Body Mass Index, Clinical Assessment and Occult Axillary Lymph Node Metastasis in Breast Carcinoma

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Abstract

Background: Breast carcinoma (BC) is among the most common carcinomas in females with changing treatment modalities. The high body mass index (BMI) in clinically node negative (cN0) obese patients is associated with decreased accuracy of clinical axillary lymph node (ALN) examination and occult heavy disease burden of carcinoma breast.

Methods: This study was aimed to assess the significance of BMI on clinical axillary examination of lymph nodes of BC with cN0 status and also to analyze the impact of high BMI on lymph node metastatic burden. The cN0 and lymph node metastatic burden status was correlated with BMI of BC patients, and data obtained was analyzed statistically.

Results: A total of 30 female patients of BC with cN0 status were recruited and categorized into three groups as per BMI, G0-underweight, <18.5; G1-normal weight, 18.5-24.9; G2-overweight, 25-29.9 and were correlated with clinical axillary examination of lymph nodes and metastatic burden microscopically. The data was analysed by using appropriate standard statistical tests. The p value more than 0.05 was considered to be insignificant. The BMI of the patients varied between 22 and 28. Upon clinical examination, all patients were node negative; histopathological examination revealed more cases with metastatic deposits in the G1 than G2 group.

Conclusion: The study concluded no effect of BMI on clinical examination of axillary lymph nodes, and high BMI was not associated with high metastatic ALN burden.

Keywords: Breast Carcinoma, Nodal Status, Body Mass Index, Disease Burden, Prognosis

Introduction

BC is the most common cancer and the leading cause of death among women worldwide[1,2]. The value of ALN metastases in patients with BC has been recognized since the 1970s, and while deciding the treatment plan, cN+ or N0 status is an important factor[3,4]. The significance of a patient's BMI on the accuracy of axillary clinical examination and on occult metastasis

ALN is an underexplored topic. That is an appropriate area to address because obesity rates are increasing in adolescents in India[5]. ALN examination and preoperative diagnostic procedures might be less sensitive in obese patients who would therefore be at higher risk for having unnoticed metastasis. The present study was done to evaluate the effect of BMI on the clinical assessment of ALN and occult disease burden in cN0 BC patients.

Materials and Methods

This was a prospective study, done on 30 patients of BC in the department of surgery. The cases satisfying the inclusion criteria, such as fine needle aspiration or biopsy proven BC cases with clinically nonpalpable axillary lymph nodes, were chosen for the study. BC cases with distant metastasis and with clinically palpable axillary lymph nodes were excluded from the study. BMI was noted, and patients were divided into three groups: G0-underweight, <18.5; G1-normal weight, 18.5-24.99; G2-overweight, 25-29.99)[6]. History was taken including age at menarche, age at first pregnancy, parity, duration of lactation, menstrual status, and age at menopause, and detailed clinical examination was done. All patients had a formal axillary lymph node dissection together with mastectomy. All the nodes were examined and correlated with the axillary status on histopathology.

Statistical Analysis

The calculation of BMI was done as per world health organization classification, by the formula of weight (kg)/height2 (m2) and then further divided into underweight with BMI <18.5 kg/m2, normal weight with BMI 18.5 to 24.9 kg/m2, and obese with BMI >25 kg/m2[7]. The data were analyzed by using appropriate standard statistical tests. A p value more than 0.05 was considered to be insignificant.

Results

A total of 30 female patients was studied to assess effect of BMI on clinical assessment of ALN and occult lymph node burden in cN0 breast cancer patients. All the cases had infiltrating ductal carcinoma. The BMI of the patients varied between 22 and 28. The mean BMI of those 30 patients was 24.7 with SD ±2.14 with the maximum number of patients in BMI group of G1 (18.5 to 24.99; n=17, 56.67%) (Table 1).

BMI	No of cases (n=30)	(%)
G0-underweight, <18.5	Nil	Nil
G1-Normal weight, 18.5-24.99	17	56.6
G2-Overweight, 25-29.99	13	43.3

Table 1: Distribution of BMI

All the patients were of G1 and G2 BMI group.

	G1- normal weight	G2- overweight
Total patients	56.67%	43.3%
Age	<45 years (11.7%) 46-55 years (47.0%) 56-65 years (41.1%) >65 years (Nil)	<45 years (30.7%) 46-55 years (23.0%) 56-65 years (30.7%) >65years (15.3%)
Age at menarche	≤15years (70.5%) >15years (29.4%)	≤15 years (100%) >15 years (Nil)
Age at 1st pregnancy	≤22years (29.4%) >22years (70.5%)	≤22years (46.1%) >22years (53.8%)
Parity	0 (5.8%) 1 Nil 2 (64.7%)3 (29.4%)	0 Nil 1 (7.6%) 2 (76.9% 3 (23.0%)
Duration of Lactation	≤12months (52.9%)>12 months (47.0%)	≤12months (84.6%)>12 months (15.3%)
Menstrual status	Pre-Menopausal	Pre-Menopausal

	(11.7%) Post-Menopausal (88.2%)	(23.0%) Post-Menopausal (76.9%)
Age at menopause	≤45 years (29.5%) >45 years (70.5%)	≤45 years (23.0%) >45 years (76.9%)
Tumor Localization	*UOQ-47.0% †UIQ-23.5% ‡LOQ-Nil §LIQ –Nil Subareolar - 29.4%	UOQ-53.8% UIQ -38.4% LOQ-15.3% LIQ-Nil Subareolar -Nil
Tumor Size <2cm - 11.7% 2-5cm- 82.3% >5cm-11.7% <2cm - 15.3% 2-5cm - 84.6% >5cm - 7.6%		

Table 2: Clinical features of patients

*Upper outer quadrant, †Upper inner quadrant, ‡Lower outer quadrant, §Lower inner quadrant

In our study, the G2 group had a greater number of cases of <45 years of age group, pregnancy <22 years of age, nullipara, <12 months' duration of lactation and more post-menopausal patients than the G1 group of cases. All patients in G2 had age of menarche less than 15 years. All the above findings were positively correlated with increased BMI but showed no statical significance (p value >0.05). Upon clinical examination, all patients were node negative; histopathological examination revealed more cases with metastatic deposits in G1 than G2.

	G1- normal weight	G2- overweight
Clinical Axillary examination	cN0-100%	cN0-100%
HPE LNS	Non metastatic	Non metastatic

	ALNs -41.1% Metastatic ALNs - 58.8%	ALNs -53.8% Metastatic ALNs - 46.1%
No of LN +	1-3-23.5%>3 35.2%	1-3-100%>3 -Nil

Table 3: Status of axillary lymph nodes

Discussion

Breast cancer is the most common cancer in women, and its incidence could be influenced by many factors such as environmental, genetic, and lifestyle[8]. Over the last two decades' surgical management of the axilla in BC patients has changed[9]. Surgical management of carcinoma breast has progressed from radical mastectomy to less invasive breast conserving surgery. Routine axillary dissection has been changed from complete dissection to sentinel lymph node (SLN) removal, but it still benefits negative sentinel lymph node dissection (SLND) patients with potential nodal involvement[10,11]. An elevated BMI has been thought to reduce the sensitivity for certain clinical examinations and also has been identified as a risk factor for failure of sentinel node mapping, but variation in accuracy of axillary physical examination based on patient BMI is unknown.

In today's era, obesity is a global health problem. BMI in obese patients reduces the accuracy of clinical examinations and also hampers the sentinel node mapping[12-15]. However, studies have also shown no variation in rates of SLN positivity and axillary physical examination among cN0 obese and nonobese patients[16].

In the current study, we assessed the effect of BMI (G1, G2) on clinical axillary examination of lymph nodes in carcinoma breast cases along with lymph node burden. It was observed that 15.3% cases of high-BMI patients were found to be more than 65 years of age. 100% showed early age at menarche and <12 months' duration

of lactation in comparison to low BMI. Those findings were in concordance with the studies found in the literature. Although no relevant effect of BMI was observed on age at menopause, many studies showed high BMI has been found to be related with higher risk of carcinoma breast for postmenopausal women, whereas for premenopausal women it is found to be associated with a low risk[17-19]. In the current study, this finding was more in concordance with normal BMI cases of breast carcinoma[20, 21]. Ahmad Kaviani and his associates had also reviewed stronger effects of obesity in premenopausal cases, as seen in the current study.

In our study the number of premenopausal patients of high BMI was more than low BMI cases[22,23]. Histopathological examination of axillary lymph node dissection showed accuracy of clinical examination in 41.1% cases of low BMI cases, whereas high BMI patients showed 53.8% accuracy. Majid et al. (2013) studied the clinical examination of axillary lymph nodes that can result in a high number of false-positive and false- negative cases[24]. In the current study, no false positive case was seen in both BMI groups. The current analysis showed more or less similar findings with studies done by those authors on the role of axillary clinical examination irrespective of BMI. Damian McCartan et al. (2016) showed no impact of high BMI in clinically node negative cases on lymph node metastatic burden. In the current study, all patients in the high BMI group showed three or less than three positive lymph nodes only, suggesting no heavy nodal burden[25].

In another study conducted, it was observed only 6% of clinically node negative cases had more than two positive nodes on histopathological examination and emphasized the risk of occult heavy nodal burden is not amplified in patients with a high BMI[16]. In another data

review, high BMI was seen associated with high lymph node burden and larger tumor size[26]. The work done by Keskin et al. (2013) showed that the number of the dissected lymph nodes in high BMI were slightly higher, but there was no correlation between metastatic lymph node number[27].

In our study, in addition to low nodal burden, lower percentage of metastatic deposits and smaller tumour size were also observed in high-BMI patients[28]. Alarfi et al. (2017) observed a high median overall survival in obese patients in comparison to normal or underweight patients and suggests overweight patients could improve overall survival in breast cancer patients[29]. Whereas, literature reviewed by Jiralerspong et al. (2016) emphasized obesity is associated with poor survival in breast cancer patients, and understanding of the mechanisms of that effect can help improve the diagnosis, treatment, and outcomes of the disease in those with a high BMI[30]. Olsson LT et al (2022) also observed high metastatic status in women with high hip and waist ration.

Conclusions

It was concluded that there is no effect of variation of BMI on clinical examination of axillary lymph nodes. It has also been analyzed there is insignificant risk of finding positive lymph nodes in patients with a clinically negative axilla irrespective of BMI. Also, high BMI was not seen associated with high metastatic burden. Low nodal burden, lower percentage of metastatic tumor deposits and lower tumor size with high BMI than normal BMI was seen in the present study but showed no statistical significance.

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