectomy, surgical dissatisfaction, insufficient information on sexual side effects, smoking, diabetes. - Depression (P: .004), sexual scores (P: .008) higher in patients over 42. - No significant association between age and anxiety (P value: .6). - Low education linked to higher sexual scores (P: .032). - Mastectomy linked to higher depression (P: .01), anxiety (P: .004), and sexual scores (P: .00).
11	• (Elsous et al., 2023)	Palestine	Cross-sectional	Mixed-method	352 females (quantitative) and 25 semi-structured interviews (qualitative)	Supportive Care Needs Survey (34 items), EORTC QLQ-C15-PAL	**Main Findings:** - Highest unmet needs: psychological (63%), health-related systems and information (62%), physical and daily life

							(61%). - Most reported symptoms: pain (65.8%), fatigue (62.5%), emotional distress (55.8%), physical function (54.3%), physical symptoms (51.5%). - Unmet needs high among married females, those on conservative treatments, young females (< 40 years), and in the first year of diagnosis. - Chronic diseases did not increase needs but affected health-related quality of life. - Six qualitative themes: availability of anticancer therapy, affordability of healthcare, family and social support, psychological support, health education, self-image & intimate relationship.
12	• (Alagizy et al., 2020)	Egypt	Cross-sectional	Analytical	64 female breast cancer patients	Socio-demographic questionnaire, Structured Clinical Interview for DSM-IV (SCID I), Beck Depression Inventory (BDI-	**Prevalence:** - Depression: 68.6% - Anxiety: 73.3% - Perceived Stress: 78.1% **Associated Factors:** -

						II), Manifest Anxiety Scale, Perceived Stress Scale (PSS-10)	Higher prevalence of moderate to severe anxiety among unemployed patients (100%) compared to employed patients (p = 0.003) - Higher prevalence of moderate to severe depression and stress among married patients, rural residents, illiterate, and those with unsatisfactory income, though not statistically significant. - Advanced disease stage patients had higher prevalence of moderate to severe anxiety (73.8%), depression (68.2%), and stress (64%).
13	• (El Sayed et al., 2021)	Egypt	Cross-sectional	Descriptive quantitative	125 female breast cancer survivors	EQ-5D-3L questionnaire, TNM classification	**Quality of Life Impacts:** - Pain: 92.8% - Anxiety: 84% - Limitation in usual activity: 81.6% - Limitation in mobility: 70.4% - Limitation in self-care: 56.8% **Associated Factors:** - Younger patients (≤50 years)

							experienced more anxiety than older patients (>50 years) ($p < 0.05$). - Low social standard was associated with lower general health scores on the EQ-VAS ($p < 0.05$). - Late-stage cancer patients reported more problems with mobility, self-care, and anxiety than early-stage patients ($p < 0.05$).
14	• (Soqia et al., 2022)	Syria	Cross-sectional	Descriptive quantitative	500 breast cancer patients	PHQ-2 (Patient Health Questionnaire-2), GAD-2 (Generalized Anxiety Disorder-2)	**Prevalence of Psychological Distress:** - Generalized Anxiety Disorder (GAD-2 score ≥ 3.00): 35.6% - Major Depressive Disorder (PHQ-2 score ≥ 3.00): 35% **Associated Factors:** - Age: Significant negative relationship with GAD-2 and PHQ-2 scores (older patients had lower scores). - Social Status: Widowed and divorced women had a stronger association with higher PHQ-2 scores compared to single women. - Younger

							patients (age ≤ 45 years) showed higher levels of both depression and anxiety ($p < 0.05$).
15	• (El Haidari et al., 2020)	Middle East (15 countries)	Systematic Review	Cross-sectional and longitudinal studies	33 studies, 5735 participants	Various HRQoL instruments including EORTC QLQ-C30, FACT-B, SF-36, etc.	**Factors affecting HRQoL:** - **Socio-Demographic:** Age, marital status, education level, employment status, income, having children. - **Clinical:** Cancer stage, time since diagnosis, menopausal status, symptom scores (pain, fatigue, dyspnea). - **Treatment-Related:** Chemotherapy, hormone therapy, breast reconstruction surgery. - **Behavioral:** Physical activity, nutritional status, body weight, positive body image, religiosity, spiritual well-being. - **Psychosocial:** Depression, anxiety, self-efficacy, self-regulation, sense of coherence.

16	• (Almutairi et al., 2020)	Saudi Arabia	Cross-sectional	Observational	Convenience sampling, 393 cancer patients	Hospital Anxiety and Depression Scale (HADS), Assessment of Quality of Life (AQOL-6D)	28.9% had depression, 13.7% had anxiety. Low QoL in 51.1% of patients, low independent lifestyle in 56.7%, low psychological coping in 60.5%, high pain occurrence in 52.9%. Correlations: Younger age (<30) showed higher anxiety and depression (P = 0.034), lymphoma (P = 0.021) and ovarian cancer (P = 0.039) showed higher anxiety and depression, divorced patients showed higher anxiety and depression (P = 0.004), no education or bachelor's degree associated with higher anxiety and depression (P = 0.000 and P = 0.002), needing a caregiver associated with higher anxiety and depression (P = 0.000).
17	• (Aadoon, 2020)	Egypt	Descriptive	Observational	Convenience sampling, 130 breast cancer women	Interview schedule, Quality of Life Scale (EORTC QLQ-C30), Breast cancer (EORTC QLQ- BR23) Scale	Positive relationship between QoL and age, marital status, education, and income. No significant differences between QoL and residence,

							occupation. Significant differences in QoL among different age groups (p=0.001), marital status (p=0.001), and education levels (p=0.001). Higher symptoms scores for fatigue, pain, nausea, and vomiting. Higher mean scores for physical and emotional functioning.
18	• (El Haidari et al., 2023)	Lebanon	Prospective Cohort	Observational	120 newly diagnosed breast cancer patients	EORTC QLQ-C30, QLQ-BR23	Significant decrease in body image (mean difference: 8.1 points, 95% CI: 4.3;11.1), physical functioning (mean difference: 6.1 points, 95% CI: 3.3;8.5), and emotional functioning (mean difference: -8.4 points, 95% CI: -12.4; -4.9) post-surgery. Positive change in physical functioning among married women, and positive change in emotional functioning among patients with poor body image score and high future perspective score.

19	• (El Haidari et al., 2021)	Lebanon	Prospective Cohort	Observational	120 newly diagnosed breast cancer patients	EORTC QLQ-C30, QLQ-BR23, MFI-20, LOT, EQ-5D-5L	The study aims to evaluate HRQoL changes pre- and post-BCS, focusing on body image, fatigue, optimism, and pessimism. Primary outcomes include changes in body image, HRQoL, fatigue, and optimism/pessimism pre- and post-BCS. Secondary outcomes include sociodemographic and clinical factors associated with changes in HRQoL. Results are pending publication.
20	• (Faroughi, Fathnezhad-Kazemi, & Sarbakhsh, 2023)	Iran	Cross-sectional	Descriptive-analytical	218 patients from Valiasr International Hospital, Tabriz	SF-12, Connor-Davidson Resilience Scale (CD-RISC), Hope Scale, Multidimensional Perceived Social Support Scale (MSPs)	Path analysis showed that age and psychosocial factors, especially social support, predicted health-related quality of life (HRQoL). Social support had both direct and indirect effects on HRQoL through resilience and hope. Resilience was significantly associated with HRQoL (adjusted R2 = 0.34 for HRQoL). The model had good fit indices (Chi2/df = 2.08,

							RMSEA = 0.014, GFI = 0.99, CFI = 0.99, IFI = 1).
21	• (Shorofi et al., 2020)	Iran	Cross-sectional	Descriptive-analytical	120 women with non-metastatic unilateral breast cancer	Beck Depression Inventory-II (BDI-II), Pittsburgh Sleep Quality Index (PSQI)	Mean BDI-II score was 13.40 (± 6.51), with 30% having mild depression and 14.2% moderate-to-severe depression. Mean global PSQI score was 6.48 (± 2.62), with 50.8% scoring 5 or greater, indicating poor sleep quality. Positive correlation found between depression scores and sleep quality scores ($p=0.001$, $r=0.48$). Depression correlated with age, number of children, household gross income, sleep duration, sleep latency, and type of mastectomy procedure ($p<0.05$). Subjective sleep quality correlated with number of chemotherapy sessions ($p=0.001$, $r=-0.67$) and daytime dysfunction ($p=0.001$, $r=0.78$). Positive correlation between sleep

							disturbances and habitual sleep efficiency (p=0.02, r=0.65).
22	• (Isfahani, Arefy, & Shamsaii, 2020)	Iran	Meta-analysis	Analytical	13 articles selected from seven electronic databases	Comprehensive Meta-Analysis software	Overall prevalence of severe depression in Iranian women with breast cancer was 11% (95% CI [7.2, 16.5]). Highest prevalence was 44% in Tehran City in 2015 (95% CI [31, 57.9]), and lowest prevalence was 0.8% in Qom City in 2017 (95% CI [0.01, 6.2]). Significant statistical correlation between prevalence of severe depression and sample size (p<0.05).
23	• (Al-Habsi, Al-Noumani, & Al Hashmi, 2022)	Oman	Cross-sectional	Descriptive/ Analytical	Convenience sampling of 275 participants	Pittsburgh Sleep Quality Index, Brief Fatigue Inventory, Functional Assessment of Cancer Therapy	64% of participants reported poor sleep and 18.5% reported severe cancer-related fatigue. Younger patients with good sleep quality, less cancer-related fatigue, and those with prostate and thyroid cancer demonstrated better HRQoL [F(5, 269) = 26.26, p <

							0.000]. The model explained 33% of the variances in HRQoL (R2 = .328).
24	• (Saleh & Narjes, 2021)	Iraq	Cross-sectional	Descriptive/ Analytical	Convenience sampling of 275 participants	EORTC QLQ-C30 and QLQ-BR23	The mean score for global QoL was 52.39 ± 17.1, indicating an average score. The most important predictors of global QoL were physical, role, cognitive, and sexual functions, future perspective, and arm symptoms. Role function, physical function, and cognitive function were significant predictors. Emotional, cognitive, and social functioning scored the lowest. The worst symptom scales were insomnia, pain, fatigue, appetite loss, and dyspnea. The mean score for the financial impact was high (82.7 ± 32.7). The study highlights the importance of addressing physical, emotional, and social factors to improve QoL.

25	• (Mahmood & Amen, 2021)	Iraq	Cross-sectional	Descriptive/ Analytical	Convenience sampling of 342 participants	EORTC QLQ-C30, EORTC QLQ-BR23, and Multidimensional Scale of Perceived Social Support	Participants' mean age was 42.65 ± 7.71. The total social support score was 52.68 ± 20.09 on a scale of 12 to 84, with about half (47.4%) receiving it moderately. The family was the highest source of social support (19.89 ± 7.80). The global health state score was 68.52 ± 19.80. The emotional function was the most affected functional subscale (52.10 ± 29.60). The financial deficit (55.95 ± 33.07) was the most disruptive symptom, followed by fatigue (43.60 ± 21.16). Sexual function (32.99 ± 28.79) was the most impaired aspect among breast cancer-specific functions, and hair loss (59.84 ± 41.37) was the most reported symptom. Perceived social support is significantly associated with and correlated to participants' quality of life ($p < 0.05$).

26	• (Daher et al., 2021)	Iraq	Cross-sectional	Descriptive/ Analytical	Systematic random sampling of 263 participants	Newly developed Impact of Breast Cancer Questionnaire	The highest negative impact was on happiness (74.49%), followed by the ability to focus on daily tasks (63.97%), sleep (57.89%), and carrying out house chores (53.04%). There was a high percentage of observed agreement between the calculated breast cancer impact and the perceived overall negative impact assessed by direct questioning. Global QoL mean score was 52.39 ± 17.1, indicating an average scale score. Significant predictors of global QoL were physical, role, cognitive, and sexual functions, future perspective, and arm symptoms.
27	• (Al-Karni et al., 2024)	Saudi Arabia	Cross-sectional	Descriptive/ Analytical	147 participants	36-item Short Form Health Survey (SF-36)	The physical component scale showed that general health scored the highest (55.41±17.99) while role physical function scored the lowest (48.61±22.51). In the mental component, social function scored the

							highest (56.91±20.84) and energy and vitality the lowest (49.62±20.84). Older age, mastectomy, comorbid conditions, chemotherapy, and hormonal therapy were associated with decreased HRQOL. Physical activity, employment, and higher education were associated with higher HRQOL. HRQOL is generally poor among breast cancer survivors in Saudi Arabia.
28	• (Elamin et al., 2024)	Saudi Arabia	Cross-sectional	Descriptive/ Analytical	56 participants	Pittsburgh Sleep Quality Index (PSQI), DASS-21, IPAQ	Poor sleep quality was present in 58% of respondents. Depression, anxiety, and stress were found in 34%, 32%, and 30% of women, respectively. Poor sleep quality was associated with depression ($p = 0.031$), anxiety ($p = 0.03$), and stress ($p = 0.024$) and was independently associated with hot flashes. In multivariate analysis, patients with depression or with cancer for more than 6 months were

							less likely to have good sleep after controlling other variables (21.74 and 14.71 times, respectively). Early identification and management of psychological and sleep disorders are necessary to improve the quality of life and survival of breast cancer patients.
29	• (AlJaffar et al., 2024)	Saudi Arabia	Cross-sectional	Analytical	276 cancer patients attending oncology outpatient clinics	EORTC QLQ-C30, various psychosocial scales	QoL was poorer among females ($p = 0.001$), those who visited a psychiatrist ($p = 0.028$), were on psychiatric medications ($p = 0.022$), and experienced anxiety ($p < 0.001$), depression ($p < 0.001$), and distress ($p < 0.001$). The most common self-treatment was Islamic Ruqya (48.6%), and the perceived cause of cancer was the evil eye or magic (28.6%). Good QoL was associated with biological treatment ($p = 0.034$) and satisfaction with healthcare ($p = 0.001$). Female sex, depression, and dissatisfaction

							with healthcare were independent predictors of poor QoL. Recommendations include enhancing social services and larger multicenter longitudinal studies.
30	• (Omar et al., 2024)	Saudi Arabia	Cross-sectional	Analytical	147 breast cancer survivors	SF-36 Health Survey	For the physical component scale, general health scored the highest (55.41 ± 17.99) while role physical function scored the lowest (48.61 ± 22.51). In the mental component, social function scored the highest (56.91 ± 20.84), and energy and vitality scored the lowest (49.62 ± 20.84). Older age, mastectomy, comorbid conditions, chemotherapy, and hormonal therapy were associated with decreased HRQOL. Being physically active, employed, and having higher education were associated with higher HRQOL. Recommendations include routine QOL assessments and targeted interventions to

							improve HRQOL among breast cancer survivors.
31	• (Smail et al., 2023)	UAE	Cross-sectional	Population-based	250 Emirati women with breast cancer	EORTC QLQ-C30 (v.3.0), EORTC QLQ-BR23	Emirati BC survivors reported good overall QoL. The most bothersome symptoms included sleep disturbance, fatigue, pain, hair loss, and arm symptoms. Average scores on all functional scales indicated mediocre functioning, while high scores on symptom scales indicated worse symptoms. Factors associated with a decline in QoL domains included higher age, lower income, history of metastases, mastectomy, and lymph node dissection. Findings emphasize the need for targeted interventions to improve specific QoL aspects in BC survivorship.
32	• (Aamir et al., 2022)	UAE	Qualitative	In-depth interviews	10 breast cancer survivors using semi-structured interviews	Thematic analysis	The study identified three major themes: (1) survivors' living experience with breast cancer,

							(2) concerns of breast cancer survivors, and (3) survivors' expectations of healthcare delivery or support needed. The findings highlighted that the psychosocial concerns of breast cancer survivors are not well understood and addressed by healthcare providers. The experiences, concerns, and expectations vary among individuals and throughout the survivorship continuum. Understanding these unmet psychosocial needs is crucial for designing structured survivorship programs and providing timely, effective interventions to improve patient-centred care in the UAE.
33	• (Narayanan, Awadallah, & Krishnasamy, 2023)	Bahrain	Cross-sectional	Descriptive	Purposive sampling; 60 women with breast cancer (stage I, II, or IIIa)	Quality of Life (QOL) questionnaire - Breast Cancer Version by National Medical Center & Beckman Research institute	42 (70%) participants had average QOL, 18 (30%) had poor QOL. Mean scores: Physical wellbeing (38.47), Psychological wellbeing (60.58), Social wellbeing (38.10), Spiritual wellbeing

							(38.58). Significant associations were found between QOL and residence, occupation ($p<0.05$), period and stages of cancer ($p<0.05$), and type of treatment ($p<0.01$). The study highlights the impact of breast cancer on women's QOL and the need for targeted health promotion and counseling interventions.
34	• (Hassan et al., 2023)	Qatar	Cross-sectional	Descriptive	300 patients: 100 at initial diagnosis, 100 undergoing treatment, 100 referred to palliative care	Distress Thermometer	- Overall distress incidence: 62% (level ≥ 4) - Severe distress: 17% (level > 7) - Distress by group: initial diagnosis 56%, undergoing treatment 54%, palliative care 75% - Distress by gender: women 69%, men 53% - Distress by nationality: expatriates 64.3%, Qataris 51% - Highest distress in breast (69%) and lung (70%) cancer patients - Common causes: physical and emotional
35	• (Safar & Mazanec, 2022)	Kuwait	Cross-sectional	Descriptive	100 women diagnosed with breast cancer within the previous year at the Kuwait	MSAS-SF, MOS-SSS, FACT-G, Demographic/cl	- Moderate symptom burden: M = 2.35, SD = 0.28 - Significant

					Cancer Control Center Hospital	inical questionnaire	negative association between symptom burden and HRQOL - Most prevalent symptoms: pain, difficulty sleeping, lack of energy, and hair loss - Findings suggest the need for improved clinician training, better screening tools, and psychosocial interventions

Chapter 5: Studies dataset sheet

	Author (years) /Registy (years)	Country/ region	Type and Design	Sample (population vs articles)	Incidents	age standarzied rate	Prevalance	Histology , Genetics Molecular Subtypes			Stage and Grade	Prognosis and Survival
1	Qatar registry (2020)	Qatar	Retrospective analysis	326 newly diagnosed cases	326 cases (99% females, 1% males)	73.26 per 100,000 females	1103 female breast cancer cases	Infiltrating duct carcinoma (77.95%)	Not specified	Not specified	55% stage II	Not specified
2	Saudi registry (2020)	Saudi	Retrospective analysis	2,459 cases	2,459 cases	28.4 per 100,000	Not specified	Infiltrating duct carcinoma (80%)	Not specified	Not specified	Localized (39%), regional (30%), distant (11%)	Alive (83%), dead (17%)
3	Kuwait registry (2019)	Kuwait	Retrospective analysis	5,719 cases (2010-2019)	5,719 cases	63.3 per 100,000 (Kuwaiti females), 43.7 per 100,000 (Non-Kuwaiti females)	Not specified	Infiltrating duct carcinoma (84.5%)	Not specified	Not specified	Localized (28%), regional (40%), distant (15%)	Alive (83%), dead (17%)
4	Oman registry (2020)		Retrospective analysis	277 cases	277 cases	27.3 per 100,000	Not specified	Infiltrating duct carcinoma (92.8%)	Not specified	Not specified	Stage 0 (3%), stage 1 (11%), stage 2 (40%), stage 3 (22%), stage 4 (13%)	Not specified

5	Humaid O. Al-Shamsi et al. (2023) / Various registries from 2011-2022	Gulf Countries	Literature review of studies and reports from 2011-2022	Multiple sources including PubMed/ Medline, Google Scholar, ASCO and ESMO abstracts, GLOBOCAN database, and national cancer registry reports	Consistent increase in breast cancer cases. For example: Kuwait: Annual new cases increased from 212 in 2012 to 608 in 2017. UAE: As of 2019, there were 883 cases of breast cancer, accounting for 20.2% of all malignant cases.	Kuwait: Kuwaiti females: 61.0 per 100,000 Non-Kuwaiti females: 41.3 per 100,000 Over the last 44 years, incidence increased from 18.5 to 63.5 per 100,000. 2013-2017 ASR: 64.6 per 100,000 for Kuwaiti females, 45.2 per 100,000 for non-Kuwaiti females. UAE: Between 1998-2001: 17.1 - 19.2 per 100,000	Breast cancer is the most frequently diagnosed cancer in all six GCC countries.	Common Subtypes: Infiltrating ductal carcinoma is the most common histological subtype. Oman: 90.3% of cases are infiltrating ductal carcinoma.	Oman: Luminal A: Most common among 542 cases diagnosed between 2006 and 2010. Bahrain: Luminal A: 60.2% Luminal B: 19% Triple-negative (TN): 13.4% HER2+: 7.4% UAE: ER+: 59.3% PR+: 51.0% HER2+: 39.1% TN: 20.8%	BRCA1/2 Mutations: Qatar: 38.0% had BRCA mutations in a study of 167 subjects. UAE: 309 BC patients undergoing genetic testing (2016-2018) identified 19 positive susceptibility genes. Oman: Study showed no significant role for BRCA1/2 mutations in sporadic BCs. Other Genes: BRIP1 implicated as a potential oncogene. Other genes studied	General: Advanced stage at presentation, with Stage II being the most frequent. Higher pathological grade reported in many cases. Kuwait: Stage I: 17% Stage II: 29% Stage III: 20% Stage IV: 12% Unknown: 21% Tis: 1% Oman: Stage I increased from 13% (2018) to 27% (2019) Stage II increased from 27%	UAE: Predicted 2-year survival rate: 97% 5-year survival rate: 89% Kuwait: Overall 5-year survival rate: 90.5% Saudi Arabia: 5-year observed survival rate: 72% Qatar: 78% survival rate among female BC patients.

						As of 2019: 20.2% of all malignant cases. Qatar: ASR: 87.07 per 100,000 (2018) Saudi Arabia: Saudi females: 24.3 per 100,000 Non-Saudi females: 29.8 per 100,000 Oman: Highest age-specific incidence rate: 112.2 per 100,000 among Omani females aged 50.				include TP53, PIK3CA, PTEN, APC, and KIT.	(2018) to 34% (2019) Stage III decreased from 30% (2018) to 17% (2019)	

6	Hamdy A. Azim, MD, Hagar Elghazawy, MD, Ramy M. Ghazy, MD, Ahmed H. Abdelaziz, MD, Marwa Abdelsalam, MRCP, Amira Elzorkany, MSc, and Loay Kassem, MD. Various studies from 1997-2015.	Egypt	Systematic review and meta-analysis of studies published from inception until December 2021.	26 studies including 31,172 breast cancer cases.	Breast cancer is the most common cancer among Egyptian females.	Egypt: 48.8 per 100,000. Forecast for 2050: 46,000 incident cases. Age-standardized mortality rate: 20.4 per 100,000 (compared with 12.3 per 100,000 in the US).	Breast cancer represents 42% of all female cancer cases in Egypt.	Invasive duct carcinoma: 87% of cases. Invasive lobular carcinoma: 7% of cases.	HER2+: 21% of cases. Triple-negative breast cancer (TNBC): 10% of cases. Estrogen receptor (ER)+: 70% of cases. Progesterone receptor (PR)+: 61% of cases.	Higher prevalence of more aggressive biological subtypes such as HER2+.	Pooled proportions of stages at presentation: Stage I: 6% (95% CI, 4 to 8; I2, 90%). Stage II: 37% (95% CI, 31 to 43; I2, 93%). Stage III: 45% (95% CI, 42 to 49; I2, 78%). Stage IV: 11% (95% CI, 9 to 15; I2, 87%). Pooled proportions of T stages at presentation: T1: 12% (95% CI, 8 to 16; I2, 97%). T2: 55% (95% CI, 48 to 61;	Younger age at diagnosis associated with poorer prognosis. Mean age at diagnosis: 50.4 years. 57% of cases are premenopausal/perimenopausal. Pooled estimated proportions of stages for young patients (≤35 or ≤40 years): Stage I: 4% (95% CI, 2 to 8; I2, 0). Stage II: 39% (95% CI, 33 to 45; I2, 15%). Stage III: 48% (95% CI, 37 to 59; I2, 69%). Stage IV: 9% (95% CI, 3 to 21; I2, 73%).

											I2, 97%). T3: 21% (95% CI, 14 to 31; I2, 99%). T4: 8% (95% CI, 5 to 12; I2, 96%). Positive lymph nodes: 70% (95% CI, 59 to 79; I2, 99%).	
7	Hikmat Abdel-Razeq, MD, Asem Mansour, MD, and Dima Jaddan, MD, MPH. Data primarily from 2015.	Jordan	Review of existing literature and data from national cancer registries.	Data from the Jordan Cancer Registry (JCR) and King Hussein Cancer Center (KHCC) involving more than 44,000 cancer cases since 2006.	Breast cancer is the most common cancer in Jordan, accounting for 20.6% of cancers in Jordanians of both sexes and 39.4% among Jordanian women.	ASR in 2015: 45.7 per 100,000. Crude incidence in 2015: 34.1 per 100,000.	Number of new cases increased by 69% from 2005 (674 cases) to 2015 (1,138 cases). 15.6% of new cases were women under 40 years old.	84.7% of patients treated at KHCC were estrogen receptor and/or progesterone receptor positive. 8.3% had triple-negative (TN) disease. 17.7% were HER2/neu positive.	HER2+: 17.7%. Triple-negative breast cancer (TNBC): 8.3%. Estrogen receptor (ER)+: 84.7%. Progesterone receptor (PR)+: 84.7%.	20% of high-risk patients had deleterious BRCA1/2 mutations. Genetic counseling clinic established at KHCC in 2015. Expanded testing services as per the National Comprehensive Cancer	Fewer than one-third present with localized disease. 13.4% present with metastatic disease at diagnosis.	Survival analysis at KHCC: Stage I: 96% 5-year survival. Stage II: 91.3% 5-year survival. Stage III: 75.7% 5-year survival. Stage IV: 31.5% 5-year survival.

										Network guidelines.		
8	Hikmat Abdel-Razeq, MD, Asem Mansour, MD, and Dima Jaddan, MD, MPH. Data primarily from 2015.	Jordan	Review of existing literature and data from national cancer registries.	553 older breast cancer patients.	Breast cancer (BC) is the most common cancer in Jordan, and its incidence increases with age.	Majority of breast cancer patients are diagnosed at a younger age compared to Western societies, with the mean age of older patients being 71 years.	Breast cancer in older women represents a smaller proportion of the total breast cancer cases in Jordan compared to Western countries.	The predominant pathology among older patients is invasive ductal carcinoma (IDC), identified in 83.2% of cases. Invasive lobular carcinoma (ILC) was seen in 10.8% of cases.	Among the 501 patients with known HER2 status: HER2+: 18.4%. Triple-negative (TN): 7.6%.	Limited data on genetic profiling specific to older breast cancer patients in Jordan. The study did not provide detailed information on genetic testing practices for this demographic.	On presentation, 20.6% of older patients had metastatic disease, primarily visceral. Non-metastatic patients exhibited poor pathological features: Node-positive: 55.6%. High grade (Grade III): 38.7%. Lymphovascular invasion: 39.4%.	The median follow-up was 45 months. The 5-year overall survival (OS) for the entire group was 67.6%. Survival rates were significantly better for non-metastatic patients: Non-metastatic: 5-year OS of 78.8%. Metastatic: 5-year OS of 25.4%. Node-negative: 5-year OS of 85.4%. Node-positive: 5-year OS of 74.1%. On Cox regression, positive lymph nodes were associated with poor outcomes in non-metastatic patients (HR: 1.75).

											Larger tumors (T3 and T4) were present in 10.9% and 3.0% of cases, respectiv ely.	
9	Abdel-Razeq, H., Abujamo us, L., & Jadaan, D. Data primarily from 2020.	Jordan	Compreh ensive genetic profiling of high-risk breast cancer patients in Jordan.	517 high-risk breast cancer patients tested for BRCA1 and BRCA2 mutation s.	Breast cancer (BC) is the most common cancer and the leading cause of cancer-related deaths among Jordanian women, accounting for almost 20% of all cancer cases.	A significa nt portion (64.4%) of the patients tested were 40 years of age or younger.	Among the 517 patients tested, 13.9% had pathogenic or likely pathogenic mutations in BRCA1 or BRCA2. The study also found that 10.3% of patients had variants of uncertain significance (VUS).	Most of the tested patients had hormone receptor-positive disease, with 25.7% being HER2-positive and 11.0% having triple-negative disease.	BRCA1 mutation s predomin antly found in patients with triple-negative disease. BRCA2 mutation s more frequentl y observed overall compare d to BRCA1.	Comprehe nsive genetic profiling of high-risk patients, identifying both pathogenic and likely pathogenic mutations in BRCA1 and BRCA2 genes. Relatively high rate of VUS, which may be related to racial differences not well-represente d in Western reference	The study does not provide specific details on the stages and grades of breast cancer at diagnosis among the tested patients.	The study does not directly address prognosis and survival rates. However, it implies that identifying BRCA mutations can significantly impact patient management and potentially improve outcomes through targeted therapies and preventive measures.

										laboratories.			
10	Hamid, G. A. (2022). Breast cancer in Yemen: Epidemiology, diagnosis, and treatment.	Yeman	Breast cancer is the most common malignancy in Yemen and the leading cause of cancer death. Data from Yemen's main cancer registries showed that breast cancer cases ranged from **13.8% to 22%** of all	The age-standardized rate (ASR) of breast cancer was **4.7** per 100,000 in 2016 and increased to **7.7** per 100,000 in 2020. The median age at diagnosis was **50** years.	The lower incidence of breast cancer compared to high-income countries may be attributed to reproductive factors such as higher fertility rates, premature births, and longer breastfeeding durations among Yemeni women. However, other	A total of **2201** breast cancer patients were identified between 2016 and 2020, with **2160 (98.1%)** being female and **41 (1.9%)** male. The mean age of all patients was **47.41** years, and nearly **25%**	Invasive ductal carcinoma (IDC) was the most common type of breast cancer, accounting for **76%** of cases. Additionally, **79%** of patients had lymph node involvement at the time of diagnosis.	The data did not provide specific details on the stages and grades of breast cancer, but it was noted that many women present with advanced disease at diagnosis.	Surgical interventions are often performed by general surgeons in teaching hospitals, which can lead to suboptimal outcomes. Chemotherapy availability has been improved through support from the World	Breast cancer care in Yemen faces several challenges, including limited access to diagnostic and treatment facilities, inadequate surgical techniques, and a lack of radiotherapy centers. The National Program of Cancer Control, in coordination with internation	The study does not mention specific genetic and molecular profiling efforts but highlights the need for improved diagnostic and treatment facilities.	N/A

			cancers reported, depending on the registry. The number of new cases has been significantly increasing, with women often presenting at a younger age and with more advanced disease compared to women in Western countries. Approximately **73%** of women were aged 50 years or younger		factors such as limited access to screening and diagnostic services also play a role.	were younger than **40** years at the time of diagnosis.			Health Organization and the King Salman Center, covering around **90%** of the chemotherapy list. Radiotherapy access is limited, with only one center in Sana'a, leading many patients to seek treatment abroad.	al organizations, is working to improve these aspects by equipping cancer centers with necessary diagnostic tools and ensuring the availability of chemotherapy.		

			at the time of diagnosis.									
11	Al-Naggar, R. A., Al-Maktari, L. A. S., Alshaikhli, H., Trafford, J., Saleh, B., & Mossfer, S. I. (2021)	Yeman	Breast cancer is the most common cancer among women in Yemen, accounting for **30.3%** of all cancers in women and **16.6%** of all cancers overall. The incidence of breast cancer has been steadily increasing, with women commonly diagnosed at a	The age-standardized rate (ASR) of breast cancer in Aden was reported as **9.6** per 100,000 females from 2002 to 2006. Higher rates were reported by international agencies, with the International Agency for Research on Cancer estimating an ASR of	Risk factors for breast cancer in Yemen include age, hormone therapy, family history, extensive exposure to radiation, benign breast tumors, obesity, tobacco smoking, diet, alcohol consumption, stress, pollution, sun exposure, physical activity, and infections. Unique cultural	Invasive ductal carcinoma was the most common histological subtype, accounting for the majority of breast cancer cases (**N=2,695**).	Invasive ductal carcinoma was the predominant histological subtype (**N=2,695**), followed by invasive lobular carcinoma (**N=120**). Other subtypes included ductal carcinoma in situ and medullary carcinoma.	Most breast cancer cases in Yemen are diagnosed at an advanced stage. Stage II was the most common at diagnosis (**N=160**), and many patients presented with large tumors. The review noted that the advanced stages at presentation are more prevalent compared to developed countries.	The most common surgical treatment for breast cancer in Yemen is the modified radical mastectomy (**N=211**). Financial constraints and late-stage diagnoses limit the use of breast-conserving surgeries. Access to advanced treatments and reconstructive surgeries is limited, impactin	Breast cancer management in Yemen faces numerous challenges, including late-stage presentation, financial burdens, insufficient medical staff training, and inadequate psychological support for patients. There is a critical need for improved screening and early detection programs, better education and	High rates of positive expression of ER, PR, Her2/neu, and P53 were reported among Yemeni breast cancer patients, highlighting the need for genetic and molecular profiling to guide personalized treatment strategies.	The review highlighted a significant lack of screening practices among Yemeni women. Only **1.6%** of women had undergone a mammogram test, and awareness of breast cancer screening was very poor. Educational interventions significantly improved knowledge of breast cancer, but practical implementation of screening remained low. The review emphasizes the need for national screening programs to enhance early detection and improve survival rates.

			younger age (50 years or younger).	**20.8** per 100,000, and the Globocan estimating **27.4** per 100,000 Yemeni females.	factors such as early marriage, high parity, and extended breastfeeding also play a role.				g overall treatment outcomes.	awareness campaigns, and enhanced oncology services to improve outcomes for breast cancer patients in Yemen. Establishing a national cancer registry and improving collaboration between cancer centers are also essential steps for better management and outcomes.		
12	Hamid, G. A. (2022) / 2016-2020	Yemen	N/A	N/A	Breast cancer is the most common malignancy in Yemen and the leading	ASR: 4.7 per 100,000 (2016) to 7.7 per 100,000 (2020). Median	A total of 2201 breast cancer patients were identified between 2016 and	Invasive ductal carcinoma (IDC) was the most common type of breast	Diagnostic techniques have been enhanced to include	The study does not mention specific genetic and molecular profiling efforts but	Data did not provide specific details on the stages and	Due to late presentation and advanced disease at diagnosis, treatment outcomes are generally poor. There is an urgent need to improve early

					cause of cancer death. Data from Yemen's main cancer registries showed that breast cancer cases ranged from 13.8% to 22% of all cancers reported, depending on the registry. The number of new cases has been significantly increasing, with women often presenting at a younger age and with more advanced disease compared	age at diagnosis was 50 years.	2020, with 2160 (98.1%) being female and 41 (1.9%) male. The mean age of all patients was 47.41 years, and nearly 25% were younger than 40 years at the time of diagnosis.	cancer, accounting for 76% of cases. Additionally, 79% of patients had lymph node involvement at the time of diagnosis.	testing for estrogen receptor (ER), progesterone receptor (PR), and HER2 status, which are important for determining treatment options.	highlights the need for improved diagnostic and treatment facilities.	grades of breast cancer, but it was noted that many women present with advanced disease at diagnosis.	detection and treatment to enhance survival rates.

					to women in Western countries. Approximately 73% of women were aged 50 years or younger at the time of diagnosis.							
13	Al-Naggar, R. A. et al. (2021) / 1989-2019	Yemen	Systematic review	Data from 19,031 participants across 27 articles	Breast cancer is the most common cancer among women in Yemen, accounting for 30.3% of all cancers in women and 16.6% of all cancers overall. The incidence of breast cancer has been steadily increasing, with women commonly	The age-standardized rate (ASR) of breast cancer in Aden was reported as 9.6 per 100,000 females from 2002 to 2006. Higher rates were reported by international agencies, with the International Agency	Invasive ductal carcinoma was the most common histological subtype (N=2,695), followed by invasive lobular carcinoma (N=120). Other subtypes included ductal carcinoma in situ and medullary carcinoma.	Most breast cancer cases in Yemen are diagnosed at an advanced stage. Stage II was the most common at diagnosis (N=160), and many patients presented with large tumors. The review noted that the advanced stages at presentation are more prevalent compared to	The most common surgical treatment for breast cancer in Yemen is the modified radical mastectomy (N=211). Financial constraints and late-stage diagnoses limit the use of breast-conserving surgeries. Access to advanced treatment	Breast cancer management in Yemen faces numerous challenges, including late-stage presentation, financial burdens, insufficient medical staff training, and inadequate psychological support for patients. There is a critical need for improved	High rates of positive expression of ER, PR, Her2/neu, and P53 were reported among Yemeni breast cancer patients, highlighting the need for genetic and molecular profiling to guide personalized treatment	The review highlighted a significant lack of screening practices among Yemeni women. Only 1.6% of women had undergone a mammogram test, and awareness of breast cancer screening was very poor. Educational interventions significantly improved knowledge of breast cancer, but practical implementation of screening remained low. The review emphasizes the need for national screening programs to enhance early detection and improve survival rates.

					diagnosed at a younger age (50 years or younger).	for Research on Cancer estimating an ASR of 20.8 per 100,000, and the Globocan estimating 27.4 per 100,000 Yemeni females.		developed countries.	s and reconstructive surgeries is limited, impacting overall treatment outcomes.	screening and early detection programs, better education and awareness campaigns, and enhanced oncology services to improve outcomes for breast cancer patients in Yemen. Establishing a national cancer registry and improving collaboration between cancer centers are also essential steps for better management and outcomes.	strategies.	

14	Mohsin and Mohamad (2024)	Iraq	Descriptive study based on pathological data.	Data from malignant breast cancer cases recorded in several hospitals in Baghdad, Iraq.	Data on the total number of cases or specific incident rates were not explicitly provided.	Not explicitly stated, but the mean age of malignant cases was 54.93 ± 14.33 years.	Highest frequency of breast cancer occurred in the sixth decade of life (35.56%).	- Invasive Ductal Carcinoma (IDC): 60% - Invasive Lobular Carcinoma (ILC): 8.89% - Mixed IDC & DCIS: 15.56% - Invasive Papillary Carcinoma (IPC): 4.44% - Ductal Carcinoma In Situ (DCIS): 2.22%	- Luminal type: 46.67% - Triple-negative: 28.89% - HER2+: 8.89%	Not detailed in the summary provided.	- Grading: - Grade I: 4.44% - Grade II: 64.44% - Grade III: 31.11% - Staging (AJCC): - Stage IA: 2.22% - Stage IIA: 15.56% - Stage IIB: 11.11% - Stage IIIA: 17.78% - Stage IIIB: 4.44% - Stage IIIC: 20.00%	- Positive lymph nodes in 53.33% of cases - Negative lymph nodes in 17.78% of cases
15	Mohsin and Mohamad (2021)	Iraq	Descriptive study based on clinical and pathological data.	Data from 60 malignant breast cancer cases recorded in several	Not explicitly stated, but the study includes a sample of 60 cases.	Not provided. The mean age of patients was 51.18 ±	Not explicitly provided.	- Invasive Ductal Carcinoma (IDC): 91.7% - Invasive Lobular	- Estrogen Receptor (ER) Positive: 80% - Progesterone	Not detailed in the summary provided.	- Grading: - Grade I: 1.7% - Grade II: 76.7% - Grade III:	- Positive lymph nodes in 61.7% of cases. - Negative lymph nodes in 38.3% of cases.

				hospitals in Iraq.		10.64 years.		Carcinoma (ILC): 8.3%	Receptor (PR) Positive: 75% - HER2 Positive: 23.3%		21.7% - Staging (AJCC): - Stage I: 11.7% - Stage II: 43.3% - Stage III: 30% - Stage IV: 15%	
16	Bashar Mohammed Hobi and Nada A. S. Alwan (2020)	Iraq	Descriptive retrospective comparative study.	1161 patients histopathologically diagnosed with breast cancer from clinical records.	Bilateral breast cancer constituted 4.4% of all breast cancer cases in the study (51 out of 1161 cases).	Not provided. Patients with bilateral breast cancer were generally younger than those with unilateral breast cancer, with a peak age frequency in the 35-49 years category.	Bilateral breast cancer prevalence was 4.4%.	- Invasive ductal carcinoma (IDC): 65.2% in bilateral cases vs. 85.1% in unilateral cases. - Invasive lobular carcinoma (ILC): 13% in bilateral cases vs. 6.4% in unilateral cases. - Others: 21.7% in bilateral cases vs. 8.4% in unilateral cases.	- Estrogen Receptor (ER) Positive: 61.9% in bilateral cases vs. 68.8% in unilateral cases. - Progesterone Receptor (PR) Positive: 66.6% in bilateral cases vs. 66.8% in unilateral cases. - HER2 Positive: 7.7% in bilateral cases vs.	Bilateral cases showed a higher prevalence of advanced stage (Stage III and IV) compared to unilateral cases.	Not detailed.	Not detailed.

									23.8% in unilateral cases.			
17	Eman Sbaity, Rachelle Bejjany, and Ali Shamseddine (2021)	Lebanon	Review study	Population-based study using data from various studies and the Lebanese National Cancer Registry	Breast cancer is the leading cancer among Lebanese females, representing 38.2% of all cancer cases	Highest among regional countries in 2012	High prevalence among Lebanese females compared to other Arab populations	Not detailed	Not detailed	Not detailed	Early detection programs have led to an increase in early-stage diagnoses and a decrease in more aggressive stages	Early detection through screening campaigns has led to better prognosis and survival rates
18	Hamadeh, L. N., Farhat, L., Hilal, L., Assi, H., Nasr, F., Chahine, G., Kattan, J., Farhat, F., Kourie, H., El Hachem, G., Ghosn, M., El Saghir,	Lebanon	Descriptive retrospective study	280 primary breast cancer paraffin-embedded tissue samples from Lebanese breast cancer patients	Breast cancer is the most common malignancy in women worldwide	Not specified	38.57% of Lebanese breast cancer patients in the study carried at least one mutation in the PIK3CA gene	PIK3CA mutations are commonly found in hormone receptor-positive (HR+) and HER2-negative breast cancer subtypes	PIK3CA mutations are associated with lower tumor grades and hormone receptor-positive tumors	The prognostic value of PIK3CA mutations is mixed	The study highlights the use of Alpelisib, an alpha-specific PIK3CA inhibitor, for patients with detected PIK3CA	The detection of PIK3CA mutations has implications for treatment strategies, particularly the use of targeted therapies such as Alpelisib

	N., Chamseddine, N., Finianos, A., Ghanem, H., Younes, A., Abi Gerges, D., Temraz, S., Haidar, M., Nabhan, T., & Mahfouz, R. (2023)										mutations	
19	Sbaity, E., Tamim, H., El-Hajj Fuleihan, G., Abbas, J., Zahwe, M., El Sayed, R., & Shamseddine, A. (2024)	Lebanon	Matched cohort study	Cohort 1: 123 Lebanese breast cancer patients, with 41 patients aged 40 years or younger matched to 41 patients older than 40. Cohort 2: 399 patients,	The proportion of young patients diagnosed with breast cancer is significantly higher in developing countries compared to developed countries	Not specified	Breast cancer in young women is more prevalent in developing countries compared to developed countries	The distribution of molecular subtypes was similar between younger and older patients	Younger patients often present with more advanced stages and higher-grade tumors compared to older patients	DFS and LRFS outcomes varied based on age groups and treatments received	Surgery, radiotherapy, chemotherapy, trastuzumab, hormonal therapy	Chemotherapy, hormonal therapy, and surgery were significant prognostic factors for DFS and LRFS

				with 55 patients aged 40 years or younger matched to 165 patients older than 40 years								
20	**Dokcu, Ş., Çaparlar, M.A., Başçeken, S.İ., & Eroglu, A. (2022)**	Turkey	Retrospective study	Population: 480 Turkish women with breast cancer treated at Ankara University's surgical oncology clinic.	Breast cancer incidence has doubled in Turkey over the last 20 years, with higher rates in the western parts compared to the eastern parts.	Mean age at diagnosis: 54.5 years	Luminal B/Her2- (33.5%), Luminal B/Her2+ (29.8%), Luminal A (19.2%), Triple Negative (9.2%), and HER2+ (8.3%)	76.3% invasive ductal carcinoma (IDC), 8.5% invasive lobular carcinoma (ILC), and 15.2% other subtypes	Luminal A, Luminal B/Her2-, Luminal B/Her2+, HER2-enriched, Triple Negative	ER, PR, and HER2 statuses were determined using immunohistochemical staining (IHC). HER2 amplification was confirmed using fluorescent in situ hybridization (FISH) when needed	82% of the cases were local stage (Stage 1, 2) and 18% were locally advanced (Stage 3, 4)	5-year OS rate: 89.5%, 10-year OS rate: 79.6%

21	**Dogan, I., Aksoy, S., Cakar, B., Basaran, G., Ercelep, O., Molinas Mandel, N., Korkmaz, T., Gokmen, E., Sener, C., Aydiner, A., Saip, P., & Eralp, Y. (2023)**	Turkey	Retrospective multicenter registry study	Population: 1381 adult patients with metastatic breast cancer	Breast cancer is the most frequent cancer type among women in Turkey, with 24,175 new cases diagnosed in 2020. Approximately 10% of new patients present with metastatic disease annually.	Median age: 48 years (range 17–91)	52.3% of patients had recurrent disease, with an increased frequency over time (47.9% in Cohort I vs. 56.1% in Cohort II).	Not detailed	Most common subtypes: HR+ (62.1%), HER2+ (27.4%), TNBC (10.5%).	First-line treatment included chemotherapy (CT) and endocrine therapy (ET). Increased use of dual HER2 blockade with trastuzumab and pertuzumab in Cohort II.	Luminal A, Luminal B, HER2+, TNBC	Hormone-responsive (HR+) disease defined as membranous estrogen (ER) or progesterone (PR) receptor expression in at least 1% of tumor cells. HER2 assessment according to the ASCO CAP 2018 guidelines.
22	**Özmen, V., Özmen, T., & Doğru, V. (2019)**	Turkey	Retrospective registry-based study	Population: 19,503 women with breast cancer registered between May 2005 and April 2017.	19,503 women included after data cleaning.	Median age at diagnosis: 51 years (range 14-97 years)	Incidence increased from 24/100,000 in 1994 to 43.8/100,000 in 2015	Invasive ductal cancer (77%), invasive lobular cancer (6.5%), invasive mixed type (4.2%), other (12.4%)	Luminal A (57.7%), Luminal B (20.6%), HER-2 (9.6%), Triple Negative (12.1%)	ER: 72.5%, PR: 62.5%, HER-2: 21.8%, Ki-67 >14%: 62.7%	Majority had stage II cancer (48.3%). Histologic grade I: 7.7%, grade II: 46.8%, grade III: 45.5%.	5-year survival: 86%, 10-year survival: 76%

23	**Dokcu, Ş., Çaparlar, M.A., Başçeken, S.İ., & Eroglu, A. (2022)**	Turkey	Retrospective study	Population: 480 Turkish women with breast cancer treated at Ankara University's surgical oncology clinic.	Breast cancer incidence has doubled in Turkey over the last 20 years, with higher rates in the western parts compared to the eastern parts.	Mean age at diagnosis: 54.5 years	Luminal B/Her2- (33.5%), Luminal B/Her2+ (29.8%), Luminal A (19.2%), Triple Negative (9.2%), and HER2+ (8.3%)	76.3% invasive ductal carcinoma (IDC), 8.5% invasive lobular carcinoma (ILC), and 15.2% other subtypes	Luminal A, Luminal B/Her2-, Luminal B/Her2+, HER2-enriched, Triple Negative	ER, PR, and HER2 statuses were determined using immunohistochemical staining (IHC). HER2 amplification was confirmed using fluorescent in situ hybridization (FISH) when needed	82% of the cases were local stage (Stage 1, 2) and 18% were locally advanced (Stage 3, 4)	5-year OS rate: 89.5%, 10-year OS rate: 79.6%
24	**Dolatkhah, R., Somi, M. H., Jafarabadi, M. A., Hosseinalifam, M., Sepahi, S., Belalzadeh, M., Nezamdoust, M., &**	Iran	Retrospective cohort study	Population: 4989 patients diagnosed with primary breast cancer. Follow-up data were available for 1335 patients (1309 females	A total of 4989 primary breast cancer cases were recorded in the EA-PBCR database during the 10-year study period.	Age-standardized incidence rates (ASIRs) of breast cancer increased from 21.68 to 36.99 per 100,000 over the study period, reflecting	Not specified	The study underscored the importance of population-based campaigns and awareness programs for early detection of breast cancer to improve	62.1% diagnosed with ductal carcinoma, while 11.7% had lobular carcinoma. Other histological types were also recorded but were	Not detailed	Not detailed	The study did not include data on genetic or molecular profiling. Incorporating such data in future studies could provide deeper insights into the biological behavior of breast cancer in the region.

	Dastgiri, S. (2020)			and 26 males).		an annual percentage change (APC) of 5.5%.		survival rates.	less common.			
25	**Sayad, S., Ahmadi, S. A. Y., Nekouian, R., Panahi, M., Anbari, K. (2020)**	Iran	Single-center cross-sectional study	Population: 62 patients diagnosed with invasive breast cancer in 2018.	Not specified	Not specified	Not specified	Educational efforts had positively impacted early detection, as evidenced by the presence of stage 1 diagnoses. However, a significant number of patients still presented at an advanced stage, indicating the need for more effective screening programs and public awareness campaigns.	96.77% had invasive ductal carcinoma, 3.22% had invasive lobular carcinoma.	Hormone therapy was common due to high ER positivity.	ER positivity: 75%, PR positivity: 63.16%, HER2 positivity: 38.60%, Triple positive cases: 17.54%, Triple negative cases: 7.02%	Not specified

26	**Zahedi, R., Vardanjani, H. M., Baneshi, M. R., Haghdoost, A. A., Afshar, R. M., Sarabi, R. E., Tavakoli, F., & Zolala, F. (2020)**	Middle East	Systematic review and meta-analysis	Population: Data from 80 studies, resulting in 545 data points.	Not specified	The pooled ASR of breast cancer for the EMR was 37.1 per 100,000 person-years during the period from 2011 to 2019.	Human Development Index (HDI), Obesity, Total Fertility Rate (TFR)	Not specified	Not specified	Not specified	Not specified	Not specified
27	Zainab A. Toorani et al. (2020-2023)	Bahrain	Retrospective, single-institution study analyzing breast biopsies.	267 breast biopsy samples from female patients aged 40 and below, taken at Salmaniya Medical Complex, Manama, Bahrain.	Benign (B2 category): 68.5% Malignant invasive carcinomas (B5b category): 20.2% Other categories: B1 (3.7%), B3 (4.1%), B4 (1.1%), B5a (1.9%), B5d (0.4%).	Not specified.	Benign breast masses were the most common, particularly fibroadenomas, with notable prevalence among younger women.	Breast masses were categorized into B1 (normal tissue), B2 (benign lesions), B3 (lesions with uncertain potential), B4 (suspicious of malignancy), B5a (in situ carcinoma), and B5b	ER/PR status: Positive for both ER and PR: 10.5% Negative for both ER and PR: 9.4% Positive for ER and negative for PR: 1.5% HER2 status: Positive:	Not specified.	Tumor grade distribution among malignant samples: Grade II: 10.9% Grade III: 8.6% Grade I: 1.5% The association between age and grade	Emphasizes thorough clinical assessment, radiological imaging, and histopathological examination for effective management. Importance of multidisciplinary breast meetings for reviewing discordant cases.

								(invasive carcinoma).	6.0% Negative: 13.5% Equivocal: 1.9% Combined status: Triple-negative (ER-, PR-, HER2-): 6.0% ER+, PR+, HER2-: 6.3% ER-, PR-, HER2+: 3.0%		was not statistically significant (p=0.113).	

28	Hala Kalaji et al. (2016-2020)	Bahrain	Retrospective analysis of cancer cases presented to the National Tumor Board of Bahrain.	2,061 cancer cases (1,367 females and 694 males) were recorded and analyzed.	A total of 2,061 cancer cases were recorded.	Not specifically mentioned in the summary provided.	High prevalence of breast cancer (37.1%) among all cases; other prevalent cancers included colorectal (11.8%), thyroid (6.5%), prostate (5.9%), and head & neck (4.8%).	Major cancers by histology included infiltrating duct carcinoma (84.5%) among breast cancers.	Not detailed in the summary provided.	Not detailed in the summary provided.	Of the 1,173 cases with recorded stage: Stage 0 (3.8%), Stage I (16.9%), Stage II (29.6%), Stage III (25.5%), and Stage IV (24.1%).	The study highlights late-stage presentation as a significant challenge, emphasizing the need for early detection and intervention programs.

The review highlights significant cultural, social, educational, and healthcare-related barriers to effective breast cancer awareness and screening in the Middle Eastern region. Cultural stigmas, conservative attitudes, and social norms were found to limit open discussions and participation in breast cancer screening programs. Educational gaps were also evident, with many women lacking sufficient knowledge about breast cancer symptoms, risk factors, and the benefits of early detection. Additionally, logistical challenges such as transportation, childcare, and financial constraints further restricted access to screening services. Countries with well-funded healthcare systems, such as Sultanate of Oman, Qatar, UAE, and Jordan exhibited more comprehensive and effective breast cancer awareness programs, while less affluent countries faced challenges due to limited resources.

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