

Original Research Article

Clinical Stage at Presentation and Obesity in South Indian Breast Cancer Patients- A Cross-Sectional Analysis

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ABSTRACT

Background: Breast cancer stands as a formidable global health challenge. While obesity is recognized as a risk factor, its specific influence on the clinical stage at presentation remains unclear, especially in populations with unique genetic and environmental factors, such as South India. This research aims to unravel the intricate links between obesity and clinical stage at presentation in South Indian breast cancer patients for tailored screening and management strategies in this distinct demographic.

Material and methods: This cross-sectional study was done at the Department of Physiology, Government Medical College, Thrissur, Kerala, India, on newly diagnosed female breast cancer patients. The menopausal status and body mass index of the patients was taken and classified as per the WHO Asian Classification. The clinical staging was assessed and classified by American Joint Committee on Cancer (AJCC) criteria. Statistical analysis, including chi-square tests, assessed the association between BMI status, menopausal status and clinical staging.

Results: Out of 93 patients, 62.8% were obese. Underweight patients mostly presented at Stage IIIa (50%), while obese women presented at Stage IIa. Linear regression showed no significant link between obesity and higher cancer stages. ($p=0.247$) Additionally, BMI and clinical stage analyses in premenopausal and postmenopausal groups revealed non-significant results ($p = 0.750$ and $p = 0.174$, respectively).

Conclusion: This study does not establish a supportive relationship between obesity and increased clinical stage of breast cancer presentation in South Indian women. The findings challenge the expected link between obesity and advanced stage. This deviation underscores the need for further exploration of the intricate interplay between obesity and regional factors influencing breast cancer in this population.

Keywords: Breast Cancer, Obesity, Clinical Staging, Body Mass Index

INTRODUCTION

Breast cancer remains a challenging health concern, with variable clinical presentations that significantly

influence treatment strategies and outcomes. Body mass index (BMI) has been identified as one of the

potential determinants of the various clinical manifestations of breast cancer. Existing literature predominantly emphasizes the heightened risk of disease severity in obese, especially postmenopausal women.¹

Yet, there is a notable gap in research for Asian populations, particularly in South India. This study seeks to fill this critical gap by examining the nuanced relationship between obesity and clinical stage of breast cancer in the unique demographic context of South India.

The rationale underlying this inquiry is the hypothesis that women with higher BMI may present at more advanced clinical stages, potentially due to the masking effect of excess adipose tissue, which can hinder the early detection of palpable lumps during breast self-examination.² Moreover, it is well established that the oestrogen milieu enhances the initiation and progression of breast cancer lesions which can cause aggressive subtypes in women with obesity.³

MATERIAL AND METHODS

This cross-sectional study was conducted at the Department of Physiology, Government Medical College, Thrissur, Kerala, India. The study population consisted of all female patients newly diagnosed with carcinoma breast, and admitted to the surgery ward.

The inclusion criteria encompassed newly diagnosed patients, excluding those who had undergone prior treatment. Additionally, patients presenting at stage IV were excluded to avoid the confounding factor of cancer cachexia. A sample size of approximately 80 patients was determined, using the formula: $n = Z\alpha^2 [p \times q] / d^2$, with $Z\alpha = 1.96$, $p = 0.54$, $q = 0.45$, and $d = 0.108$.⁴ Ethical clearance of the study was obtained from the institutional ethical committee.

Study procedures included obtaining informed consent, collecting detailed medical histories, recording height, weight, and calculating BMI, and classifying them according to the WHO Asian Classification.⁵ Conducted physical examinations of breast lump and lymph node involvement, and determined their clinical stage as per TNM staging.⁶

RESULTS

Demographic Details

Age: The age of the 94 breast cancer patients in the study ranged from 19 to 75 years, with a mean age of 53.23 years (SD = 10.451).

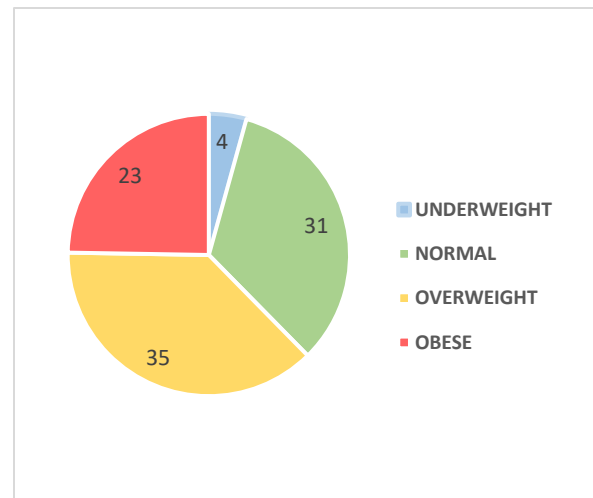


Figure-1: Distribution of BMI Classes in Study Participants

BMI: The body mass index (BMI) of the participants ranged from 16.0 to 37.0, with a mean BMI of 26.182 (SD = 4.4243). Based on the BMI the study participants were categorized based on Asian BMI criteria. (Figure1).

BMI Class and Clinical Stage Categories

Underweight patients predominantly presented at Stage IIIa (50%), while obese individuals exhibited a higher prevalence in Stage IIa (39.1%) and Stage IIb (30.4%).

A linear regression analysis examined the relationship between BMI and clinical stage categories (I, IIa, IIb, IIIa, IIIb). [Table 1] which proved that there is no statistically significant relationship between BMI and clinical stage.

Table-1: Distribution of BMI in each Clinical Stage

Clinical Stage	Frequency	BMI [Mean + S.D]
Stage I	3	26.4 $\pm$ 1.59
Stage IIa	35	26.25 $\pm$ 0.78
Stage IIb	18	27.73 $\pm$ 0.96
Stage IIIa	20	25.44 $\pm$ 1.18
Stage IIIb	17	24.94 $\pm$ 1.03

*p value> 0.05 Linear Regression Analysis

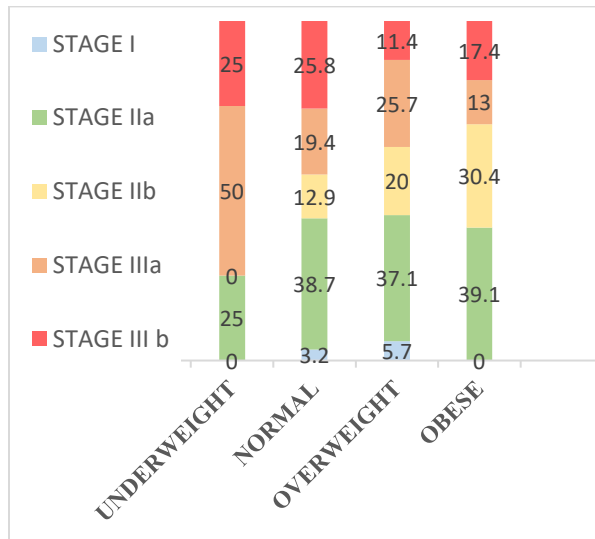


Figure-2: Breast Cancer Presentation by BMI Class and Clinical Stage

The majority of our study participants were 'Postmenopausal,' comprising 66.0% of the total sample. Additionally, 26.6% were 'Premenopausal,' while 7.4% fell into the 'Perimenopausal' category. The relationship between body mass index and clinical stage were assessed separately for pre and post menopausal breast cancer patients figure. [Figure 3] [Figure 4]. Statistical analysis by linear regression revealed non significant results for both pre and post menopausal groups. (p = 0.750 and p = 0.174, respectively).

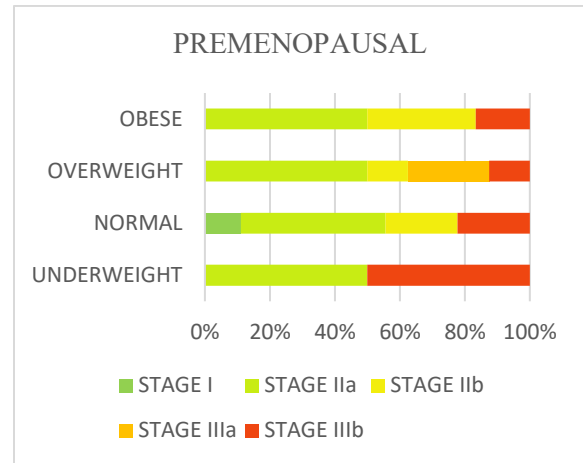


Figure-3: Distribution of Premenopausal Breast Cancer Patients by BMI Class across different stages

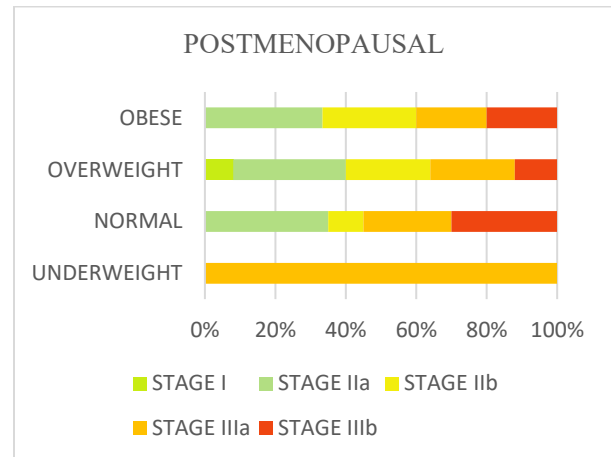


Figure-4: Distribution of Postmenopausal Breast Cancer Patients by BMI Class across different stages

DISCUSSION

This study was aimed to explore the intricate relationship between obesity and the clinical stage of breast cancer, focusing on the unique demographic context of Kerala, a coastal state in southern India. The observed prevalence of obesity among the study participants (62.8%) surpasses the suggested prevalence reported by Soman et al.⁷ for the region.

Obesity has been consistently linked to the progression of breast cancer, with several studies

highlighting its role in promoting the incidence, severity, and mortality of the disease.^{8,9,10} Despite Kerala's high prevalence of overweight and obesity, the observed distribution of clinical stages challenges the current literature. In Stage I, patients exhibit higher BMI levels, while advanced stages IIIa and IIIb show lower mean BMI values, defying the expected association between obesity and advanced clinical stages. Table 1 underscores this unexpected finding, providing statistical evidence ($p=0.247$) against a significant relationship between BMI and clinical stages in the Kerala population.

Further insights from Figure 2 reveal a diverse distribution of breast cancer patients across stages based on BMI classes. Underweight individuals challenge assumptions by presenting at Stage IIIa, while overweight patients tend to present more frequently at Stage IIa. Obese individuals show a varied distribution between Stage IIa and IIIa.

In premenopausal women, existing studies show mixed relation between obesity and breast cancer risk.^{11,12} Conversely, in postmenopausal women, numerous studies, including the Million Women Study in UK, reveal a significant increase in breast cancer risk with obesity.¹³

Figure 3 and Figure 4 reflect the distribution of pre and postmenopausal women separately. In this study, we find underweight premenopausal women presenting more at higher stages which aligns with the current studies. In Postmenopausal women, no distinct pattern could be identified and this was statistically proven which challenges the current literature.

This unexpected pattern may be influenced by factors unique to Kerala, such as heightened awareness of the disease and high literacy rates, potentially leading to early diagnosis¹⁴ or differences in tumor biology, drug metabolism, and health beliefs potentially impacting treatment.¹⁵

This complex interplay of genetic and environmental factors in this population remains unexplored. Future research should delve into these nuances to better understand the intricate relationship between obesity and breast cancer stage in the Kerala context especially the genetic factors.

CONCLUSIONS

Although past studies have highlighted postmenopausal obesity as a potent risk factor for

advanced breast cancer stages, our investigation in South Indian women presents a different picture. Obesity was prevalent across both pre- and postmenopausal groups. We did not observe the expected trend of obese individuals presenting at later stages or underweight individuals presenting at earlier stages. This unexpected finding suggests the need for further research to unravel the complex interplay between BMI, menopausal status, and other potential factors influencing breast cancer presentation in this population. Unravelling these intricacies is crucial for refining risk prediction models and tailoring effective preventive strategies, ultimately leading to improved breast cancer management for all women within the South Indian community.

REFERENCES

1. Porter, Geoffrey A. et al. "Effect of Obesity on Presentation of Breast Cancer." *Annals of Surgical Oncology* 13 (2006): 327-332.
2. Renehan AG, Tyson M, Egger M, Heller RF, Zwahlen M. Body-mass index and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *Lancet*. 2008;371(9612):569-78.
3. Picon-Ruiz M, Morata-Tarifa C, Valle-Goffin JJ, Friedman ER, Slingerland JM. Obesity and adverse breast cancer risk and outcome: mechanistic insights and strategies for intervention. *CA Cancer J Clin*. 2017;67(5):378-97.
4. Kapil U, Deo S, Singh P, Shukla N, Dwivedi S. Association of overweight and obesity with breast cancer in India. *Indian J Community Med*. 2011;36(4):259.
5. World Health Organization. Regional Office for South-East Asia. The Asia-Pacific perspective: redefining obesity and its treatment. New Delhi: World Health Organization, Regional Office for South-East Asia; 2000.
6. Edge SB, Compton CC. The American Joint Committee on Cancer: the 7th edition of the AJCC cancer staging manual and the future of cancer staging. *CA Cancer J Clin*. 2010;60(6):290-300.

7. Sugathan TN, Soman CR, Sankaranarayanan K. Behavioural risk factors for non communicable diseases among adults in Kerala, India. *Indian J Med Res* [Internet]. 2008 Jun [cited 2019 Apr 6];127(6):555–63. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18765874>
8. Reggiani, Francesca and Francesco Bertolini. “Roles of obesity in the development and progression of breast cancer.” *Discovery medicine* 24 133 (2017): 183-190 .
9. Orecchioni, Stefania et al. “Mechanisms of obesity in the development of breast cancer.” *Discovery medicine* 20 109 (2015): 121-8 .
10. Zimta, Alina-Andreea et al. “Molecular Links between Central Obesity and Breast Cancer.” *International Journal of Molecular Sciences* 20 (2019): n. pag.
11. Carmichael, Amtul Razzaq and Tom Bates. “Obesity and breast cancer: a review of the literature.” *Breast* 13 2 (2004): 85-92 .
12. Pan, Hongchao and Richard Gray. “Effect of obesity in premenopausal ER+ early breast cancer: EBCTCG data on 80,000 patients in 70 trials.” *Journal of Clinical Oncology* 32 (2014): 503-503.
13. Reeves, Gillian K. et al. “Cancer incidence and mortality in relation to body mass index in the Million Women Study: cohort study.” *BMJ : British Medical Journal* 335 (2007): 1134.
14. Lakshmanan, M., R. Chayampurath, R. Trivikraman, S. Paramasivam, and S. M. P. “Delay in Diagnosis of Breast Cancer in a Developing Country: A Single Centre Observational Study in a Tertiary Care Hospital in North Kerala, India”. *International Journal of Research in Medical Sciences*, vol. 5, no. 10, Sept. 2017, pp. 4604-9, doi:10.18203/2320-6012.ijrms20174605.
15. Bhoo-Pathy, Nirmala et al. “Breast cancer research in Asia: adopt or adapt Western knowledge?” *European journal of cancer* 49 3 (2013): 703-9.

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