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THE ASSOCIATION BETWEEN BODY MASS INDEX AND BREAST CANCER AMONG WOMEN IN BAGHDAD

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ABSTRACT

Background: Breast cancer is a leading cause of morbidity and mortality among women worldwide, with developing nations facing higher death rates due to inadequate awareness and limited early detection programs. Among several risk factors, body mass index (BMI) has been increasingly scrutinized for its potential association with breast cancer. **Aim:** This study aimed to evaluate the relationship between BMI and the risk of breast cancer among women in Baghdad. **Methods:** A case-control study was conducted from February to July 2024 in Al-Karkh teaching hospitals in Baghdad. The study included 234 women, divided equally into 117 cases with histologically confirmed breast cancer and 117 age-matched controls without breast cancer. Data were collected from clinic records and analyzed using SPSS version 28. **Results:** The majority of participants in both groups were aged 40–50 years and married. A higher percentage of breast cancer cases resided in urban areas and had a higher educational level compared to controls. Statistically significant associations were found between breast cancer and several variables, including age at menarche, parity, hormonal contraceptive use, postmenopausal status, hypertension, smoking, family history of breast cancer, and high BMI ($p < 0.05$). No significant association was observed with age, diabetes mellitus, or family history of other cancers. **Conclusion:** The findings suggest a significant association between high BMI and increased breast cancer risk among women in Baghdad. These results underscore the importance of public health strategies focused on weight management and routine screening to aid in early detection and risk reduction.

KEYWORDS: Body Mass Index, Breast Cancer, Women, Baghdad.

INTRODUCTION

Breast cancer (BC) is the most frequently diagnosed cancer among women, accounting for approximately 12.5% of all cancer cases globally and remaining a leading cause of female mortality worldwide.[1,2] Despite advancements in treatment, early detection remains the cornerstone of effective breast cancer control, with studies indicating that timely screening can reduce mortality by up to 40%.[2] In many developing countries, limited access to screening services and low awareness contribute significantly to late-stage diagnosis and increased death rates. Breast conditions are broadly categorized into malignant (cancerous) and benign (non-cancerous) types. Malignant tumors, such as carcinomas, have the potential to invade surrounding tissues and metastasize to distant sites, whereas benign conditions, though sometimes symptomatic, do not pose a life-threatening risk.[3] Clinical indicators of breast cancer include a palpable breast lump, changes in breast shape, nipple discharge, skin dimpling, a newly inverted nipple, or red or scaly patches on the skin. Numerous risk factors have been associated with breast cancer, including advancing age, female sex, genetic predisposition, environmental exposures, obesity, nutritional habits, alcohol use, hormone replacement therapy (HRT) post-menopause, ionizing radiation exposure, and a positive family history.[4,5] Obesity has emerged as a key modifiable risk factor in the etiology and progression of breast cancer. The association between obesity and cancer is complex and involves genetic susceptibility, environmental exposures, and lifestyle influences. One hypothesized mechanism is the chronic low-grade inflammatory state induced by obesity, particularly in white adipose tissue. This state contributes to immune

dysfunction through enhanced secretion of pro-inflammatory cytokines, altered macrophage behavior, and impaired T-cell function. Since the breast is primarily composed of adipose tissue, these alterations in the microenvironment may significantly influence tumorigenesis and cancer progression.[6,7] Moreover, obesity has been strongly linked with hormone receptor-positive breast cancer. Increased adiposity enhances aromatase enzyme activity, leading to higher circulating estrogen levels, while concurrently reducing the levels of sex hormone binding globulin (SHBG), thus increasing the availability of biologically active estrogen. These hormonal changes are believed to promote tumor growth and aggressiveness.[8,9] Clinical observations also support that obese breast cancer patients tend to present with more advanced disease, larger tumor sizes, higher lymph node involvement, and poorer prognostic outcomes. Furthermore, they are at an increased risk of recurrence, distant metastasis, reduced quality of life, and co-existing comorbidities such as diabetes, hypertension, and cardiovascular complications.[10,11] The aim of this study was to: Assess the relationship between body mass index (BMI) and breast cancer. Explore the role of early detection breast cancer clinics in diagnosing breast cancer.

METHOD

An analytical case-control study was conducted to assess the relationship between body mass index (BMI) and breast cancer, as well as to explore the role of early detection clinics in breast cancer diagnosis. The study was carried out over a six-month period, from the 1st of February 2024 to the end of July 2024. **Study Setting and Population:** This study was based on archived reports from three major breast screening clinics located in Baghdad City, specifically within Al-Karkh teaching hospitals: Imamein Kadhumein Medical City, Al-Yarmouk Teaching Hospital, and Al-Karkh General Hospital. The study population included women aged between 40 and 65 years who visited these clinics for breast cancer screening during the study period. **Sample Size and Selection:** A total of 234 reports were reviewed, consisting of 117 breast cancer cases confirmed through histopathology and 117 age-matched controls without breast cancer. All available eligible records within the specified timeframe were included. **Inclusion and Exclusion Criteria:** Inclusion criteria encompassed reports of women aged 40–65 years attending the breast screening clinics. Exclusion criteria included reports of pregnant women, women with a prior history of breast cancer, and reports of male patients. **Data Collection:** All required variables were extracted from patient reports, including demographic information, medical history, reproductive factors, and BMI. Missing data fields such as age at menopause and type of contraception were noted as study limitations. **Ethical Approval:** Ethical and administrative approvals were obtained from the Scientific Council of the Arab Board of Family Medicine and the Al-Karkh Health Directorate. Patient confidentiality was maintained, with all data anonymized. **Statistical Analysis:** Data analysis was performed using SPSS version 28. Descriptive statistics, including means, frequencies, and percentages, were used for data summarization. The Chi-square test was applied to examine associations between breast cancer and categorical variables. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

The study included 234 patient records, which were categorised into 117 cases with malignant breast cancer and 117 controls with normal breast examinations. Table (1) shows the socio-demographic characteristics of the study sample. It found that nearly half of the control and case groups were aged 40-50 years, (51.28%) and (44.44%) respectively. Most of the control and case groups were married, (87.17%) and (89.74%) respectively. About one-third of the control group had a high educational level and about half of the cases group had a high educational level (37.60%) and (43.58%) respectively**.** About two-thirds of the control group and three-quarters of the cases group live in urban areas (64.10%) and (76.06%) respectively.

Table 1: Distribution of the Socio-demographic data of breast cancer cases and controls.

Socio-demographic data	Control N=117	%	Case N=117	%
Age group				
40-50 yrs.	60	51.28%	52	44.44%
51-60 yrs.	42	35.89%	45	38.46%
61-65 yrs.	15	12.82%	20	17.09%
Marital status				
Married	102	87.17%	105	89.74%
Single	6	5.12%	4	3.41%
Widow	9	7.69%	8	6.83%
Educational level				
low	25	21.36%	23	19.65%
intermediate	48	41.02%	43	36.75%
high	44	37.60%	51	43.58%
Residency				
rural	42	35.89%	28	23.93%
urban	75	64.10%	89	76.06%

The results of the present study are described in Table (2), There was a significant statistical association between age, the number of births (parity), age at menarche, post-menopausal status, smoking and hypertension among breast cancer cases and controls. The corresponding p-values were 0.049, <0.001, 0.019, <0.001, 0.009, 0.04, respectively. There was no significant statistical association between diabetes and breast cancer (p value 0.13).

Table 2: Association of risk factors with breast cancer cases and controls.

Risk factor	Control N=117	%	Case N=117	%	P value
Age					
40-50 yrs.	60	51.28%	52	44.44%	0.49
51-60 yrs.	42	35.89%	45	38.46%	
61-65 yrs.	15	12.82%	20	17.09%	
Parity					
Nulliparous	18	15.38%	53	45.29%	<0.001*
1-2	45	38.46%	41	35.04%	
≥3kids	54	46.15%	23	19.65%	
Age at menarche					
≤11 years	28	23.93%	48	41.02%	0.019*
12-13 years	44	37.6%	36	30.76%	
≥14 years	45	38.46%	33	28.20%	
Menstrual status					
Pre-menopausal	86	73.5%	54	46.15%	<0.001*
Post-menopausal	31	26.49%	63	53.84%	
Smoking					
Ex/current smoker	3	2.6%	14	11.96%	0.009*
Never	114	97.4%	103	88.03%	
Other risk factors					
Hypertension	8	6.83%	19	16.23%	0.04*
Diabetes mellitus	5	4.27%	12	10.25%	0.13

Table (3) shows that 57% of cases use hormonal contraception, while (43%) of the control group use hormonal contraception, this shows a significant statistical association between hormonal contraception and breast cancer (p value 0.036).

Table 3: The association between hormonal contraception and breast cancer cases and control groups.

Risk factor	Control	Cases	Total	P value
+ Hormonal contraception	53	70	123	0.036*
- Hormonal contraception	64	47	111	
Total	117	117	234	

Table (4) showed a significant statistical association between family history of breast cancer and breast cancer (p value 0.0034). Family history of other cancers showed no significant statistical association with breast cancer (p value 0.313).

Table 4: The association of family history of breast cancer and other cancers with breast cancer cases and control groups.

Family History	Control	Percentage	Cases	Percentage	P value
+ve family history of breast cancer	27	23.07%	49	41.88%	0.0034*
-ve family history of breast cancer	90	76.92%	68	58.12%	
+ve family history of other cancers	30	25.64%	38	32.48%	0.313
-ve family history of other cancers	87	74.35%	79	67.52%	

The cases group reported various complaints with nearly half of the cases (45%) attending the clinics for screening. Additionally, (38%) of cases presented with a mass.

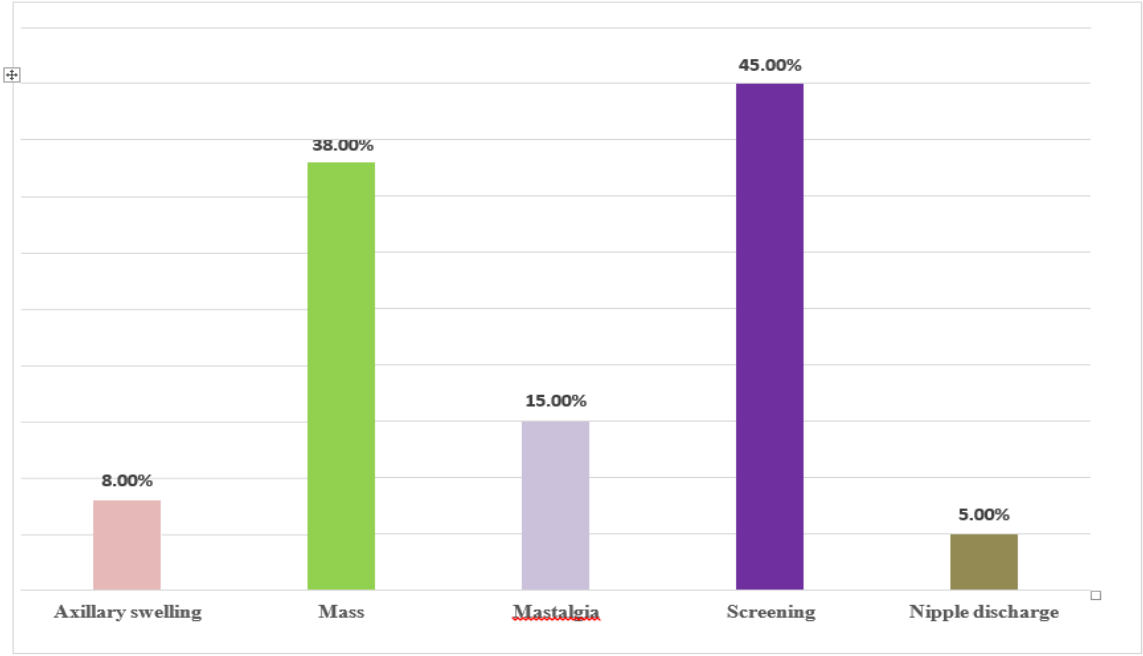

Figure 2: Distribution of case group according to presenting complaint.

In Table (5) the data showed that nearly half of cases (47.86) are obese. There is a significant statistical association between BMI and breast cancer (p value 0.019).

Table 5: The association between body mass index and case-control group.

BMI Group	Control (N=117)	Percentage	Case (N=117)	Percentage	P value
Underweight <18.5 kg/m²	8	6.83%	1	0.85%	0.019*
Normal weight 18.5-23 kg/m²	39	33.33%	28	23.93%	
Overweight 23 to 27.5 kg/m²	30	25.64%	32	27.35%	
Obese ≥ 27.5 kg/m²	40	34.18%	56	47.86%	

DISCUSSION

Breast cancer continues to pose a major public health challenge globally and is the most frequently diagnosed cancer among women. In 2020 alone, an estimated 2.3 million new cases were reported worldwide, accounting for 11.7% of all cancer cases and leading to approximately 685,000 deaths.[12] In Iraq, breast cancer remains the most common malignancy among females, constituting 35.9% of all female cancer cases, with 8,184 cases reported in 2022.[13] In this study, we analyzed data from 234 female patients to evaluate the relationship between various sociodemographic and clinical risk factors—including BMI—and the occurrence of breast cancer. The mean age of participants in the case group was 52.5 ± 7 years, compared to 50.7 ± 7 years in the control group. These findings align with previous studies such as those conducted in Pakistan and India, where mean ages in the breast cancer groups were within similar ranges.[14,15] The slightly older age in the case group might reflect increased susceptibility with advancing age. Regarding marital status, the majority of participants in both groups were married, consistent with the findings of Abdul Rauf et al.[14] Similarly, urban residence was more common among both case and control groups, comparable to the trends observed in the study by Nile et al. in Iraq.[16] This may be attributed to increased access to healthcare services and awareness in urban settings. Several reproductive and lifestyle factors showed significant associations with breast cancer. In this study, early age at menarche, lower parity, and postmenopausal status were all significantly associated with increased breast cancer risk. These results are consistent with studies by Abdul Rauf et al. and Nile et al., where postmenopausal status and low parity emerged as risk factors.[14,16] Smoking, also found to be significantly associated in our study ($p = 0.009$), corroborates findings from Abdul Rauf et al. ($p < 0.001$), emphasizing smoking as a modifiable risk factor.[14] Hypertension was significantly associated with breast cancer in this study ($p = 0.04$), which differs from Abdul Rauf et al., who found no such association ($p = 0.1$).[14] This divergence may reflect differences in population characteristics, disease stage, or healthcare access. Meanwhile, diabetes mellitus showed no significant association with breast cancer in our population, aligning with the findings of Nile et al. ($p = 1$).[16] A significant relationship was also found between hormonal contraception and breast cancer risk ($p = 0.036$).

However, this contrasts with the findings of Nile et al. who reported no significant association (p = 0.296).[16] This inconsistency may be due to variations in contraceptive type, duration, and user compliance across different settings. Importantly, family history of breast cancer was a significant risk factor (p = 0.003), reinforcing earlier findings from Abdul Rauf et al. (p = 0.04).[14] This underscores the role of genetic predisposition in breast cancer pathogenesis. Finally, this study confirmed a statistically significant association between elevated BMI and breast cancer (p = 0.019), consistent with several previous studies.[14-16] Obesity may contribute to carcinogenesis through mechanisms involving estrogen metabolism, inflammation, and insulin resistance. The results strongly support the view that obesity is not only a metabolic condition but also a critical cancer risk factor.

CONCLUSION

Most cases were identified during routine breast cancer screening. The age, age at menarche, parity, hormonal contraception, post-menopausal status, hypertension, smoking, family history of breast cancer and high body mass showed significant association with an increased risk of breast cancer. Family history of other cancers and diabetes mellitus showed no significant statistical association with breast cancer.

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