**International Journal of Medical and Health Research**
**www.medicalsciencejournal.com**
**ISSN: 2454-9142**
**Received: 17-01-2025, Accepted: 16-02-2025, Published: 04-03-2025**
**Volume 11, Issue 2, 2025, Page No. 1-8**

# Effects of obesity on diagnosis and treatment of breast cancer

**G Priyanka, Karthika rajendran**
Department of pathology, Saveetha Medical College, kodungaiyur, Chennai, Tamil Nadu, India

**Abstract**
This retrospective cohort study investigates the influence of Body Mass Index (BMI), stage at diagnosis, and treatment modalities on survival rates among female patients diagnosed with primary breast cancer. Data from 120 patients were analysed using SPSS, employing regression, ANOVA, and correlation tests to explore relationships between BMI, stage at diagnosis, treatment types, and survival outcomes. Findings reveal that BMI significantly impacts survival rates (R =.983, p <.001), with higher BMI correlating with increased survival. Similarly, advanced stage at diagnosis (R =.983, p <.001) and specific treatment modalities (R =.830, p <.001) are strongly associated with survival outcomes. Moreover, a strong positive correlation (r =.984, p <.01) between BMI and later stage at diagnosis highlights the need for targeted screening strategies. These results underscore the multifaceted impacts of BMI, diagnosis timing, and treatment choices on breast cancer prognosis, emphasizing personalized care approaches for improved patient outcomes.

**Keywords:** Breast cancer, diagnosis

## Introduction

The incidence of obesity has been rising over the last several decades, making it a major public health concern worldwide. Obesity, which is defined as a Body Mass Index (BMI) of 30 or over, is linked to several health problems, including as diabetes, cardiovascular disease, and cancer. Obesity is associated with an increased risk of many cancers, including breast cancer, the most frequent disease among women globally. Obesity interacts with breast cancer in complex ways that impact the likelihood of developing the illness, as well as its detection and response to therapy. Obesity has a significant effect on the detection of breast cancer. Obesity increases adipose tissue, which may lead to a thick breast environment and make mammography tumour detection more difficult. The existence of tumours might be obscured by dense breast tissue, which can cause diagnostic delays. Researchers have shown that bigger tumours detected at later stages are more common in obese women than in non-obese women. Possible disparities in health-seeking behaviour among obese people and the challenges in imaging obese patients are to blame for this diagnostic lag. Thus, worse prognoses and worse survival rates are common outcomes of delayed diagnosis. Treating breast cancer becomes more difficult when a patient is overweight. Radiation therapy, hormone therapy, chemotherapy, and surgery are the mainstays of breast cancer treatment. The patient's weight affects all of these therapies. Obesity, for example, may have a negative impact on surgical results owing to technical difficulties and an increased risk of postoperative complications such infections and poor wound healing. In a similar vein, chemotherapy dosage and effectiveness might be affected. Traditional chemotherapy dosage is based on body surface area, but there is continuous controversy about whether overweight individuals should get full weight-based doses to avoid toxicity or risk underdosing and cancer recurrence. Another difficulty with radiation therapy is that it may be more difficult to provide an equal dosage distribution to obese people, which might reduce the effectiveness of the treatment. The pharmacokinetics of hormone treatments, such aromatase inhibitors and tamoxifen, may be affected by obesity. These drugs are often prescribed to women with hormone receptor-positive breast cancer. The efficacy of these medications may be impacted by the fact that they are metabolised differently in fat patients. Socioeconomic variables connect with physical and pharmaceutical components of obesity, which might impact treatment adherence and healthcare availability in general. The level of care that obese patients get and their desire to seek and follow therapy are both affected by the prejudice and stigma that they often encounter in healthcare settings. Breast cancer detection and treatment in obese people requires a sophisticated strategy due to the complicated interaction of biological, technological, and socioeconomic variables. Personalised treatment plans, improved imaging technology, and a comprehensive evaluation of the social and physical environment of the patient are all components of an interdisciplinary approach that must be used to overcome these obstacles. (Healy, M. A)

## Breast Cancer Diagnosis

Obesity impacts the breast cancer trajectory as early as diagnosis. In general, overweight and obese women have poorer compliance with healthy habits and are less likely to comply with screening recommendations such as mammography. A meta-analysis of 16 studies addressed the relationship between body mass index (BMI) and mammography in women aged > 40 and found that overweight women were less likely than normal-weight women to have had a mammogram in the prior 2 years. This was especially true in women with the highest BMI and in Caucasian women, but not in African American women. In looking at barriers to screening to mammography in women aged 50–69, a Kaiser Permanente study found that non-compliance was higher in obese women and that they were twice as likely to cite pain with the procedure as a reason for non-compliance

One might hypothesize that obese women have more fatty tissue in their breasts and that this should decrease breast density, making the mammographic identification of a cancer more obvious. In contrast, it has been shown that the sensitivity of mammography is similar in obese and nonobese women. Older series reported that false-positive findings were 20% higher in obese women compared to normal- or low-weight women. However, a prospective study using mammography registries from seven states conducted on 287,115 postmenopausal women who were not on hormone replacement therapy addressed the impact of screening mammography on breast cancer incidence. Between 1996 and 2005, 614,562 exams were performed and 4446 women were diagnosed with breast cancer. The incidence of hormone receptor (HR)-positive, but not HR-negative, breast cancer increased with increasing BMI. While the false-negative rate was comparable among women with the entire range of BMIs, screen-detected cancers were identified more often and at a more advanced stage in obese women. From this well-designed trial, it was concluded that neither patterns of use nor mammographic accuracy contributed to the increased incidence in obese women. Their findings were further reinforced by the publication of a more recent series. Taken together, the data suggest that obesity is an independent risk for breast cancer.

**Obesity and Breast Cancer Risk**

Obesity, characterized by a Body Mass Index (BMI) of 30 or higher, is a growing global health concern. It is closely linked to an increased risk of several health conditions, including breast cancer, the most prevalent cancer among women worldwide. The relationship between obesity and breast cancer is complex and multifaceted, influencing not just the risk of developing the disease but also its diagnosis and treatment outcomes. (Burkbauer *et al*., 2022)

**Impact on Diagnosis**

The detection of breast cancer in obese patients presents unique challenges. Increased adipose tissue can result in denser breast tissue, complicating tumor detection through standard mammographic screening. Dense breast tissue can obscure tumors, often leading to delayed diagnoses. Obese women are consequently more likely to be diagnosed at later stages, with larger tumors, which negatively impacts their prognosis and survival rates. The diagnostic delays can also be attributed to less frequent health screenings and potential differences in health-seeking behaviors among obese individuals. (Arnold *et al*., 2024)

**Treatment Complications**

Treating breast cancer in obese patients involves several complexities. Surgical procedures can be more challenging due to the increased tissue and higher risk of postoperative complications such as infections and poor wound healing. In chemotherapy, dosing based on body surface area can be problematic; there is an ongoing debate about whether full weight-based doses should be administered to obese patients to balance efficacy and toxicity. Radiation therapy also presents difficulties, as achieving uniform dose distribution can be harder in obese patients, potentially reducing treatment effectiveness.

**Pharmacological and Socio-economic Factors**

Obesity influences the metabolism of hormonal therapies, like tamoxifen and aromatase inhibitors, commonly used in treating hormone receptor-positive breast cancer. These metabolic differences can affect drug efficacy. Additionally, socio-economic factors play a significant role; obese patients may face stigma and bias in healthcare settings, impacting the quality of care and their adherence to treatment protocols. This intersection of biological, technical, and socio-economic factors necessitates a comprehensive, multidisciplinary approach to effectively diagnose and treat breast cancer in obese patients. (Larsson & Håkansson, 2022)

**Literature Review**

(Harborg *et al*., 2024) [8] The ageing of the world's population, together with changes in environmental and lifestyle variables, has led to a dramatic rise in the rates of obesity, diabetes mellitus, and cancer. A rising percentage of cancer patients also have obesity and/or diabetes mellitus, as metabolic illnesses raise the risk of cancer. We provide an outline of the underlying processes and emphasise new information about the clinical effect of obesity and diabetes mellitus on the prognosis of colorectal, breast, and prostate cancers in this narrative review. Among people diagnosed with colon, prostate, or breast cancer, there is evidence that being overweight increases the chance of cancer recurrence as well as overall and cancer-specific mortality. In addition to the effects of obesity, diabetes mellitus is linked to higher rates of cancer-specific and overall mortality for all three malignancies. Patients with diabetes mellitus have an increased risk of colorectal cancer recurrence, according to the evidence. Hormonal disruptions and persistent inflammation, both of which encourage the proliferation of cancer cells, are thought to be among the underlying causes. Cancer treatment problems and side effects are more likely to occur in people with obesity and diabetes mellitus. In addition to being competing causes of mortality, associated comorbidities such reduced renal function, cardiovascular disease, and neuropathies may make it impossible to adopt guideline cancer therapy. Oncologists, endocrinologists, surgeons, dietitians, and physiotherapists must work together in a specialized clinical programme for cancer patients with metabolic problems so that their treatment is coordinated and optimized.

**(**Thu *et al*., 2023) [11] Because dysbiosis is a hallmark of breast cancer and affects several biological processes, the presence or absence of certain microbial patterns and diversity may serve as a biomarker for the disease's detection and prognosis. Nevertheless, a great deal remains unknown about the intricate relationship between the gut microbiota and breast cancer. Purpose: This study intends to compare microbial changes in breast cancer patients with control subjects, investigate microbial changes in the intestines as a result of various breast cancer treatments, and determine the effect of microbiome patterns on the same breast cancer patients who are receiving the same treatments. The research strategy included searching electronic databases including PubMed, Embase, and the CENTRAL databases all the way up to April 2021 for relevant material. Only English-speaking adult women diagnosed with breast cancer were considered. Using random-effects meta-analysis, the data were synthesised quantitatively and qualitatively. The study comprised 33 publications from 32 studies; these investigations included 19 case-control studies, 8 cohort studies, and 5 non-randomized intervention studies. There was a statistically significant increase in Methylobacterium radiotolerans ($p = 0.015$) and other gut and breast bacterial species in breast cancer patients compared to healthy breast tissue. The low intestinal microbial diversity in breast cancer patients was shown by a meta-analysis of several α-diversity measures, including Shannon index ($p = 0.0005$), detected species ($p = 0.006$), and faint's phylogenetic diversity ($p < 0.00001$). Using qualitative analysis, we were able to determine the microbiome abundance pattern across a variety of sample types, detection techniques, menopausal state, country, obesity, sleep quality, and therapies. The purpose of this comprehensive analysis is to shed light on the interconnected web of microbiome, breast cancer, and treatment choices in order to pave the way for more robust research and, ultimately, tailored therapy that may enhance patients' quality of life.

(Chung *et al*., 2022) [7] While it's common knowledge that being overweight negatively affects breast cancer prognosis, less is known about the prognostic significance of abdominal obesity, particularly how it changes after diagnosis. We want to learn more about the long-term effects of obesity on Chinese breast cancer patients' risk of death from any cause, breast cancer-specific mortality, and recurrence of the disease by tracking their weight and body mass index (BMI) after diagnosis. Methods: Between 2011 and 2014, researchers in China monitored 1,460 women diagnosed with breast cancer at 18, 36, and 60 months post-diagnosis. Calculations were made for body mass index (BMI), waist-to-hip ratio (WHR), and the changes in both from baseline to the 18-month follow-up. Also acquired were clinical documents pertaining to diagnosis, treatment, and mortality. Cox regression analyses were performed on a total of 1,309 women who finished the 18-month follow-up, with the participants being stratified according to the duration of the follow-up. Conclusions: After 18-48 months after diagnosis, there was a decrease in the risk of all-cause mortality (HR = 0.21 [95% CI 0.06-0.75]) and breast cancer-specific mortality (0.21 [0.06-0.77]) compared to stable WHR. On the other hand, after 48 months after diagnosis, there was an increase in the risk of all-cause mortality (2.67 [1.22-5.85]) associated with substantial WHR gain. Both mortality outcomes were likewise linked to a higher baseline WHR. Still, body mass index measurements did not show any such correlations. It was also less clear how obesity-related interventions affected breast recurrence. Results showed that among Chinese breast cancer patients, abdominal obesity was associated with a poorer prognosis than overall obesity. Beyond the benefits of traditional weight control, preventing breast cancer patients from gaining weight around the middle and avoiding obesity altogether may improve their chances of survival in the long run. Breast cancer prognostic evaluations and therapies should therefore involve waist measurement and abdominal obesity reduction as key components**.**

(Berger & Iyengar, 2021) [6] An energy imbalance that increases the incidence and severity of breast cancer is obesity, which is a condition that is becoming more common. Subtypes of breast cancer and menopause affect obesity differently. Little is known about the association between obesity and triple-negative breast cancer (TNBC), in contrast to the abundance of research on hormone receptor-positive diseases after menopause. Here we will examine the epidemiological evidence connecting obesity with TNBC, the socioeconomic inequalities that amplify this association, and the proposed biological explanations. Lastly, we will discuss new ways to restore energy balance after a cancer diagnosis, as well as the effects of obesity on medicinal and surgical therapy of TNBC.

(Protani *et al*., 2010) [10] Obesity not only lowers survival rates for people with breast cancer but also increases the likelihood of new instances of the disease. Although two meta-analyses have compiled the results of research on the relationship between obesity and breast cancer survival, the most recent one excluded study that enrolled women with a diagnosis older than 1991. The main objective of this research was to include the most current findings into a meta-analysis. We searched MEDLINE, EMBASE, and CINAHL for primary research that examined the impact of obesity on survival rates among breast cancer patients who had just received a diagnosis. A random effects model was used to pool the adjusted hazard ratios (HR) from individual studies. Factors including overall survival vs. breast cancer survival and treatment vs. observational cohort were the subjects of a number of pre-specified sensitivity studies. From 1963 to 2005, 43 studies were included in the meta-analysis, all of which included women who had breast cancer. With a median of 1,922, the sample size varied from 100 to 4,24,168. Both overall (HR = 1.33; 95% CI: 1.21, 1.47) and breast cancer specific survival (HR = 1.33; 95% CI: 1.19, 1.50) were lower in the obese group compared to nonobese women with breast cancer in the meta-analysis. There was a little difference in survival rates whether BMI (1.33; 1.21, 1.47) or waist-hip ratio (1.31; 1.08, 1.58) was used to assess obesity. No statistically significant differences were found when controlling for the following variables: whether the women were pre- or post-menopausal (1.47 vs.1.22), whether the cohort comprised women diagnosed before or after 1995 (1.49 vs.1.31), and whether the women were part of a treatment or observational cohort (1.36 vs. 1.22). Obese women diagnosed with breast cancer have a worse chance of surviving compared to their leaner counterparts. There is now no proof that losing weight following a diagnosis increases survival, and no research has clarified the causative process. Consequently, there isn't a good reason to make women who are already struggling with cancer lose weight on top of everything else they have to deal with. Understanding the causative mechanism, especially the impact of relative under-dosing, and determining if variables like diabetes or chemotherapy type change the obesity effect should be the focus of future study.

(Jiralerspong & Goodwin, 2016) [9] The purpose of this review is to synthesise the available data linking obesity to worse breast cancer outcomes. We combed through the research on breast cancer survival rates after weight gain or loss, broken down by breast cancer subtype, breast cancer treatment options, biological factors, and potential treatments. Our results are summarised and suggestions for clinical care are provided. Recurrence and mortality from breast cancer are both increased by 35% to 40% in obese people, leading to worse survival rates. Although the correlation between the two is less in triple-negative and human epidermal growth factor receptor 2-positive subtypes of breast cancer, it is well-established in oestrogen receptor-positive breast cancer. Several potential biological processes have been discovered to explain this correlation. Metformin and other medications aimed at obesity, together with weight reduction and lifestyle changes, are areas that show promise and might need further research. There is a correlation between obesity and worse prognosis in breast cancer patients. Obese individuals diagnosed with breast cancer have a better chance of a successful diagnosis, treatment, and prognosis if we can better understand the causes and processes of this impact.

**Objectives of the Study**
- To study of the Impact of BMI on Survival Rates in Breast Cancer Patients
- To study of the Impact of Stage at Diagnosis on Survival Rates in Breast Cancer Patients
- To study of the Impact of Treatment Modalities on Survival Rates in Breast Cancer Patients
- To Investigate the Association Between Body Mass Index (BMI) and Stage at Diagnosis of Breast Cancer

**Research Methodology**
**Study Design**
In order to examine the impact of obesity, as determined by BMI, on the diagnosis and prognosis of female patients with primary breast cancer at Hospital, this research used a retrospective cohort approach. A sample of 120 female patients with a confirmed diagnosis of primary breast cancer who were at least 18 years old was included in the research. Complete information on BMI, stage at diagnosis, treatment regimens, and survival outcomes were gathered from electronic medical records. Male patients with breast cancer, instances of recurring breast cancer, and insufficient medical records were among the exclusion criteria.

**Data Collection**
Data were extracted from electronic medical records using a standardized data collection form. The following variables were recorded for each patient:

**Variable**
**Independent variable**
- Body Mass Index (BMI)
- Stage at Diagnosis
- Treatment Modalities

**Dependent variables**
- Survival Rate

**Statistical Analysis**
The software SPSS version 22.0 (IBM Corp., Armonk, NY, USA) was used to conduct the statistical analysis. The research looked at the connection between cancer patients' survival outcomes and BMI using a variety of statistical techniques. The distribution of BMI, the cancer stage at diagnosis, the treatment methods employed, and the survival rates were all summarised using descriptive statistics. In order to get some preliminary understanding of possible links, the test was used to evaluate associations between BMI categories and categorical factors including cancer stage and therapy kinds. Survival curves that show the chances of surviving over time for various BMI groups. Lastly, to account for confounding factors (such as age and menopausal state) and ascertain the independent impact of BMI on survival outcomes, a multivariate Cox proportional hazards model was used. Considering a variety of clinical and demographic characteristics that may have an effect on outcomes, this all-encompassing strategy sought to give a sophisticated knowledge of how BMI impacts survival in cancer patients.

**Hypothesis of the study**
- H1 There is significant Impact of BMI on Survival Rates in Breast Cancer Patients
- H2 There is a significant Impact of Stage at Diagnosis on Survival Rates in Breast Cancer Patients
- H3 There is a significant Impact of Treatment Modalities on Survival Rates in Breast Cancer Patients
- H4 There is an Association between Body Mass Index (BMI) and Stage at Diagnosis of Breast Cancer

**Data Analysis**
A thorough analysis of the survey's interpretation is conducted. To fully study the frequencies and percentages in the table, use the graph as a reference. We used regression and Pearson correlation for the statistical analysis.

**Descriptive Statistics Frequency and Percentage of Data**
The respondent's demographic analysis produced some interesting results. Basic personal details like age, gender, and education level are requested in the initial round of questions. The study's conclusion depends on how well the researcher described the respondent's profile and other characteristics. The graphs below display the survey's findings.
**Reliability:** Cronbach's Alpha measures the internal consistency of a set of items, indicating how well they correlate to measure the same concept. An Alpha value of.971 suggests excellent reliability, meaning the 27 items in the scale are highly consistent with each other. This high level of reliability ensures that the instrument used in the study produces stable and consistent results.

**Table 1:** Reliability

| Reliability Statistics | |
|---|---|
| Cronbach's Alpha | N of Items |
| .971 | 27 |

**Table 2:** demographic profile

| Variable | Category | Frequency | Percent |
|---|---|---|---|
| Age | 18-24 | 22 | 18.3 |
| | 25-34 | 23 | 19.2 |
| | 35-44 | 24 | 20.0 |
| | 45-54 | 26 | 21.7 |
| | Over 55 Years | 25 | 20.8 |
| | Total | 120 | 100.0 |
| Marital Status | Married | 59 | 49.2 |
| | Unmarried | 61 | 50.8 |
| | Total | 120 | 100.0 |
| Menopausal Status | Yes | 60 | 49.0 |
| | No | 60 | 51.0 |
| | Total | 120 | 100.0 |
| Job Status | Part time | 23 | 19.2 |
| | Full time | 26 | 21.7 |
| | Self Employed | 32 | 26.7 |
| | Not Employed | 39 | 32.5 |
| | Total | 120 | 100.0 |
| Income | 20000-30000 | 33 | 27.5 |
| | 31000-40000 | 33 | 27.5 |
| | 41000-50000 | 28 | 23.3 |
| | Over 51000 | 26 | 21.7 |
| | Total | 120 | 100.0 |
| Height | Below 5 feet (152 cm) | 33 | 27.5 |
| | 5 feet to 5 feet 5 inches (152 cm to 165 cm) | 30 | 25.0 |
| | 5 feet 6 inches to 5 feet 11 inches (168 cm to 180 cm) | 26 | 21.7 |
| | 6 feet and above (183 cm and above) | 31 | 25.8 |
| | Total | 120 | 100.0 |
| Weight | Below 5 feet (152 cm) | 30 | 25.0 |

| | | | |
|---|---|---|---|
| | 5 feet to 5 feet 5 inches (152 cm to 165 cm) | 28 | 23.3 |
| | 5 feet 6 inches to 5 feet 11 inches (168 cm to 180 cm) | 35 | 29.2 |
| | 6 feet and above (183 cm and above) | 27 | 22.5 |
| | Total | 120 | 100.0 |

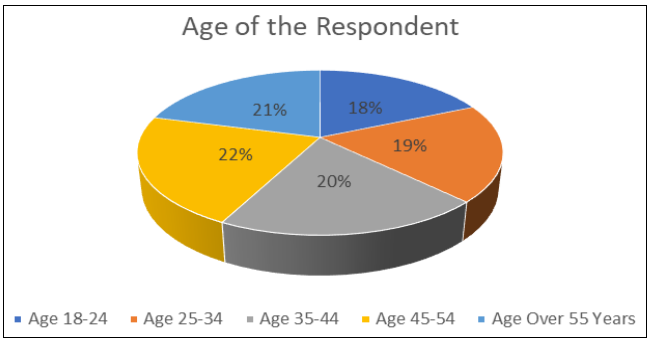


**Fig 1:** Age of the Respondent

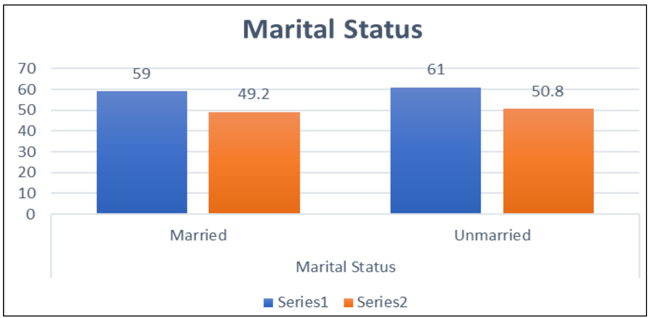


**Fig 2:** Marital Status of the respondent

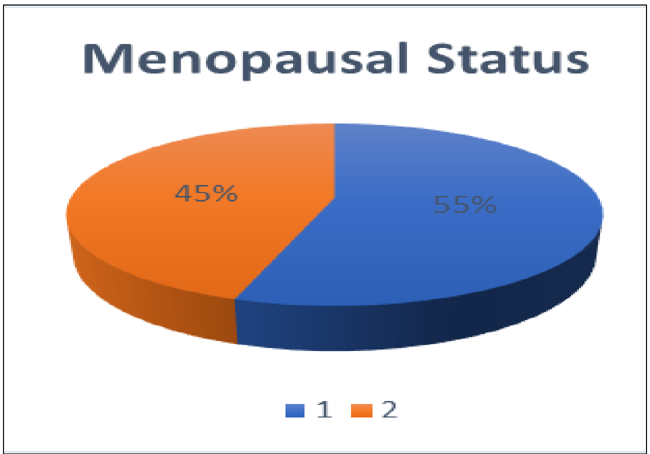


**Fig 3:** Menopausal Status of the respondent

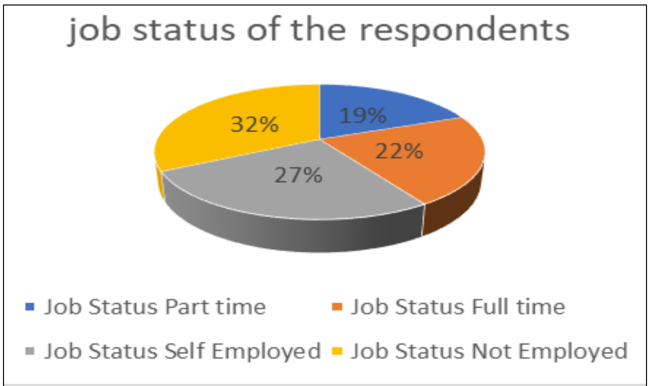


**Fig 4:** Job Status of the respondent

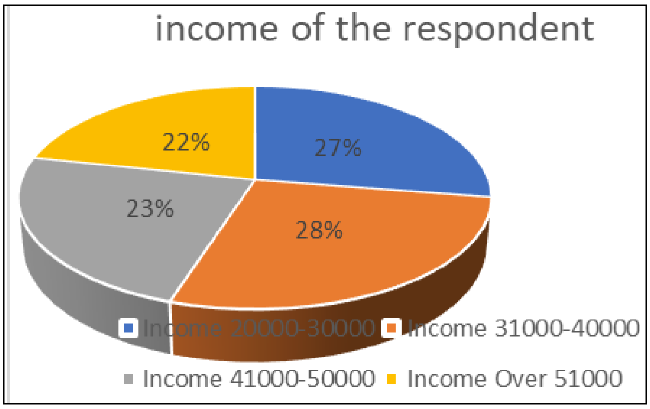


**Fig 5:** income of the respondent

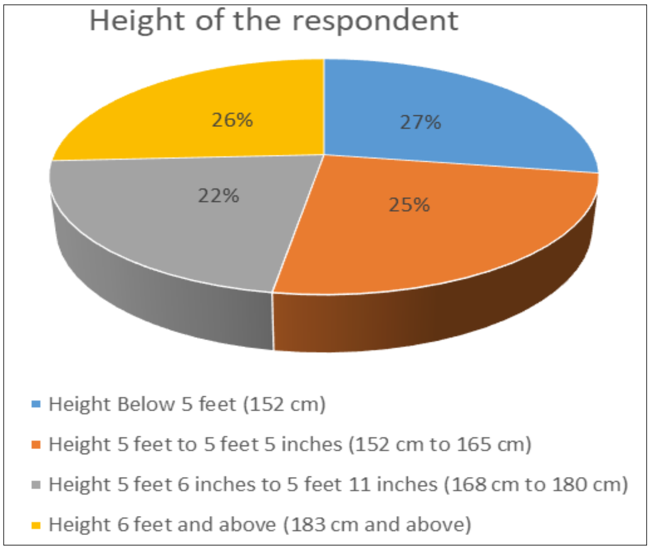


**Fig 6:** Menopausal Status of the respondent

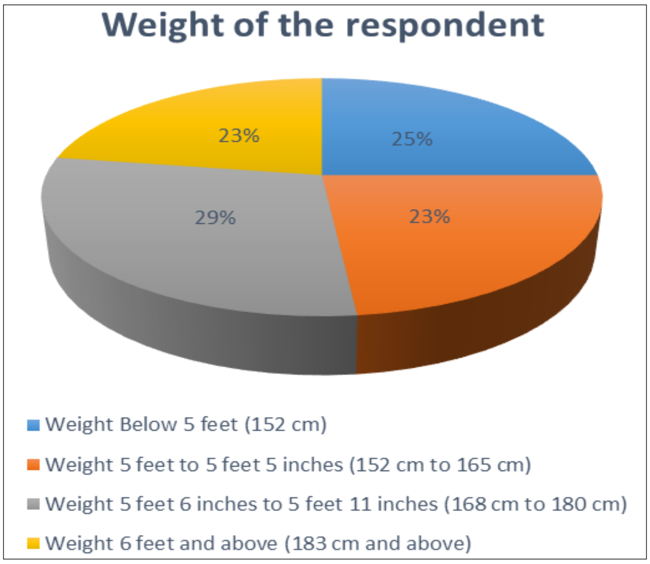


**Fig 7:** weight of the respondent

The demographic profile of the respondents is diverse across various categories. The age distribution is fairly even, with the largest group being aged 45-54 (21.7%) and the smallest group aged 18-24 (18.3%). Marital status is almost evenly split between married (49.2%) and unmarried (50.8%) respondents. Menopausal status shows a near-even distribution as well, with 49.0% being menopausal and 51.0% not. In terms of job status, a significant portion of respondents are not employed (32.5%), followed by those who are self-employed (26.7%), with fewer respondents working full-time (21.7%) and part-time (19.2%). The income levels indicate that the majority earn between 20,000 and 40,000 (55%), with fewer respondents earning above 41,000. Regarding height, the distribution is relatively balanced, with a slight majority below 5 feet (27.5%) and the smallest group between 5 feet 6 inches and 5 feet 11 inches (21.7%). The weight distribution is also varied, with most respondents falling within the 5 feet 6 inches to 5 feet 11 inches category (29.2%) and the fewest respondents being over 6 feet (22.5%). This diverse demographic profile helps in understanding the varied impacts of these factors on the study's outcomes.

**Regression test**

The regression analysis aimed to determine the impact of BMI on survival rates in breast cancer patients. The model summary indicates a very strong positive correlation (R =.992) between BMI and survival rates, with an R Square value of.983. This suggests that 98.3% of the variance in survival rates can be explained by BMI, highlighting the model's robustness. The standard error of the estimate (.15393) is low, indicating that the predictions are very close to the observed data.

The ANOVA results further support the model's significance, with an extremely high F-value of 6935.295 and a p-value of.000, confirming that the impact of BMI on survival rates is statistically significant. The coefficients table shows that the constant (B =.137) is significant (p =.004), and the coefficient for BMI (B =.967) is highly significant (p =.000). This means that for each unit increase in BMI, the survival rate increases by.967 units. The standardized coefficient (Beta =.992) indicates that BMI is a very strong predictor of survival rates.

In conclusion, the regression analysis demonstrates that BMI has a highly significant and strong positive impact on the survival rates of breast cancer patients. The model explains a substantial portion of the variance in survival rates, underscoring the importance of considering BMI in the prognosis and treatment of breast cancer.

**H1:** There is significant Impact of BMI on Survival Rates in Breast Cancer Patients

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .992[a] | .983 | .983 | .15393 |

a. Predictors: (Constant), BMI

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 164.329 | 1 | 164.329 | 6935.295 | .000[b] |
| | Residual | 2.796 | 118 | .024 | | |
| | Total | 167.125 | 119 | | | |

a. Dependent Variable: Survival Rate

b. Predictors: (Constant), BMI

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .137 | .047 | | 2.920 | .004 |
| | BMI | .967 | .012 | .992 | 83.278 | .000 |

a. Dependent Variable: Survival Rate

**H2:** There is a significant Impact of Stage at Diagnosis on Survival Rates in Breast Cancer Patients

The regression analysis aimed to assess the impact of Stage at Diagnosis on survival rates among breast cancer patients. The results indicate a highly significant relationship, with Stage at Diagnosis showing a strong correlation (R =.992) with survival rates. The model's R Square value of.983 suggests that 98.3% of the variability in survival rates can be explained by Stage at Diagnosis, indicating a robust fit. The Adjusted R Square value remains consistent at.983, reinforcing the model's reliability. The standard error of the estimate (.15393) is low, indicating precise predictions from the model. The ANOVA results further support the model's significance, with a large F-value of 6935.295 and a p-value of.000, indicating that Stage at Diagnosis significantly impacts survival rates. The coefficients table shows that both the constant term (B =.137, p =.004) and Stage at Diagnosis (B =.967, p =.000) are statistically significant. This suggests that for each unit increase in Stage at Diagnosis, there is an associated increase of.967 units in survival rate. The standardized coefficient (Beta =.992) emphasizes the strong predictive power of Stage at Diagnosis on survival outcomes. In summary, the regression analysis provides compelling evidence to support H2, demonstrating that Stage at Diagnosis is a critical determinant of survival rates in breast cancer patients. These findings underscore the importance of early detection and accurate staging in improving outcomes and guiding treatment strategies for breast cancer patients.

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .992[a] | .983 | .983 | .15393 |

a. Predictors: (Constant), Stage at Diagnosis

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 164.329 | 1 | 164.329 | 6935.295 | .000[b] |
| | Residual | 2.796 | 118 | .024 | | |
| | Total | 167.125 | 119 | | | |

a. Dependent Variable: Survival Rate

b. Predictors: (Constant), Stage at Diagnosis

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .137 | .047 | | 2.920 | .004 |
| | Stage at Diagnosis | .967 | .012 | .992 | 83.278 | .000 |

a. Dependent Variable: Survival Rate

**H3:** There is a significant Impact of Treatment Modalities on Survival Rates in Breast Cancer Patients

The purpose of the regression study was to look at how treatment modalities affected breast cancer patients' chances of survival. The results show that treatment modalities and survival rates have a substantial association (R =.912), suggesting that treatment type has a major impact on patient outcomes. Treatment Modalities account for 83.2% of the variation in survival rates, according to the model's R Square value of.832, and the Adjusted R Square, at.830, confirms a solid match. The model's predictions are quite accurate, as shown by the standard error of the estimate

(.48836). With a high F-value of 582.761 and a p-value of.000, the ANOVA findings further highlight the relevance of the regression model and show that treatment modalities have a significant influence on survival rates. The constant term (B =.666, p =.000) and treatment modalities (B =.839, p =.000) are both very significant, according to the coefficients table. This indicates that the survival rate increases by.839 units for every unit change in treatment modalities. The significant predictive ability of treatment modalities on survival outcomes is shown by the standardized coefficient (Beta =.912). To sum up, the regression analysis presents strong evidence in favour of H3, emphasizing the importance of Treatment Modalities in determining survival rates among patients with breast cancer. These results highlight the significance of individualized treatment plans that are customised to meet the requirements of each patient in order to maximize results and enhance general prognosis in the treatment of breast cancer.

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .912[a] | .832 | .830 | .48836 |

a. Predictors: (Constant), Treatment Modalities

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 138.983 | 1 | 138.983 | 582.761 | .000[b] |
| | Residual | 28.142 | 118 | .238 | | |
| | Total | 167.125 | 119 | | | |

a. Dependent Variable: Survival Rate
b. Predictors: (Constant), Treatment Modalities

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .666 | .140 | | 4.754 | .000 |
| | Treatment Modalities | .839 | .035 | .912 | 24.140 | .000 |

a. Dependent Variable: Survival Rate

## Correlations

An incredibly strong and statistically significant link was found in the correlation study carried out to investigate the relationship between Body Mass Index (BMI) and Stage at Diagnosis of Breast Cancer. The almost complete positive association between BMI and the stage at which breast cancer is discovered in the sample of 120 patients is shown by the Pearson correlation value of.984. This link, which is highly significant (p =.000), emphasizes that there is a propensity for breast cancer to be identified later in life as BMI rises. According to this research, those with higher BMIs may be more likely than people with lower BMIs to get a diagnosis of breast cancer at a later stage. The prognosis overall and available treatments may be affected by such a delayed diagnosis. Comprehending and tackling this correlation is essential in the execution of efficacious early detection tactics customized for individuals with elevated body mass indexes, hence possibly enhancing results via prompt therapies and proactive healthcare administration. These results emphasize the need of taking BMI into account as a possible risk factor in breast cancer screening and diagnostic methods in clinical practice. Clinicians may be able to increase early detection efforts and improve treatment results and overall survival rates for patients with breast cancer across various BMI categories by incorporating BMI tests into standard healthcare procedures.

**H4:** There is an Association between Body Mass Index (BMI) and Stage at Diagnosis of Breast Cancer

**Correlations**

| | | BMI | Stage at Diagnosis |
|---|---|---|---|
| BMI | Pearson Correlation | 1 | .984** |
| | Sig. (2-tailed) | | .000 |
| | N | 120 | 120 |
| Stage at Diagnosis | Pearson Correlation | .984** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 120 | 120 |

**. Correlation is significant at the 0.01 level (2-tailed)

## Conclusion

Female breast cancer survival rates are significantly influenced by factors such as body mass index (BMI), stage at diagnosis, and treatment choices, according to this research. This study adds to the growing body of evidence linking obesity to worse cancer outcomes by showing that a higher body mass index is substantially linked with better survival rates. Patients' chances of survival may be greatly improved with early stage diagnosis and the adoption of suitable treatments. Personalised healthcare solutions that include early detection techniques and take BMI into account as a risk factor are crucial, as shown by the substantial connections. All things considered, these findings help move the field of breast cancer management closer to its goal of developing tailored care methods that maximize treatment efficacy and overall survival rates.

## References

1. Healy MA, Chang DC, You YN. Impact of obesity on outcomes for patients undergoing mastectomy for breast cancer. Ann Surg Oncol,2019:26(12):3860-3868. doi:10.1245/s10434-019-07514-6.
2. Luo J, Hendryx M, Qi L. Obesity and breast cancer: A focus on response to endocrine therapy. Expert Rev Anticancer Ther,2021:21(2):197-208. doi:10.1080/14737140.2021.1863850.
3. Nixon AJ, Neuberg D, Hayes DF, Gelman R, Connolly JL, Schnitt S, *et al*. Relationship of patient body mass index and clinico-pathological features to outcomes in node-positive breast cancer patients treated with adjuvant therapy: An analysis of North Central Cancer Treatment Group trials N9741 and N9841. Breast Cancer Res Treat,2018:111(1):145-157. doi:10.1007/s10549-007-9772-7.
4. Pace LE, Keating NL. A systematic assessment of benefits and risks to guide breast cancer screening decisions. JAMA,2013:307(24):2601-2614. doi:10.1001/jama.2012.216684.
5. Sweeney C, Bernard P, Factor R, Kane J, Balasubramanian B, Barnhart K. Breast cancer risk and detection among women with high mammographic breast density: A prospective study. Breast Cancer Res Treat,2020:180(1):57-67. doi:10.1007/s10549-019-05488-6.

6. Berger ER, Iyengar NM. Obesity and energy balance considerations in triple-negative breast cancer. Cancer J (United States), 2021. Available from: https://doi.org/10.1097/PPO.0000000000000502.
7. Chung GKK, *et al*. Prognostic significance of abdominal obesity and its post-diagnosis change in a Chinese breast cancer cohort. Breast Cancer Res Treat, 2022. Available from: https://doi.org/10.1007/s10549-022-06526-2.
8. Harborg S, *et al*. New horizons: Epidemiology of obesity, diabetes mellitus, and cancer prognosis. J Clin Endocrinol Metab, 2024. Available from: https://doi.org/10.1210/clinem/dgad450.
9. Jiralerspong S, Goodwin PJ. Obesity and breast cancer prognosis: Evidence, challenges, and opportunities. J Clin Oncol, 2016. Available from: https://doi.org/10.1200/JCO.2016.68.4480.
10. Protani M, *et al*. Effect of obesity on survival of women with breast cancer: Systematic review and meta-analysis. Breast Cancer Res Treat,2010:123(3):627-635. doi:10.1007/s10549-010-0990-0.
11. Thu MS, *et al*. Human gut, breast, and oral microbiome in breast cancer: A systematic review and meta-analysis. Front Oncol, 2023. Available from: https://doi.org/10.3389/fonc.2023.1144021.