



## Original Research Article

# Histomorphological study of invasive breast carcinoma and its prognostic scoring using Nottingham prognostic index

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## ABSTRACT

**Introduction:** Breast carcinoma is the common malignant tumor in women accounting for 15% of cancer related deaths. Clinical history, examination and use of mammography has improved the diagnostic approach to breast cancer. Nottingham prognostication index is considered to be a useful marker that takes into consideration some of the important factors like tumor size, histologic grade and lymphnode stage.

**Aims and Objectives:** 1. To study histomorphological distribution pattern of various invasive breast carcinoma. 2. To estimate prognosis by using Nottingham prognostic index score.

**Materials and Methods:** One year six months descriptive study was performed which included all the invasive breast carcinoma cases comprising of mastectomy specimen with lymphnode sampling. Based on tumor size, histologic grade and lymphnode stage; Nottingham prognostic index score was calculated and cases were categorised into different prognostic group.

**Results:** 68 cases were included in the study with 67 female patients and one male patient. Histopathologically, 80.88% were Infiltrating ductal carcinoma – not otherwise specified. Tumor size belonging to T2 in 66.17%. 45.58% showed no lymphnode involvement and 33.82% belonged to lymphnode stage N1. Majority (50%) belonged to histologic grade II. Nottingham Prognostic Index (NPI) score in 42.64% showed moderate prognosis.

**Conclusion:** Histomorphological study showed commonest lesion to be Infiltrating Ductal carcinoma-not otherwise specified and majority belonged to moderate prognosis category according to Nottingham Prognostic Index score.

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## 1. Introduction

Breast carcinoma is the most frequent malignant tumor in women associated with increasing mortality rate and accounting for about 15% of cancer related deaths.<sup>1</sup> The widespread use of mammography has changed the outlook of diagnostic approach to breast carcinoma. Even extremely small tumors (1 – 2 mm) can be detected with this technique and this relies mainly on the presence of calcification. 50-60% of breast carcinoma show calcification on mammography.<sup>2</sup> Male breast carcinoma is very uncommon and accounting for 0.5-1% of all breast

cancer cases.<sup>3,4</sup> Some studies have shown that primary breast carcinoma have occurred in patients with prostatic carcinoma following treatment with estrogens and in countries where the incidence of gynecomastia is high, have an increased incidence of breast carcinoma.<sup>5</sup>

Clinical management of breast carcinoma depends on various prognostic factors, some of the important ones being tumor size, lymphnode stage and histologic grade. There are many other features that also have prognostic value like patient's age, genetic mutation, presence of hormone receptors, size of tumor, lymphovascular invasion, tumor necrosis, local extent of tumor, metastasis, cytomorphological pattern, histologic grade and many

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others. Nottingham prognostication index (NPI), was first described in 1982 and takes into consideration the tumor size, lymphnode stage and histologic grade.<sup>1,6</sup>

The Nottingham prognostication index is said to be clinically relevant and has international validation. It can classify early and locally advanced breast carcinoma into three or more prognostic groups. It gives valuable information to the clinician/ surgeon to decide if post-surgery adjuvant chemotherapy is necessary in a given patient.<sup>7</sup>

Thus the aim of the study was to determine the distribution pattern of various breast carcinoma and we have attempted to categorize these cases into different prognostic group using Nottingham prognostication index score.

## 2. Materials and Methods

One year six months cross-sectional descriptive study was performed in the Department of Pathology, Shimoga institute of Medical Sciences, Shimoga. All the modified radical mastectomy specimen with lymphnode sampling received in the study period were included. Simple mastectomy cases without lymphnode sampling were excluded from the study as lymphnode status could not be assessed in these patients. Specimen were received in 10% buffered formalin and after thorough gross examination representative bits were given for tissue processing. Prepared slides were stained with routine H & E stain. Slides and blocks were retrieved from the departmental archives for review.

Details regarding tumor size, lymphnode stage and histologic grade were used to assess the Nottingham Prognostic Index (NPI) score using the following formula,

$$\text{NPI} = (\text{Maximum Tumor size} \times 0.2) + \text{Lymphnode stage (N 1, N 2, N3)} + \text{Histologic grade (I, II, III)}$$

Tumor size was evaluated using TNM staging, based on which they were classified into T1 ( $\leq 2\text{cm}$ ), T2 ( $> 2\text{cm} - \leq 5\text{cm}$ ), T3 ( $> 5\text{cm}$ ). Lymphnode involved was divided into N1 (0), N2 (1-3), N3 ( $> 3$ ). Histological grading was done using Nottingham modification of Bloom-Richardson scoring system that takes into consideration the tubule formation, nuclear pleomorphism and mitotic count; each being scored 1 to 3 and after summing up the scores, the following grades were given I (3-5), II (6-7), III (8-9).

Based on the NPI score, patients were categorized into three prognostic groups – Good ( $\leq 3.4$ ), Moderate ( $> 3.4 - \leq 5.4$ ) and Poor ( $> 5.4$ ).

Data was analysed and descriptive statistics was used in the study.

## 3. Results

Total of 68 invasive breast carcinoma cases were included in the study. 51-60 yrs was the commonest age group of presentation (Table 1). None of the cases occurred

before the age of 30yrs. There were 67 female patients and only 01 male patient in the study. In 52.94%, right breast was involved and 47.05% left breast was involved. Commonest histopathologic type of tumor was infiltrating ductal carcinoma – not otherwise specified in 80.88%. Other types identified were 4.41% invasive lobular carcinoma, 4.41% Mucinous carcinoma, 2.94% Invasive papillary carcinoma, 2.94% Infiltrating ductal carcinoma with medullary features, 1.47% Infiltrating ductal carcinoma – apocrine type, 1.47% Infiltrating ductal carcinoma with papillary and mucinous differentiation and 1.47% Mixed type carcinoma (ductal and lobular) (Table 2).

66.17% showed tumor size of 2 – 5cm (T2), 45.58% showed no regional lymphnode involvement and 34% belonged to histologic grade II (Table 3).

Pagets disease was seen in 2.94%. Some cases showed in-situ component, with 16.17% showing Ductal carcinoma in situ and 1.47% showing Lobular carcinoma in situ. Tumor necrosis was present in 32.35%. Lymphovascular invasion and perineural invasion was seen in 33.82% and 5.88% respectively.

Based on the Nottingham Prognostic index score (NPI), patients were categorized into three prognostic groups – Good ( $\leq 3.4$ ), Moderate ( $> 3.4 - \leq 5.4$ ) and Poor ( $> 5.4$ ) (Table 4).

In good prognosis category - in 60% tumor size belonged to T2, 100% showed N1 involvement and 90% belonged to histologic grade I. 65.85% in moderate prognosis category showed tumor size of T2 stage, 48.78% showed no lymphnode involvement and 60.97% belonged to histologic grade II. In poor prognosis category; tumor size of T2, lymphnode stage N3 and histologic grade of III was seen in 70.58%, 64.70% and 52.94% respectively (Table 5).

In the above given table it can be clearly seen that the trend of lymphnode involvement and histologic grade goes on increasing when the Nottingham prognostic index (NPI) score has increased. But in all the prognostic categories, majority cases belonged to T2.

## 4. Discussion

Breast carcinoma is the most common malignancy affecting women and is associated with increasing cancer related deaths. Many prognostic factors including clinical and pathological indicators have been discussed in various literatures. In the present study, histomorphological pattern of invasive breast carcinoma was assessed and an attempt was made to categorize these patients into various prognostic groups using Nottingham prognostic index (NPI) score.

In the present study, commonest age group involved was 51 – 60yrs; which was also seen in a study done by Pradhan A et al.<sup>1</sup> Infiltrating ductal carcinoma – not otherwise specified was seen in 80.88%. Pradhan A et al,<sup>1</sup> Hearne B J et al<sup>8</sup> and Hamza A et al<sup>9</sup> also showed infiltrating ductal

**Table 1:** Age group at presentation

Age group	No. of cases	% of cases
31 – 40yrs	14	20.58
41 – 50 yrs	17	25
51 – 60yrs	22	32.35
61 – 70 yrs	09	13.23
71 – 80 yrs	04	5.88
81 – 90 yrs	02	2.94
<b>Total cases</b>	<b>68</b>	

**Table 2:** Histomorphological type of Invasive breast Carcinoma

Type	No. of cases	% of cases
1. Infiltrating ductal carcinoma – not otherwise specified	55	80.88
2. Infiltrating ductal carcinoma – apocrine type	01	1.47
3. Infiltrating ductal carcinoma with medullary features	02	2.94
4. Infiltrating ductal carcinoma with papillary and mucinous differentiation	01	1.47
5. Invasive lobular carcinoma	03	4.41
6. Invasive papillary carcinoma	02	2.94
7. Mucinous carcinoma	03	4.41
8. Mixed carcinoma (ductal and lobular)	01	1.47
<b>Total cases</b>	<b>68</b>	

**Table 3:** Tumor size, lymphnode stage and histologic grade

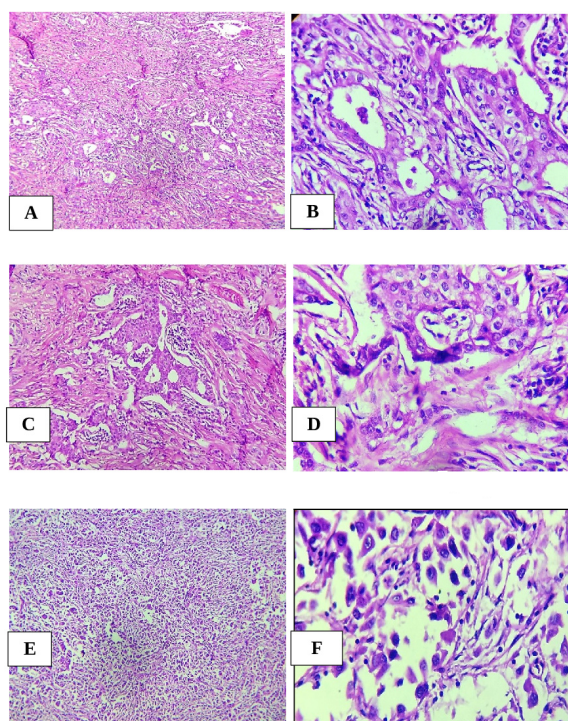
Category	No. of cases	% of cases
<b>Tumor Size (TNM)</b>		
T1 ( $\leq 2$ cm)	07	10.29
T2 ( $> 2 - \leq 5$ cm)	45	66.17
T3 ( $> 5$ cm)	16	23.52
<b>Lymphnode Stage</b>		
N1 (0)	31	45.58
N2 (1-3)	23	33.82
N3 ( $> 3$ )	14	20.58
<b>Histologic Grade (Nottingham modification of Bloom-Richardson scoring system)</b>		
I (3-5)	20	29.14
II (6-7)	34	50
III (8-9)	14	20.58

**Table 4:** Categorization of NPI score

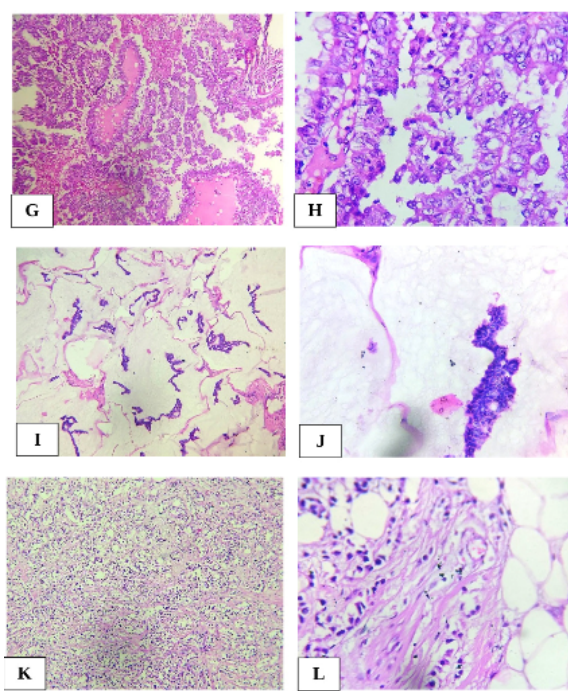
Category (NPI score)	No. of cases	% of cases
Good ( $\leq 3.4$ )	10	14.70
Moderate ( $> 3.4 - \leq 5.4$ )	41	60.29
Poor ( $> 5.4$ )	17	25

**Table 5:** Tumor size, lymphnode stage and histologic grade in different NPI prognostic groups

NPI	Tumor size	Lymphnode stage	Histologic grade
$\leq 3.4$ (Good) 10 cases	T1 – 02 (20%)	N1 – 10 (100%)	I – 09 (90%)
	T2 – 06 (60%)	N2 – 00	II – 01 (10%)
	T3 – 02 ( 20%)	N3 – 00	III – 00
$> 3.4 - \leq 5.4$ (Moderate) 41 cases	T1 – 04 (9.75%)	N1 – 20 (2 9.41%)	I – 11 (26.82%)
	T2 – 27 (65.85%)	N2 – 18 (48.78%)	II – 25 ( 60.97%)
	T3 – 10 (24.39%)	N3 – 03 (7.31 %)	III – 05 ( 12.19%)
$> 5.4$ (Poor) 17 cases	T1 – 01 (5.88%)	N1 – 0 1 (5.88%)	I – 00
	T2 – 12 (70.58%)	N2 – 05 (29.41%)	II – 08 (47.05%)
	T3 – 04 (23.52%)	N3 – 11 (64.70%)	III – 09 (52.94%)



**Fig. 1: A, B):** Infiltrating ductal carcinoma- NOS, Grade I, H&E stain (4x, 40x); **C, D):** Infiltrating ductal carcinoma – NOS Grade II, H&E stain (10x, 40x); **E, F):** Infiltrating ductal carcinoma - NOS Grade III, H&E stain (4x, 40x)



**Fig. 2: G, H):** Invasive papillary carcinoma, H&E stain (10x, 40x); **I, J):** Mucinous carcinoma, H &E stain (10x, 40x); **K, L):** Invasive lobular carcinoma, H&E stain (10x, 40x)

carcinoma – not otherwise specified to be present in 67.74%, 88% and 76.5% in their respective studies. Our finding of 54.4% showing lymphnode involvement was comparable with the study done by Pradhan A et al.<sup>1</sup> Tumor necrosis and lymphovascular invasion was present in 32.35% and 33.82%, comparable with study done by Pradhan A et al<sup>1</sup> and Ahmad Z et al.<sup>10</sup>

In the present study; T2, N0, histologic grade II involved 66.17%, 45.58% and 50% of cases respectively. Similarly, Shukla A et al<sup>11</sup> showed T2, N0, histologic grade II involvement in 70%, 42%, 62% respectively. Moderate prognostic category showed 60.29% of cases which was comparable with study done by Kwatra A et al<sup>6</sup> and Jarroudi O A et al.<sup>12</sup> But in a study done by Ahmad Z et al, majority belonged to poor prognostic category (56.1%).

Shukla A et al<sup>10</sup> showed positive correlation between tumor size, lymphnode involved and histologic grade with the NPI score. Whereas in the present study, in poor prognostic category - N3 and histologic grade III was seen in majority as compared to that seen in good and moderate prognostic category. In poor prognostic category, majority belonged to tumor size T2, T3 whereas only one case belonged to T1.

## 5. Conclusion

Breast carcinoma can be diagnosed early by spreading awareness among the population about the importance of clinical examination. Clinical examination used in conjunction with diagnostic modalities like mammography and Fine needle aspiration cytology, can efficiently diagnose breast carcinoma. Early diagnosis and appropriate treatment strategies can improve prognosis. There are many prognostic factors and use of some of these factors like tumor size, lymphnode stage, histologic tumor grade help in calculating a prognostic score known as Nottingham Prognostic Index. In the present study, we found commonest type of breast carcinoma to be Infiltrating Ductal Carcinoma – not otherwise specified. We even categorized these breast carcinoma patients into three prognostic groups based on the Nottingham Prognostic Index score. Majority belonged to the moderate prognosis category. Follow-up of these patients should be carried out to assess the survival rate among different prognostic groups. Usefulness of NPI in guiding clinicians to choose treatment strategies has been recorded. Thus, one can take into account the Nottingham Prognostic Index score amongst others to predict prognosis in a breast carcinoma patient.

## 6. Source of funding

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## 7. Conflict of interest

None declared.

## 8. Ethical approval

Institutional ethical clearance has been obtained.

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