GinPolMedProject ©
03 (69) 2025 : 001-008 • RESEARCH ARTICLE

Individual and combined effects of lifestyle, demographic, and clinical factors on breast cancer risk and stage at the time of diagnosis

Ahmed Ziarra Khalaf[1]*, Mazin A. Abdulaa[2], Ahmed A. R. Issa[3], Nawar H. Khalil[4]

[1]Associated Professor, Consultant Surgeon, University of Basrah, Basrah, Iraq

[2]Professor of Surgery, Department of Surgery, Medical College, University of Basrah, Basrah, Iraq

[3]Consultant surgeon, Department of Surgery, Al-Basrah Teaching Hospital, Basrah, Iraq

[4]Consultant Family physician, Department of Surgery, Al-Basrah Teaching Hospital, Basrah, Iraq

SUMMARY

Breast cancer is a major global health issue, particularly among women, and its risk factors include genetics and modifiable lifestyle, and socioeconomic conditions. This prospective study, which was conducted in Basrah, Iraq, examined the sociodemographic and anthropometric profiles of 121 patients with breast cancer. Data were collected via structured interviews and review of medical records. Variables such as age, marital status, employment, financial status, residential area type, educational level, housing type, and body mass index were analyzed. Descriptive statistics were used to summarize the findings. The average age of the participants was 50.75 ± 11.02 years. Most of them were married (85.1%) and living in urban areas (56.2%). A significant proportion had limited education (illiterate: 28.9%), and the majority were unemployed (82.6%). Over half of the participants reported an acceptable financial status (52.1%), and most lived in houses that they owned (51.2%). Further, almost half were obese (46.3%). These results underscore the effect of socioeconomic and lifestyle factors on breast cancer risk, thereby emphasizing the need for targeted interventions to facilitate early detection and address healthcare disparities. This study offers critical insights into the demographic and anthropometric characteristics of patients with breast cancer in Basrah. The findings can then be used as a basis for the development of effective public health strategies for reducing the impact of the disease.

Keywords: Breast cancer risk factors; Socioeconomic disparities; Lifestyle factors; Public health interventions

List of abbreviations: BMI: Body mass index; SES: Socioeconomic status

Address for correspondence:

Ahmed Ziarra Khalaf

Associated Professor, Consultant Surgeon, University of Basrah, Basrah, Iraq

Word count: 3616 **Tables:** 04 **Figures:** 00 **References:** 50

Received: 20.06.2025, Manuscript No. gpmp-25-168067; **Editor assigned:** 23.06.2025, PreQC No. P-168067; **Reviewed:** 15.07.2025, QC No. Q-168067; **Revised:** 23.07.2025, Manuscript No. R-168067; **Published:** 29.08.2025

INTRODUCTION

Breast cancer remains a major public health issue worldwide. In particular, it is the most common type of cancer in women and a major contributor to cancer-related mortality [1,2]. Better patient outcomes and effective preventive techniques are dependent on an understanding of the complicated interactions between risk factors and the development of breast cancer. Unlike other modifiable risk factors, including environmental exposures, lifestyle choices, and Socioeconomic Status (SES), specific risk factors such as genetic predispositions cannot be changed. This finding provides prospects for interventions [3].

This study examined the association between the risk of breast cancer and important sociodemographic and lifestyle characteristics, including age, social status, income, educational level, type of residential area (rural or urban), and Body Mass Index (BMI). The incidence rates of breast cancer typically increase with aging. Thus, age is considered a risk factor [4]. However, the impact of socioeconomic factors, including income, educational level, and social status, has a more complex effect on the risk of breast cancer and can change among populations [5].

These variables can affect lifestyle choices and access to screening procedures and healthcare, all of which impact the development and detection of cancer [6]. Other factors, such as the type of residential area (urban vs rural areas), can also influence the risk of developing diseases due to differences in access to healthcare facilities, environmental exposures, and lifestyle conditions [7]. Further, obesity is associated with an increased risk of postmenopausal breast cancer [8]. The current study aimed to investigate the impact of lifestyle and demographic factors on the risk and stage of breast cancer. However, it is intended to improve and develop knowledge on the risk of breast cancer within a particular community.

MATERIALS AND METHODS

This prospective study was conducted at the Breast Cancer Clinic of Al-Basrah Teaching Hospital, Basrah, Iraq, from March 2023 to December 2024. The sociodemographic and anthropometric characteristics of patients with breast cancer were examined. In total, 121 participants diagnosed with breast cancer were enrolled in this research. Data on sociodemographic variables (such as age, social status, type of residential area, educational level, type of job, financial status, gynecological history, menopausal status, and type of housing) and anthropometric measurements (BMI) were collected *via* structured interviews and review of medical records. Descriptive statistics, including means, standard deviations, medians, frequencies, and percentages, were used to summarize the data. The study protocol was approved by the relevant ethics committee, and informed consent was obtained from all participants. Statistical analysis was performed using the Statistical Package for the Social Sciences software (version 23, SPSS Inc., Chicago, released in 2007).

RESULTS

Tab. 1. shows the sociodemographic and anthropometric characteristics of the study population. The mean age of the participants was 50.75 ± 11.02 years, with a median of 50 (range: 26–80) years. The majority of the participants were married (85.1%) and were residing in urban areas (56.2%). Further, the participants had various educational levels, with illiteracy being the most common (28.9%). Most participants were unemployed (82.6%), and majority of them had an acceptable financial status (52.1%). Regarding the type of housing, 51.2% of the participants lived in their own houses. In terms of BMI, nearly half of the participants were classified as obese (46.3%). Further, 30.6% were overweight, and 23.1% had a normal weight.

As shown in **Tab. 2.**, a significant association was not observed between BMI and stage of breast cancer.

In total, 69 (57%) patients were premenopausal. However, premenopausal status was not significantly associated with disease progression, as illustrated in **Tab. 3**.

As shown in **Tab. 4.**, the association between gynecological history and disease stage was not significant.

Tab. 1. Sociodemographic and anthropometric characteristics of the study population.

Variables	Mean ± SD	Median (min–max)	Frequency	Percentage
Age (years)	50.75 ± 11.02	50 (26–80)	-	-
Social status				
Single	-	-	18	14.9
Married	-	-	103	85.1
Type of residential area				
Urban	-	-	68	56.2
Rural	-	-	53	43.8
Educational level				
Illiterate	-	-	35	28.9
Primary school	-	-	31	25.6
Intermediate school	-	-	15	12.4
Secondary school	-	-	15	12.4
Graduate from technical institutions	-	-	13	10.7
Tertiary education	-	-	12	9.9
Employment status				
Employed	-	-	21	17.4
Unemployed	-	-	100	82.6
Financial status				
Very good	-	-	8	6.6
Middle	-	-	27	22.3
Acceptable	-	-	63	52.1
Poor	-	-	23	19.0
Type of housing				
Owned residence	-	-	62	51.2
Rented residence	-	-	46	38.0
Others	-	-	13	10.7
BMI				
Normal	-	-	28	23.1
Overweight	-	-	37	30.6
Obese	-	-	56	46.3
Total	-	-	121	100.0

Tab. 2. BMI and stage of breast cancer.

Variables		Stage of the disease				Total number of participants	P-value
		Stage 1	Stage 2	Stage 3	Stage 4		
BMI	Normal	8	15	5	0	28	0.392
		30.8%	25.9%	17.2%	0.0%	23.1%	
	Overweight	8	14	12	3	37	
		30.8%	24.1%	41.4%	37.5%	30.6%	
	Obese	10	29	12	5	56	
		38.5%	50.0%	41.4%	62.5%	46.3%	
Total		26	58	29	8	121	
		100.0%	100.0%	100.0%	100.0%	100.0%	

* Fisher's exact test

Tab. 3. Menstrual cycle and stage of breast cancer.

Variables		Stage of the disease				Total	P-value*
		Stage 1	Stage 2	Stage 3	Stage 4		
Menstrual cycle	No	10	27	13	2	52	0.7
		38.5%	46.6%	44.8%	25.0%	43.0%	
	Yes	16	31	16	6	69	
		61.5%	53.4%	55.2%	75.0%	57.0%	
Total		26	58	29	8	121	
		100.0%	100.0%	100.0%	100.0%	100.0%	

* Fisher's exact test

Tab. 4. Stage of breast cancer and gynecological history.

Stage of the disease		Age (years)	Number of pregnancies	Number of abortions
Stage 1	N	26	26	26
	Mean	49.65	4.19	.42
	Median	49.50	4.00	.00
	Std. deviation	8.476	2.994	.857
	Minimum	36	0	0
	Maximum	71	11	3
Stage 2	N	58	58	58
	Mean	50.17	4.12	.60
	Median	50.00	4.00	.00
	Std. deviation	10.535	2.636	1.059
	Minimum	26	0	0
	Maximum	80	12	5
Stage 3	N	29	29	29
	Mean	51.03	4.38	.59
	Median	53.00	4.00	.00
	Std. deviation	13.295	3.610	1.150
	Minimum	26	0	0
	Maximum	75	15	4
Stage 4	N	8	8	8
	Mean	57.50	4.50	.50
	Median	53.50	4.00	.00
	Std. deviation	12.479	2.070	.756
	Minimum	43	2	0
	Maximum	80	8	2
P-value*		0.382	0.985	0.852

*** Kruskal–Wallis test**

DISCUSSION

This study showed that the average age of the patients with breast cancer was 50.75 years (standard deviation: 11.02). Hence, most patients were predominantly within middle age, with a moderate degree of variability as indicated by the standard deviation. This result is significant compared with published epidemiological data on the incidence of breast cancer [9].

Further, the result is under broader trends in breast cancer epidemiology. Approximately 80% of patients with breast cancer are aged >50 years. Notably, over 40% of patients are aged >65 years [10-12]. This emphasizes that the prevalence of breast cancer increases with age. Interestingly, the association between age and breast cancer extends beyond mere prevalence. Younger patients (aged<40 years) are more likely to be diagnosed with aggressive, treatment-resistant triple-negative breast cancer. Nevertheless, the luminal A subtype is more common in individuals aged >70 years [12]. This suggests that age may play a role in the biological mechanisms driving the different subtypes of breast cancer.

Previous research has revealed better breast cancer-related outcomes based on marital status in women aged >65 years [13,14]. Nevertheless, data on women aged<65 years remain limited. The findings of our study are under those observed in older women. In particular, married status had protective effects against later-stage diagnosis. Moreover, it was associated with reduced breast cancer-specific and all-cause mortality, even after controlling for age, stage, race, and estrogen receptor status. This supports the hypothesis that being married may buffer against delayed diagnosis *via* social support, spousal influence on care access, or other factors [15]. However, later-stage diagnosis among younger women may reflect a lower perceived susceptibility or breast cancer awareness [16]. Further, younger women who are unmarried, healthy, and financially independent may present with increased social isolation and mortality risk [17]. The combination of young age and unmarried status may synergistically increase mortality risk. Nonetheless, further studies should be conducted to validate this association. Targeted educational interventions for younger women, regardless of marital status, are essential to promote early detection and improve outcomes. To address this complex relationship definitively, future research should explore the interaction between young age and marital status using larger, more diverse samples, as the combination of these factors may synergistically influence mortality risk, as hypothesized [6].

Urban areas had a higher percentage of breast cancer cases than rural ones (68 [56.2%] vs 53 [43.8%]). This may be attributed to differences in lifestyle conditions (dietary habits, less physical activity) and environmental factors (pollution). Further, compared with patients in rural areas, those in urban areas may have a better access to healthcare services, leading to increased detection of the disease. However, the quality of care within urban areas differs, and this is consistent with the findings of some studies [18,19].

Less-educated groups (illiterate: 28.9%, primary school: 25.6%) had a higher prevalence of breast cancer than higher-educated groups (tertiary: 9.9%, technical institutions: 10.7%). This suggests a strong association between educational level and breast cancer awareness, early detection, and access to healthcare [20].

Previous studies have shown that unemployment and unstable housing conditions are significant socioeconomic factors that can negatively affect health outcomes, particularly in relation to breast cancer. Our findings are in accordance with this body of evidence, which showed that 21% of the patients in our study were unemployed and 82.6% were employed. Individuals who are unemployed are at an increased risk of breast cancer, potentially due to higher stress levels, reduced access to healthcare, and a lower SES. Unemployment, which results in financial instability, often limits access to screening services and its benefit of early diagnosis. Specifically, unemployed housewives may face additional barriers [21].

Similarly, unstable housing conditions are associated with poorer management and outcome of breast cancer, which result from delayed diagnosis, treatment, and follow-up care. Housing often provides clues about SES. In particular, a lower SES is usually associated with a higher breast cancer incidence and mortality. This may lead to inadequate access to healthcare, unhealthy living conditions, and elevated stress levels [22]. Taken together, these findings underscore the significant role of socioeconomic factors in the risk and outcomes of breast cancer.

Financial status is an important determinant of breast cancer outcomes, as it affects access to healthcare and screening services, which are associated with early detection and overall survival rates. The current research showed that 52.1% of the participants were in the acceptable category. Meanwhile, 19.0% were under the poor category. Only 6.6% had a very good financial status, and 22.3% were in the middle category. This distribution emphasizes the preponderance of individuals from the lower economic status, which is in evidence linking socioeconomic limitations to inferior outcomes in breast cancer [23].

Limited access to screening programs is commonly associated with a lower financial status, which is associated with delayed diagnoses and advanced-stage cancer at presentation [24]. Financial difficulties frequently restrict access to screening procedures including mammograms and treatments, thereby aggravating inequalities in survival rates [25]. Further, such challenges lead to stress, nutritional issues, and morbid living circumstances, which promote increased cancer risk and progression [26]. Our findings underscore the need for targeted interventions, such as increased access to inexpensive healthcare and use of community-based screening programs, to address this injustice.

Housing condition is a major social factor of health, as it has an impact on access to healthcare, environmental exposure, and overall well-being. Other studies have shown an association between housing conditions and breast cancer outcomes, which are associated with incidence, survival, and access to healthcare. Based on our findings, the distribution of housing types was as follows: owned residence, 62 (51.2%); rented residence, 46 (38.0%); and others, 13 (10.7%]). Homeownership is related to improved healthcare access, which can lead to early disease detection. Renters face barriers such as instability and delayed diagnosis [26]. In addition, housing type reflects SES. A lower SES is associated with a higher breast cancer-related mortality due to limited resources [27].

The impact of BMI on breast cancer risk and survival is complex and widely studied, with findings that often vary based on menopausal status, cancer types and stage, and methods used to measure body fat. Our findings on BMI distribution (normal: 23.1%, overweight: 30.6%, and obese: 46.3%) emphasize the significant role of obesity in breast cancer progression and patient survival. As shown in **Tab. 2.**, patients with obesity (BMI $\geq$ 30 kg/m^2) accounted for the largest proportion of the cohort (46.3%). Further, these patients were more likely to present with advanced-stage breast cancer. In particular, 62.5% and 50.0% of patients with stage 4 and 2 diseases, respectively, were obese. This result is following findings in the existing literature, which show that obesity is a risk factor for both the development and progression of breast cancer [28]. Obesity is associated with chronic inflammation, elevated estrogen levels, and insulin resistance, all of which can promote tumor growth and metastasis [29]. Further, individuals with obesity often encounter delayed diagnosis due to challenges in physical examination and imaging, which may contribute to a higher prevalence of advanced-stage disease in this patient group [30]. A higher BMI is consistently associated with poorer outcomes, including lower rates of breast-conserving surgery, higher rates of lymph node involvement, larger tumor size, higher tumor grade, and more advanced stage at diagnosis [31,32]. It is also related to an increased risk of recurrence and mortality from breast cancer or other causes [33]. These effects are observed regardless of menopausal status. Therefore, BMI influences the aggressiveness, responsiveness, and treatment tolerance of breast cancer [34,35].

In contrast, as shown in **Tab. 2.**, patients with a normal weight (BMI<25 kg/m^2) were more likely to be diagnosed at earlier stages (stage 1: 30.8%, stage 2: 25.9%). This finding is consistent with those of studies suggesting that individuals with a normal weight may have better access to early detection services or may be more likely to notice breast abnormalities due to the absence of excess adipose tissue [36]. However, the small proportion of patients with stage 1 breast cancer in our cohort (n = 26) emphasizes the need for improved early detection programs. The overweight group had an intermediate distribution across stages, with 41.4% of patients with stage 3 breast cancer falling under this category. This finding indicated that even moderate weight gain can influence breast cancer outcomes [37]. As depicted in **Tab. 2.**, the observed differences in stage distribution across BMI categories did not significantly differ, likely due to the relatively small sample size or population heterogeneity (P-value of 0.392

based on the Fisher's exact test). However, the clinical trends observed—particularly the higher proportion of patients with obesity who presented with advanced-stage disease—should be further investigated *via* larger, prospective studies.

The mechanisms underlying these associations are not completely understood. However, they may involve inflammation, immune system dysfunction, hormone resistance, and treatment toxicity. In postmenopausal women, a higher BMI is associated with an increased risk of developing breast cancer, particularly hormone receptor-positive types, due to elevated estrogen and insulin levels from excess body fat [38]. In contrast, premenopausal women with a higher BMI may have a reduced risk, likely due to hormonal changes that lower estrogen exposure [39]. The clinical implications of BMI on breast cancer are significant, as it is a modifiable risk factor for the prevention and management of breast cancer [40]. However, it alone cannot fully capture the complex association between body composition and breast cancer biology. Future research should explore alternative parameters such as waist circumference, waist-to-hip ratio, and body fat percentage. Health professionals and patients should prioritize maintaining a healthy weight and lifestyle habit to inhibit these risks. These findings, as illustrated in **Tab. 2.**, have important implications for the prevention and control of breast cancer in Iraq and similar settings. Public health interventions targeting weight management, such as community-based nutrition and physical activity programs, could help reduce the burden of obesity-related breast cancer. In addition, improving access to early diagnostic services, particularly for individuals with obesity, is critical for reducing the proportion of advanced-stage diagnoses [41].

Breast cancer is a complex disease influenced by various factors, including hormonal status, genetics, and lifestyle habits. As depicted in **Tab. 3.**, the association between menstrual cycle status (currently menstruating or not) and breast cancer stage at the time of diagnosis was explored. Data have shown that stage 2 breast cancer (47.9%) was most commonly detected at the time of diagnosis, followed by stage 1 (21.5%), stage 3 (24.0%), and stage 4 (6.6%). This distribution is in accordance with global trends, where early-stage diagnoses (stages 1 and 2) are more common than advanced-stage diagnoses (stages 3 and 4), likely due to improved screening practices and knowledge [42].

As shown in the **Tab. 3.**, patients were further categorized based on their menstrual cycle status. Patients who were currently menstruating ("yes," 57.0%) made up a slightly higher proportion of the total sample compared with those who were not menstruating ("no," 43.0%). Interestingly, the percentage of patients who were currently menstruating and diagnosed with stage 4 breast cancer (75.0%) was higher than that of patients who were not menstruating (25.0%). However, the absolute numbers of patients with stage 4 breast cancer are small (6 vs. 2), which limits the strength of this observation. A statistically significant association was not observed between menstrual cycle status and breast cancer state at the time of diagnosis (P-value of 0.7 based on the Fisher's exact test). This suggests that menstrual cycle status does not strongly influence the stage at which breast cancer is detected in this sample.

Menstrual cycle is closely associated with hormonal fluctuations, particularly estrogen and progesterone, which play a role in the development of breast cancer. Premenopausal women (particularly those who are currently menstruating) typically have higher levels of these hormones, which may contribute to tumor growth. However, the lack of a significant association indicates that other factors, such as genetics, lifestyle habits, and access to screening procedures, may play a more critical role in determining the disease stage at the time of diagnosis [43]. For example, postmenopausal women are more likely to be diagnosed with hormone receptor-positive breast cancer, which is likely to be associated with a better prognosis than the more aggressive subtypes, such as triple-negative breast cancer, which are more common in premenopausal women [44].

The current study had a limitation. In particular, the sample size of patients with stage 4 breast cancer (n = 8 only) was small. This decreases the statistical power to identify significant associations and limits the ability to draw solid conclusions about advanced-stage disease in relation to menstrual cycle status. Hence, larger-scale studies with comprehensive subtype information and adjustments for confounders should be performed to further explore this relationship [45].

Globally, differences in breast cancer stage at the time of diagnosis are often associated with access to healthcare and screening procedures. For example, women with a low SES are more likely to be diagnosed at advanced stages due to limited screening programs. The high proportion of stage 2 diagnoses in this sample may reveal improved awareness and screening practices in the population examined. Efforts to facilitate early detection, particularly in underserved areas, are important for reducing advanced-stage diagnoses and improving survival rates [46,47].

The current study showed interesting insights into the association between menstrual cycle status and breast cancer stage at the time of diagnosis. However, the lack of a significant association emphasizes the need for further research into the role of hormonal factors in breast cancer progression. To better understand this relationship, future studies should include larger sample sizes, detailed information on tumor subtypes, and adjustments for confounding factors to obtain a better understanding of the disease. In addition, efforts to improve early detection and access to screening procedures remain essential for reducing the burden of advanced-stage breast cancer worldwide.

Tab. 4. shows the analysis of the association between breast cancer stages and factors such as age, number of pregnancies, and number of abortions. Data revealed that the mean age of the patients increased slightly with advancing stages, from 49.65 years in stage 1–57.50 years in stage 4. However, based on the Kruskal-Wallis test, there were no statistically significant differences in age distribution across stages (p-value of 0.382). This showed that age alone may not be a strong predictor of disease progression in this cohort. Previous studies have shown that older age is generally associated with a higher risk of breast cancer. However, its association with advanced stage at the time of diagnosis is inconsistent. A previous research has revealed that younger women may develop more aggressive tumors [48]. Nevertheless, this trend was not observed in the current study.

In terms of the number of pregnancies, minimal variations were observed across stages, with mean values ranging from 4.12 in stage 2 to 4.50 in stage 4. However, the results did not show a significant association between the number of pregnancies and cancer stage (p-value of 0.985). This finding is in contrast with that of some studies showing that multiparity may influence breast cancer risk due to hormonal changes. Some studies have shown that multiple pregnancies can have a protective effect [49,50]. Meanwhile, others argue that prolonged estrogen exposure from repeated pregnancies might increase the risk. The lack of association in this dataset indicates that parity may not play a major role in determining the disease stage at the time of diagnosis in these patients.

The number of abortions reported across stages was generally low, with most women having no history of abortion (median = 0 for all stages). The mean values ranged from 0.42 in stage 1–0.60 in stage 2. Nevertheless, no significant difference was observed between the disease stages (p-value of 0.852). This finding is in accordance with those of large-scale meta-analyses, which showed no conclusive evidence linking induced abortions to an increased risk of breast cancer. The low prevalence of abortions in this sample further supports the notion that a history of abortion does not significantly influence disease progression.

CONCLUSION

Neither age, number of pregnancies, nor number of abortions was strongly associated with breast cancer stage in this dataset. However, the small proportion of patients with stage 4 breast cancer limited the generalizability of the results for advanced-stage diseases. Nevertheless, future studies with larger cohorts can provide more definitive insights, particularly if they account for additional variables such as hormone receptor status, genetic factors, and lifestyle habits. In addition, further research should be conducted to explore whether reproductive history interacts with tumor biology in ways that were not identified in this analysis.

ACKNOWLEDGEMENT

We extend our deepest gratitude to the Department of Surgery staff, who are behind-the-scenes efforts—from resource allocation to ethical compliance guidance—laid the foundation for this work. Their collaborative spirit and commitment to advancing patient care exemplify the ethos of this institution.

REFERENCES

1. **Siegel RL, Miller KD, Jemal A, et al.** Cancer statistics, 2020. *CA Cancer J Clin.* 2020;70:7-30.
2. **World Health Organization**. Cancer [online]. [Accessed 1 May 2024]
3. **Anand P, Kunnumakkara AB, Sundaram C, et al.** Cancer is a preventable disease that requires major lifestyle changes. *Pharm Res.* 2008;25:2097-2116.
4. **DeSantis CE, Cronin KA, Miller KD, et al.** Cancer statistics for women, 2019. *CA Cancer J Clin.* 2019;69:292-321
5. **Schottenfeld D, Winawer SJ**. Cancer epidemiology and prevention. 2nd ed. Oxford: Oxford University Press. 2000.
6. **Thun MJ, Linet MS, Cerhan JR, et al.** Cancer epidemiology and prevention. 4th ed. Oxford: Oxford University Press. 2017.
7. **Yen IH, Giger CS**. The role of culture and socioeconomic disparities in cancer prevention and control. *J Clin Oncol.* 2007;25:2524-2531.
8. **Baumgart LA, Gerling GJ, Bass EJ**. Characterizing the range of simulated prostate abnormalities palpable by digital rectal examination. *Cancer Epidemiol*. 2010;34:79-84.
9. **Renehan AG, Tyson M, Hurson J, et al.** Body-mass index and risk of 22 specific cancers: a systematic review and meta-analysis. *Lancet.* 2008;371:928-937.
10. **Chen HL, Zhou MQ, Tian W, et al.** Effect of age on breast cancer patient prognoses: a population-based study using the SEER 18 database. *PLOS One.* 2016;11:e0165409.
11. **Benz CC**. Impact of aging on the biology of breast cancer. *Crit Rev Oncol Hematol;* 2008;66:65-74.
12. **Siegel R, Ma J, Zou Z, et al.** Cancer statistics, 2014. *CA Cancer J Clin.* 2014;64:9-29.
13. **McGuire A, Brown JAL, Malone C, et al.** Effects of age on the detection and management of breast cancer. *Cancers Basel.* 2015;7:908-929.
14. **Aizer AA, Chen MH, McCarthy EP, et al.** Marital status and survival in patients with cancer. *J Clin Oncol.* 2013;31:3869-3876.
15. **Osborne C, Ostir GV, Du X, et al.** The influence of marital status on the stage at diagnosis, treatment, and survival of older women with breast cancer. *Breast Cancer Res Treat.* 2005;93:41-47.
16. **Kroenke CH, Kubzansky LD, Schernhammer ES, et al.** Social networks, social support, and survival after breast cancer diagnosis. *J Clin Oncol*. 2006;24:1105-1111.
17. **Smith RA, Andrews K, Brooks D, et al.** Cancer screening in the United States, 2016: a review of current American Cancer Society guidelines and current issues in cancer screening. *CA Cancer J Clin.* 2016;66:96-114.
18. **Fei X, Wu J, Kong Z, et al.** Urban-rural disparity of breast cancer and socioeconomic risk factors in China. *PLOS One.* 2015;10:e0117572.
19. **Khanna D, Sharma P, Budukh A, et al.** Rural-urban disparity in cancer burden and care: findings from an Indian cancer registry. *BMC Cancer.* 2024;24:308.
20. **Sharp L, Donnelly D, Hegarty A, et al.** The risk of several cancers is higher in urban areas after adjusting for socioeconomic status. *J Urban Health.* 2014;91:510-525.
21. **Palme M, Simeonova E**. Does women’s education affect breast cancer risk and survival? Evidence from a population-based social experiment in education. *J Health Econ.* 2015;42:115-124.
22. **Pranjić N, Gledo I, Maleš-Bilić L, et al.** The most common new cases of breast cancer among the housewives: some carcinogenic determinants. *Maced J Med Sci.* 2014;7:344-349.
23. **Timperi AW, Ergas IJ, Rehkopf DH, et al.** Employment status and quality of life in recently diagnosed breast cancer survivors. *Psychooncology.* 2013;22:1411-1420.
24. **Khan MA, Hanif S, Iqbal S, et al.** Presentation delay in breast cancer patients and its association with sociodemographic factors in North Pakistan. *Chin J Cancer Res.* 2015;27:288-293.
25. **Lobb R, Ayanian JZ, Allen JD, et al.** Stage of breast cancer at diagnosis among low-income women with access to mammography. *Cancer.* 2010;116:5487-5496.
26. **Adler NE, Newman K**. Socioeconomic health disparities: pathways and policies. *Health Aff Millwood.* 2002;21:60-76.
27. **Rademacher N, Zhou YM, McGinley EL, et al.** Effects of housing quality, housing stability, and contemporary mortgage lending bias on breast cancer stage at diagnosis among older women in the United States. *J Clin Oncol.* 2022;40:e18557.
28. **Devericks EN, Carson MS, McCullough LE, et al.** The obesity-breast cancer link: a multidisciplinary perspective. *Cancer Metastasis Rev.* 2022;41:607-625.
29. **Jin Q, Liu S, Zhang Y, et al.** Severe obesity, high inflammation, insulin resistance with risks of all-cause mortality and all-site cancers, and potential modification by healthy lifestyles. *Sci Rep.* 2025;15:1472.
30. **Cecchini RS, Costantino JP, Cauley JA, et al.** Body mass index and the risk for developing invasive breast cancer among high-risk women in NSABP P-1 and STAR breast cancer prevention trials. *Cancer Prev Res Phila.* 2012;5:583-592.
31. **Wong FY, Wong RX, Zhou S, et al.** Effects of housing value and medical subsidy on treatment and outcomes of breast cancer patients in Singapore: a retrospective cohort study. *Lancet Reg Health West Pac.* 2021;6:100065.
32. **Wang B, Zhu L, Jiang S, et al.** Association between body mass index and clinical characteristics, as well as with management, in Chinese patients with breast cancer. *J Int Med Res*. 2020;48:300060520949041.
33. **Wang J, Cai Y, Yu F, et al.** Body mass index increases the lymph node metastasis risk of breast cancer: a dose-response meta-analysis with 52904 subjects from 20 cohort studies. *BMC Cancer.* 2020;20:601.
34. **Harborg S, Cronin-Fenton D, Jensen MR, et al.** Obesity and risk of recurrence in patients with breast cancer treated with aromatase inhibitors. *JAMA Netw Open.* 2023;6:e2337780.
35. **Zhao C, Hu W, Xu Y, et al.** Current landscape: the mechanism and therapeutic impact of obesity for breast cancer. *Front Oncol.* 2021;11:704893.
36. **Kamineni A, Anderson ML, White E, et al.** Body mass index, tumor characteristics, and prognosis following diagnosis of early-stage breast cancer in a mammographically screened population. *Cancer Causes Control.* 2013;24:305-312.
37. **Chan DSM, Vieira AR, Aune D, et al.** Body mass index and survival in women with breast cancer-systematic literature review and meta-analysis of 82 follow-up studies. *Ann Oncol.* 2014;25:1901-1914.
38. **Saleh K, Carton M, Dieras V, et al.** Impact of body mass index on overall survival in patients with metastatic breast cancer. *Breast.* 2021;55:16-24.
39. **Picon-Ruiz M, Morata-Tarifa C, Valle-Goffin JJ, et al.** Obesity and adverse breast cancer risk and outcome: mechanistic insights and strategies for intervention. *CA Cancer J Clin.* 2017;67:378-397.
40. **Dehesh T, Fadaghi S, Seyedi M, et al.** The relation between obesity and breast cancer risk in women by considering menstruation status and geographical variations: a systematic review and meta-analysis. *BMC Womens Health.* 2023;23:392.
41. **Ginsburg O, Bray F, Coleman MP, et al.** The global burden of women's cancers: a grand challenge in global health. *Lancet.* 2017;389:847-860.
42. **Ginsburg O, Yip CH, Brooks A, et al.** Breast cancer early detection: a phased approach to implementation. *Cancer.* 2020;126:2379-2393.
43. **Xu H, Xu B**. Breast cancer: epidemiology, risk factors and screening. *Chin J Cancer Res*. 2023;35:565-583.
44. **Nishimura R, Osako T, Okumura Y, et al.** Triple negative breast cancer: an analysis of the subtypes and the effects of menopausal status on invasive breast cancer. *J Clin Med.* 2022;11:2331.
45. **Gao Y, Xiang L, Yi H, et al.** Confounder adjustment in observational studies investigating multiple risk factors: a methodological study. *BMC Med.* 2025;23:132.
46. **Nayyar S, Chakole S, Taksande AB, et al.** From awareness to action: a review of efforts to reduce disparities in breast cancer screening. *Cureus.* 2023;15:e40674.
47. **National Cancer Institute**. Breast cancer screening. 2023.

48. **Gabriel CA, Domchek SM**. Breast cancer in young women. *Breast Cancer Res.* 2010;12:212.

49. **Kelsey JL, Gammon MD, John EM**. Reproductive factors and breast cancer. *Epidemiol Rev.* 1993;15:36-47.

50. **Arthur R, Wassertheil-Smoller S, Manson JE, et al.** The combined association of modifiable risk factors with breast cancer risk in the Women's Health Initiative. *Cancer Prev Res Phila.* 2018;11:317-326.