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**Original research article**

# Study of Correlation Between Size of Tumour and Involvement of Axillary Lymph Nodes in Case of Breast Cancer

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## Abstract

***Background*:** When distant metastasis first appears, axillary lymph node metastasis (ALNM) is frequently the first detectable clinical sign of breast cancer. The goal of this study was to investigate the ALNM-influencing components and create models that may foretell its presence before surgery.

***Methods*:** This two-year prospective observational study was carried out at the Tertiary Care Teaching Hospital of Bihar, India, in the Department of Surgery. 50 patients who presented with invasive breast cancer between two years were included in the study.

***Results*:** The majority of the patients (34 percent) were between the ages of 41 and 50, with a mean age of 51.18 ± 11.93 years. The left breast was more afflicted (62%) than the right breast (38 percent). The majority of the cases (70 percent) had tumours that were 5 cm in size, with a mean size of 4.65 ± 1.89 cms. The majority of the patients (62%) were Bloom Richardson (BR) Grade II, and 24 percent were ER and PR positive. Lymphovascular invasion was found in 74% of the cases. The tumour size and lymph node involvement had a substantial positive connection. There was a significant association between NPI score and tumour size, positive lymph nodes, and BR grade. The mean NPI scores in patients with lymphovascular invasion were 4.92 ± 1.05, compared to 4.83 ± 0.93 in patients without lymphovascular invasion (p=0.779). The mean NPI scores in ER-, PR- patients were somewhat higher (4.91 ± 0.94) than in ER+, PR+ patients (4.76 ± 1.19) (p=0.778).

***Conclusion*:** The results of the current investigation show that the prognosis is inversely correlated with the size of the primary tumour and the number of lymph nodes that are positive. The size of the tumour as T and axillary lymphadenopathy as N form an essential part of TNM staging and are of utmost importance for their role in treatment decisions and for their ability to illustrate prognosis in patients with invasive breast cancer, despite advancements in diagnostic modalities, evolution of newer markers, and genetic typing.

***Keywords*:** axillary lymph node metastasis, breast cancer, decision tree, risk factor

## Introduction

Axillary lymph node metastasis (ALNM), which is typically the earliest identifiable clinical presentation when distant metastasis arises, can occur during the early stages of primary breast cancer. [1] The conventional method for axillary staging in breast cancer patients without palpable axillary adenopathy is sentinel lymph node biopsy (SLNB), and even when sentinel

lymph node (SLN) involvement is present, the trend in breast cancer treatment is moving away from axillary surgery.

The Z0011 trial has shown that the 10-year overall survival (OS) of patients with one to two sentinel lymph node metastases (SLNM) treated with SLNB and whole-breast irradiation is comparable to that of patients with clinical T1-T2 invasive breast cancer (IBC) who have not developed palpable axillary adenopathy and who have undergone axillary lymph node dissection (ALND). [2] The AMAROS trial also discovered more proof that patients with SLNB-proven metastases receiving radiation do not perform worse than those receiving ALND in terms of axillary recurrence-free rates. In addition to having a reduced rate of lymphedema at 1 or 5 years into treatment, the radiation group also experienced fewer complications from surgery. [3] Collectively, these trials' findings point to IBC as a systemic illness, [4,5] and as a result, the treatment plan should begin with a thorough evaluation of the TNM stage rather than merely rapid treatment. [6,7]

Despite the fact that SLNB is still the standard of care for breast cancer patients without palpable axillary adenopathy, between 24.8 percent and 35.5 percent of final pathology results showed ALNM, [8-11] indicating that many patients receive unnecessary medical attention. As a result, there is an urgent need for non-invasive techniques for evaluating axillary lymph nodes. Ultrasonography (US) is being used in the ongoing SOUND experiment to enrol patients who have small tumours (2 cm) and negative lymph nodes. The trial's outcomes have not yet been released. [12]

Previous research has demonstrated the association between ALNM and clinicopathological characteristics as size, age at diagnosis, palpable mass or lack thereof, body mass index (BMI), hormone receptors, and others. [13–16] High-frequency ultrasonography, the primary imaging modality for the diagnosis of breast cancer, can reveal the complex morphology of breast tumours, some of which may be associated with ALNM. [13,17–20]

**Methods**

This prospective study was carried out in the Department of Surgery. Between one and a half year, 50 patients were found to have invasive breast tumours that had been confirmed by cytology. The pathologic lymph node status was accessible in every case, and all of these patients underwent a modified radical mastectomy as their initial course of treatment. Inclusion criteria for the present study were the following:

1. Cytology proven invasive breast cancer;
2. Known histological nodal status;
3. No distant metastasis at the time of registration;
4. No previous treatment for breast cancer;
5. No previous or concomitant malignancy;

Patients who were excluded from the study included those with in situ ductal or lobular carcinoma, Paget's disease of the nipple without a tumour, no residual primary tumour (following neoadjuvant chemotherapy), metastases from other organs to the breast at the time of registration, unknown pathological nodal status (Nx), and immeasurable primary tumour (Tx). Data was gathered to document demographic information, clinical tumour features (tumour side and location), and tumour histology information (histological types, tumour size, histological grade, skin, nipple and areola invasion).

The biggest tumour diameter recorded during the pathological investigation that followed surgery was used to determine the tumor's size. Each specimen's number of nodes that were pathologically assessed was calculated based on the probability that at least one lymph node would be positive for the disease. The relationship between tumour size and its invasiveness (such as axillary lymph node status, skin, areola, and nipple invasion) was examined using clinical and histological factors.

The Scarff-Bloom-Richardson (SBR) system was used to grade the histological type and determine its severity. Follow-up information was gathered to document the history, examination, laboratory, and radiological findings in order to track local recurrence, distant metastasis, and mortality during the course of the investigation.

**Results**

This two-year prospective, observational study was conducted in the Department of Surgery at a Tertiary Care Teaching Hospital in Bihar, India. A total of 50 patients with breast cancer were studied.

The collected data was analysed, and the final findings were tabulated and interpreted. In the current study, the majority of the patients were aged 41-50 years (mean 51.1811.94), and the tumour size ranged from 2.1 to 5 cm in the larger dimension. The majority of the patients presented with left sided ca breast 31 patients (62 percent), and lymph node metastasis was present in 58 percent of the patients. The bulk of the 50 instances (62 percent) were Grade II, 22 percent were Grade III, and 16 percent were Grade I. Vascular invasion was found in 37 of the instances. In 33 cases, the ER, PR status was negative, while in 12 cases, the ER, PR status was positive [Table].

**Table 1: Correlation of Tumor size, BR grade, positive lymph nodes, lymphovascular invasion and mean scores**

| **Tumor size** | **No. of patients** | **Mean NPI score** | |
|---|---|---|---|
| | | **Mean** | **SD** |
| T1 (≤2.00) | 2 | 4.35 | 0.07 |
| T2 (2.10-5.00) | 35 | 4.67 | 1.08 |
| T3 (>5.00) | 13 | 5.55 | 0.53 |
| P value | | <0.050 | |
| | | | |
| **BR grade** | **No. of patients** | **Mean NPI score** | |
| | | **Mean** | **SD** |
| Grade I | 8 | 4.10 | 1.07 |
| Grade II | 31 | 4.94 | 0.95 |
| Grade III | 11 | 5.36 | 0.89 |
| P value | | <0.050 | |
| | | | |

| **Lymph nodes** | **No. of patients** | **Mean NPI score** | |
|---|---|---|---|
| | | **Mean** | **SD** |
| 0 (no lymph nodes involved) | 21 | 4.15 | 0.78 |
| 1 to 3 | 14 | 4.96 | 0.66 |
| >3 | 15 | 5.90 | 0.68 |
| P value | | <0.050 | |
| | | | |
| **Lymphovascular invasion** | **No. of patients** | **Mean NPI score** | |
| | | **Mean** | **SD** |
| Present | 37 | 4.92 | 1.05 |
| Absent | 13 | 4.83 | 0.93 |
| P value | | >0.050 | |

The mean NPI scores in patients with tumour sizes of 2.0 cm, 2.01 to 5.0 cm, and >5 cm were 4.35 ± 0.64, 4.67 ± 1.08, and 5.55 ± 0.53, respectively, in the current study. This difference between tumour size and NPI score was statistically significant ($p < 0.050$). (Table). The table shows that there is a rise in NPI score with increasing BR grade, and the difference is statistically significant ($p < 0.050$). (Table). In the current investigation, the mean NPI scores in patients with no axillary lymph node involvement were 4.15 ± 0.78, 4.96 ± 0.66 in those with 1 to 3 positive lymph nodes, and 5.90 ± 0.68 in those with involvement of more than 3 lymph nodes. This variation was statistically significant ($p < 0.050$) (Table).

In the current study, the mean NPI scores in patients with lymphovascular invasion were 4.92 ± 1.05, compared to 4.83 ± 0.93 in patients without lymphovascular invasion. This difference, however, was not statistically significant ($p >0.050$). (Table). The majority of participants in this study had a mediocre prognosis (64 percent). The mean NPI score was 4.90 ± 1.02, and the median NPI score was 4.9, with a range of 2.4 to 6.9. (Table).

**Discussion**

The radical mastectomy was made popular by Sir William Halsted in the late 1800s on the theory that breast cancer spreads in an ordered manner, first through the skin and local lymphatics and then, later, hematogenously to other organs [21]. However, in the modern scenario, notions of management have altered. For example, surgery has become more conservative than radical mastectomy, and systemic chemotherapy is now used before locoregional control. In recent years, there has been a significant improvement in breast cancer prognosis and survival rates [22,23].

The influence of screening programmes and improved treatment regimens, such as the use of systemic chemotherapy in a Neo adjuvant approach and targeted medicines for hormone receptor and HER2 neu receptor, have made these advancements possible. Therefore, it is crucial to identify and characterise criteria at the time of diagnosis that will enable us to forecast the clinical result of treatment administration.

Different prognostic factors have been established with regard to breast cancer. Numerous variables, including younger age, greater histological grade, larger size, high rate of p53 mutations, and Ki-67 staining, are typically linked to poor prognosis in the literature that is currently accessible [24]. Advanced genomic approaches and the investigation of gene expression profiles are required for some of these components, but these methods are still in the experimental stage and are not frequently used [25]. Therefore, it is still crucial to consider criteria like tumour size and nodal status while choosing the right course of treatment and determining the prognosis today.

Breast carcinomas have a wide range of clinical and pathologic characteristics, which ultimately affect the clinical prognosis. The goal of the current study was to assess clinical outcomes and connections between lymph node status, tumour size, and prognosis in breast cancer. It is common knowledge that a poor prognosis and survival are related to the size of the main tumour and the number of lymph nodes that are positive in breast cancer [26]. As the tumour size and the number of lymph nodes that were positive grew, the RFS (Relapse Free Survival) rate and OS (Overall Survival) rate fell [24]. According to the current study, there is a significant correlation between primary tumour size and axillary lymph node involvement; as tumour size increased, so did the frequency of positive axillary nodes. In a 20 year follow-up for T2 lesions, PP Rosen et al. found a strong relationship between the prognosis and primary tumour size ($p=0.06$) [27]. They found that tumours between 2.1 and 3.0 cm had a 33 percent chance of recurrence at 20 years and between 3.1 and 5 cm had a 44 percent chance of recurrence.

Additionally, when examining the relationship between tumour size, lymph node status, and survival in 24,740 breast cancer cases, Christine L. Carter et al. discovered that regardless of lymph node status, as tumour size increased, survival decreased, and similarly, as lymph node involvement increased, survival status decreased regardless of tumour size [26]. Therefore, both choosing a course of treatment and determining the prognosis depend greatly on the size of the tumour. In light of this, Port ER et al. proposed that the primary objective of screening and early detection should be to find malignancies when they are small and node-negative [28]. This was based on the link between tumour size and survival.

Wo JY et al. observed that in cases where small tumour sizes are associated with extensive lymph node involvement, they may be of a more aggressive subtype than larger tumours with the same degree of lymph node involvement and thus be representative for biologically aggressive disease in such patients [29]. Five patients in our study had tumours that were less than 2 cm in size, but they nonetheless had a higher axillary lymph node involvement. However, all of these patients had SBR grade III and cutaneous, nipple, and areola involvement, demonstrating the aggressive behaviour of the cancer. This implies that even in situations of modest tumour masses, axillary lymph node involvement can be found and, if present, is linked to a somewhat unfavourable prognosis.

Complications include discomfort, lymphoedema, and shoulder stiffness are linked to axillary dissection [30]. Sentinel lymph node biopsy reduces the likelihood of these complications, but it is very resource-intensive and expensive, which restricts its use. It requires a team of multiple specialists from different departments (radiologist, surgeon, nuclear medicine specialist, and pathologist) at the time of the procedure.

## Conclusion

Observations from this study lead us to the conclusion that lymph node status and tumour size are independent prognostic factors. The present investigation was limited by its small sample size and brief follow-up period. The link between rising tumour size and mortality was linear. However, distant metastasis and axillary lymph node involvement can occur in even tiny tumours. This underlines how the potential of the tumour to disseminate locally or to distant places, which is reflected in both nodal status and survival, is a biological process. However, the importance of catching the disease early is once again highlighted by the relevance of lump size in prognosis, underscoring the necessity of improving current screening programmes and educating the public about breast self-examination, which can prove to be a highly effective screening method in a nation like ours. The TNM approach is based on tumour size and nodal status, which continue to be the primary factors in determining how to handle invasive breast cancer patients and estimate their prognosis in underdeveloped nations.

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