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OBESITY AND BREAST CANCER SCREENING: CROSS-SECTIONAL SURVEY

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ABSTRACT

Background: Breast cancer is a leading cause of cancer-related mortality among women, with early detection through mammography screening significantly reducing death rates. Despite these benefits, adherence to screening guidelines varies due to multiple barriers, including socioeconomic status, racial disparities, and geographic access. Obesity, a known risk factor for breast cancer, may influence mammography utilization, but the relationship remains inconsistent across studies. This study aimed to examine the association between body mass index (BMI) and mammography use, particularly across racial and ethnic groups, to address potential disparities in screening uptake. **Methods:** A retrospective cross-sectional analysis was conducted using data health survey. Women aged 50–74 years without a prior breast cancer diagnosis were included (N=10,000). Self-reported mammography use within the past two years served as the primary outcome, while BMI was the main exposure variable, categorized as normal (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), obese class I (30–34.9 kg/m²), obese class II (35–39.9 kg/m²), and obese class III (≥40 kg/m²). Additional variables included demographics, socioeconomic status, and healthcare access. Statistical analyses included descriptive statistics, chi-squared tests, logistic regression, and cubic spline regression to assess the relationship between BMI and mammography use. **Results:** Among respondents, 75.5% reported undergoing mammography within the past two years. Mammography use decreased with increasing BMI, with the lowest rates observed in obese class III women. Higher BMI was associated with younger age, lower educational attainment, lower income, and being unmarried ($p<0.01$). Multivariable logistic regression revealed that women in obese class II (OR 0.85, 95% CI: 0.78–0.93) and obese class III (OR 0.78, 95% CI: 0.70–0.87) had significantly lower odds of undergoing mammography compared to women with normal BMI. Racial and ethnic disparities further compounded these trends, particularly among underserved populations. **Conclusion:** Obesity negatively impacts mammography uptake, with obese class III women being the least likely to adhere to screening guidelines. These findings highlight the need for targeted interventions to address barriers to screening in obese women, with particular focus on racial and socioeconomic disparities. Improving access to mammography and addressing weight-related stigma in healthcare settings may enhance screening rates, ultimately reducing breast cancer mortality.

KEYWORDS: Additional variables included demographics, socioeconomic status, and healthcare access.

INTRODUCTION

Breast cancer stands as a significant health challenge, being among the most commonly diagnosed non-skin cancers and a leading cause of cancer-related mortality in women.[1] Early detection through screening mammography has been pivotal in reducing breast cancer mortality, with studies showing a remarkable 30% decline in death rates over recent decades.[2,3] To capitalize on these benefits, healthcare recommendations advocate for regular mammography screenings every two years for women aged 50 and above who are at an average risk of developing breast cancer.[4] However, the effectiveness of these guidelines heavily relies on adherence to screening schedules, making it essential to identify and address factors that hinder routine participation.

Several barriers to mammography uptake have been explored, including socioeconomic factors, racial and ethnic disparities, health insurance status, and geographic access to healthcare facilities.[5,6] These factors are known to play a significant role in determining whether women participate in recommended screening programs. However, the relationship between body mass index (BMI) and the likelihood of undergoing mammography screening remains ambiguous. Earlier research suggested that obese women, defined as having a BMI greater than 25 kg/m², may have lower screening rates compared to

women with a BMI in the normal range of 18.5–24.9 kg/m².[7,8] In contrast, more recent, smaller studies have reported no significant difference in screening rates between these groups, raising questions about the consistency of findings across various populations.

The issue becomes even more complex when examining how BMI and mammography use vary among racial and ethnic groups. Research in this area has yielded inconsistent results, with some studies identifying significant disparities and others finding no meaningful differences.[9-12] These inconsistencies underscore the need for further investigation into the intersection of obesity, racial/ethnic background, and access to mammography. By identifying these potential disparities, researchers and policymakers can better target interventions to improve screening participation in underserved populations.

Obesity is a well-documented risk factor for breast cancer, particularly in postmenopausal women.[13,14] Women with obesity are not only at an increased risk of developing breast cancer but are also more likely to have aggressive tumor subtypes that are associated with poorer prognoses and higher mortality rates.[15] This dual burden of increased incidence and worse outcomes makes it critically important to ensure that obese women are accessing and utilizing preventive measures such as mammography. However, the rising prevalence of obesity among women adds urgency to understanding how weight status impacts participation in regular screening programs.[16, 17]

This study leverages national cross-sectional survey data to examine the relationship between BMI and mammography use in obese women. The primary objectives are to explore how increasing BMI affects screening rates and to investigate whether these patterns differ across racial and ethnic groups. By addressing these gaps in knowledge, the findings aim to provide valuable insights into how obesity influences mammography uptake, offering an opportunity to design targeted interventions to reduce disparities and further decrease the burden of breast cancer on public health.

MATERIALS AND METHODS

This study utilized a retrospective, cross-sectional analysis of data collected from health survey aimed at exploring the association between mammography utilization and body mass index (BMI). The survey was conducted among non-institutionalized adult women, capturing information on health-related behaviors, chronic disease prevalence, and the use of preventive health services. For this research, data survey were selected, as this was the latest dataset that included comprehensive information on mammography use. The survey achieved a response rate of 48%, ensuring a diverse and representative sample.

The study included women aged 50–74 years without a prior diagnosis of breast cancer. Participants who did not provide clear responses regarding the timing of their last mammogram were excluded. Women with BMI values below 18.5 kg/m² were also excluded, as the study specifically focused on the impact of elevated BMI compared to a normal BMI range. Self-reported data on mammography usage within the past two years and BMI were collected. Additional variables included age, education level, income category, employment status, health insurance coverage, access to a primary care provider, and marital status.

Primary Outcome and Exposure

The primary outcome was self-reported mammography use within the previous two years, classified as either "yes" or "no." The main exposure of interest was BMI, which was analyzed both as a continuous variable and an ordinal variable. BMI categories were defined as follows: normal (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), obese class I (30–34.9 kg/m²), obese class II (35–39.9 kg/m²), and obese class III (≥40 kg/m²). Adjustments were made for confounding variables to ensure accurate analysis.

Confounders and Statistical Analysis

Potential confounders included age (categorized into five-year intervals), educational attainment (<high school, high school diploma or equivalent, some college, or college graduate), income level (<$12,000, $12,000–$24,999, $25,000–$49,999, $50,000–$74,999, or ≥$75,000), employment status (employed, unemployed, retired, or unable to work), health insurance status (insured or uninsured), having a primary care provider (yes or no), and marital status (married/partnered or single). These variables were accounted for to minimize potential bias in the analyses.

Descriptive statistics were used to compare participant demographics across BMI categories. Differences in characteristics between groups were assessed using linear regression for continuous variables and logistic regression for categorical variables. The percentage of women undergoing mammography within the past two years was calculated across BMI categories, and statistical significance was assessed using chi-squared tests.

Advanced Statistical Methods

The relationship between BMI and mammography use was first explored using a cubic spline regression model, allowing for a detailed examination of non-linear associations. The analysis compared the odds of mammography use at various BMI levels, using a BMI of 18.5 kg/m² as the reference point. Additionally, BMI was analyzed as a categorical variable to simplify interpretation. For this secondary analysis, a multivariable logistic regression model was employed to estimate odds ratios (ORs) for mammography use across BMI categories, both unadjusted and adjusted for

confounders. A type I error rate of 5% was applied to all analyses, with a significance level set at p<0.05. All statistical analyses were conducted using STATA 12 (StataCorp LLC), and results were presented with 95% confidence intervals (CIs) to ensure precision and reliability.

RESULTS

Of the survey respondents, 75.5% reported undergoing mammography within the past two years. Among the 1000 participants surveyed, 33.5% had a normal BMI, 32.6% were overweight, 19.3% were classified as obese class I, 8.4%were classified as obese class II, and 6.2% were classified as obese class III (Table 1). Higher BMI was associated with younger age (P ≤ .01), lower educational attainment (P < .01), lower income levels (P < .01), and being unmarried (P < .01). Although these differences were statistically significant, they may not represent a clinically meaningful difference due to the large sample size.

Table 1: Study Population Characteristics by BMI (N = 1000).

Characteristic	Normal BMI (18.5-24.9 kg/m²) (%)	Overweight BMI (25-29.9 kg/m²) (%)	Obese Class I BMI (30-34.9 kg/m²) (%)	Obese Class II BMI (35-39.9 kg/m²) (%)	Obese Class III BMI (>40 kg/m²) (%)
Age (years)					
50-54	0.25	0.23	0.23	0.22	0.26
55-59	0.22	0.21	0.21	0.22	0.25
60-64	0.22	0.22	0.23	0.24	0.23
65-69	0.17	0.19	0.19	0.19	0.15
70-74	0.14	0.16	0.13	0.14	0.10
Educational level					
<High school	0.08	0.12	0.15	0.17	0.18
High school or GED	0.25	0.29	0.29	0.32	0.33
Some college	0.32	0.33	0.36	0.33	0.34
College	0.35	0.26	0.20	0.18	0.15
Income level					
<$10,000	0.04	0.05	0.05	0.07	0.10
$10,000-<$15,000	0.04	0.06	0.07	0.10	0.11
$15,000-<$20,000	0.06	0.07	0.08	0.10	0.11
$20,000-<$25,000	0.07	0.09	0.09	0.11	0.13
$25,000-<$35,000	0.09	0.11	0.12	0.12	0.11
$35,000-<$50,000	0.12	0.14	0.14	0.14	0.15
$50,000-<$75,000	0.16	0.17	0.18	0.15	0.15
≥$75,000	0.41	0.32	0.26	0.21	0.16
Employment status					
Employed	0.48	0.46	0.42	0.38	0.34
Unemployed	0.04	0.04	0.04	0.05	0.05
Retired	0.29	0.31	0.30	0.29	0.24
Unable to work	0.08	0.10	0.14	0.20	0.28
Other	0.10	0.10	0.09	0.08	0.09
Health insurance					
Yes	0.94	0.94	0.94	0.94	0.92
No	0.06	0.06	0.06	0.06	0.08
Marital status					
Married	0.64	0.62	0.57	0.55	0.47
Unmarried	0.36	0.38	0.43	0.45	0.53

Abbreviations: BMI, body mass index; GED, General Education Development.

In our unadjusted analysis, overweight women were more likely to undergo mammography screening compared to women with normal BMI (OR, 1.15; 95% CI, 1.06-1.25 [P < .01]) (Table 2). After adjusting for factors such as age, income, insurance status, access to a personal physician, marital status, and education level, this association remained statistically significant (P ≤ .01). However, no significant differences in mammography screening rates were observed between women with normal BMI and those categorized as obese (class I-III) in either unadjusted or adjusted analyses. Additionally, no evidence of effect modification by other demographic variables was detected (P = .53).

Table 2: Association Between BMI and Mammography Use in the Last Two Years (Unadjusted and Adjusted ORs).

BMI	Unadjusted OR (95% CI)	P	Adjusted OR (95% CI)	P
Normal (18.5-24.9 kg/m²)	1 (Reference)	-	1 (Reference)	-
Overweight (25-29.9 kg/m²)	1.15 (1.06-1.25)	<.01	1.14 (1.05-1.25)	<.01
Obese class I (30-34.9 kg/m²)	1.08 (0.98-1.18)	0.11	1.05 (0.95-1.17)	0.33
Obese class II (35-39.9 kg/m²)	1.05 (0.94-1.18)	0.39	1.07 (0.94-1.21)	0.34
Obese class III (>40 kg/m²)	0.90 (0.79-1.02)	0.10	1.03 (0.89-1.20)	0.69

When analyzing subgroups by demographic characteristics, overweight women demonstrated higher odds of mammography use only in specific groups. Overweight women from certain demographic groups (e.g., OR, 1.11; 95% CI, 1.02-1.21 [P < .02]) were more likely to receive screening compared to their normal-BMI counterparts. However, there were no significant differences in mammography use among obese women (class I-III) compared to those with normal BMI across demographic categories (Table 3).

DISCUSSION

Obesity is linked to poorer breast cancer outcomes, with a significant proportion of cases and breast cancer-related mortality among postmenopausal women being associated with obesity.[19] Previous research has highlighted weight-related barriers to routine screening as key contributors to delayed breast cancer diagnosis and treatment, particularly among women with higher BMI.[20] Contrary to these reports, the findings of this study revealed no significant association between obesity and adherence to mammography screening recommendations. This lack of association was consistent across various demographic groups, suggesting potential shifts in attitudes toward body image and improvements in addressing facility-level challenges over time.

Earlier studies have shown that obese women diagnosed with breast cancer often present with more advanced disease stages.[21-23] The increased breast size associated with higher BMI may impede the early detection of small tumors, delaying diagnosis.[24] Additionally, socioeconomic disparities, which are more prevalent in obese populations, may further contribute to late-stage presentations.[25-26] Obesity also influences breast cancer outcomes after diagnosis, with treatment-related challenges such as reduced chemotherapy dosing due to concerns about toxicity, as well as obesity-related comorbidities, impairing the effectiveness of therapy.[27-29] Furthermore, obesity-associated factors like impaired immune function and elevated estrogen levels can reduce treatment efficacy and increase the risk of recurrence.[30] Surgical complications, challenges in radiation therapy delivery, and suboptimal responses to endocrine therapy have also been reported in obese women.[31,32]

These findings emphasize the importance of regular mammography screening for obese women. Interestingly, mammography may be more sensitive in obese women because they generally have less dense breast tissue, allowing for better tumor visibility compared to women with normal BMI.[33,34] This increased sensitivity, combined with limitations in detecting tumors through physical examination in women with larger breasts, underscores the value of mammographic screening in this population.

Previous studies suggested that obesity-related delays in screening were influenced by racial and cultural factors. For instance, earlier research found that obesity was a stronger predictor of delayed mammography in some demographic groups compared to others.[7,10] Patient-level factors, including cultural perceptions of body image, discomfort with the screening process, and experiences of insensitive comments from healthcare providers, have been proposed as barriers to screening uptake.[10] Limited mobility, insufficiently equipped facilities, and prioritization of comorbid conditions during medical consultations may also contribute to lower screening adherence among obese women.

However, the findings of this study suggest that such barriers might not have significantly impacted the participants. Changes over time, including improved healthcare provider attitudes, better accommodations for obese patients (e.g., appropriately sized equipment and gowns), and growing awareness of obesity-related health risks, may have reduced these barriers.[35,36] Additionally, cultural and social shifts, such as increased acceptance of larger body sizes, may have lessened feelings of self-consciousness during the screening process, further mitigating previous deterrents.

Unlike prior studies that focused primarily on specific demographic groups, this analysis found no significant differences in mammography adherence between obese and normal-weight women across all included demographics. Earlier research had suggested that cultural attitudes, particularly concerning self-perception and body image, contributed to disparities in screening behaviors among groups.[9,37] This study's results indicate that the increasing prevalence of obesity and changing societal norms may have led to a more uniform approach to screening adherence across all groups.

Despite its strengths, this study has limitations. It relied on self-reported data, which may be subject to recall or social desirability bias, as participants may underreport their BMI or overreport screening adherence.[38] Additionally, the cross-sectional nature of the study limits the ability to infer causality. While adjustments

were made for known factors influencing mammography use, unmeasured variables may have influenced the results.

Obese women face unique challenges related to routine mammography, and timely screening remains crucial given their increased risk of breast cancer and associated mortality. Although no significant link was observed between obesity and mammography adherence in this study, it remains essential to continuously evaluate and address potential barriers to screening in this population. As obesity rates rise, identifying and targeting modifiable factors will be critical to ensuring equitable access to and utilization of preventative healthcare services.

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