

# Histopathology and Immunohistochemical Profile of Breast Cancer amongst Young Females below 40 Years of Age: A Cross-sectional Study

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## ABSTRACT

**Introduction:** Breast cancer is a diverse and heterogeneous disease affecting women in both developing and developed countries. In 2022, Global Cancer Observatory (GLOBOCAN) reported 2.3 million cases of breast carcinoma, which accounted for 11.6% of all cancer cases worldwide. The incidence of breast cancer in India has been steadily rising and has surpassed cervical cancer as the most common cancer in women. Invasive ductal carcinoma is the most common histologic type found in all age groups. Grading is done according to Elston Ellis's modification of the Scarff Bloom Richardson Scoring system. Hormonal {Estrogen Receptor (ER), Progesterone Receptor (PR)} and Human Epidermal growth factor Receptor-2 (HER2/neu) immunohistochemical expression are used for molecular typing of breast carcinoma. Young women account for up to 25% of all breast carcinoma cases in India.

**Aim:** To assess the clinical symptoms, histological type, grade, Immunohistochemistry (IHC) profile (ER, PR, HER2/neu), and their relationships in females below 40 years of age with breast carcinoma.

**Materials and Methods:** An ambispective cross-sectional study with a total of 99 cases of breast carcinoma in young females were included in the study, which was conducted in the Department of Pathology at Sri Aurobindo Medical College and PG Institute in Indore, Madhya Pradesh, India, between

April 2022 and March 2024. Biopsies, lumpectomy, and total or modified mastectomy specimens were fixed in formalin and paraffin embedded. Sections were stained with Haematoxylin and Eosin (H&E) and IHC markers ER, PR, and HER2neu using Estrogen Receptor Alpha Antibody (EP1), EP2, and EP3 antibodies, respectively, on a fully automated workstation. Carcinomas were classified according to the World Health Organisation (WHO) classification and graded based on Elston Ellis's modification of the Scarff Bloom Richardson System Scoring. The proportion of tumour cells and intensity were studied, and evaluation was done with appropriate controls.

**Results:** The most common symptom was a breast lump (84.84%), while Invasive breast cancer of {No Special Type (NST)} was the most common histologic type (96.96%) and histological Grade III was predominant (53.53%) in the majority of patients. ER, PR, and HER2neu were positive in 57.57%, 51.51%, and 33.33% of cases, respectively. HER2neu expression was negative in the majority of cases (66.66%). The most common molecular subtype was Luminal A (35.35%), followed by Triple-negative Breast Cancer (TNBC) (29.29%), Luminal B (22.22%), and the least common was the HER2neu enriched subtype (13.13%).

**Conclusion:** Invasive breast carcinoma (NST) is the most common histologic type, with higher histologic grade and a greater number of triple-negative cases seen in young females (<40 years).

**Keywords:** Histological grade, Invasive breast carcinoma, Molecular subtypes, Triple-negative breast cancer

## INTRODUCTION

Breast cancer is a diverse disease that affects women in both developed and developing countries [1]. In India, it surpasses cervical cancer and is the most common cancer in women [2]. Young women account for up to 25% of cases in India [3], while in China, it accounts for 5%-13% [4]. In 2022, GLOBOCAN reported 2.3 million breast cancer cases, representing 11.6% of global cancer cases [5]. The incidence among women under 40 years of age doubled between 1995 and 2004 in Geneva, Switzerland, Spain and the Netherlands. In the United States, breast cancer is the leading cause of cancer death in women aged 20-39 years [6].

Breast lumps are the most typical presenting symptom in women [7]. Young age is an important independent factor in the poor prognosis of the disease. In young women, breast cancer usually presents with a high histological grade, an unfavourable hormonal status, and a high mortality rate [1]. The World Health Organisation (WHO) classification of breast tumours in 2019 as Invasive breast carcinoma includes NST, lobular, oncocytic, tubular, mucinous

adenocarcinoma, metaplastic carcinoma, and other types such as papillary neoplasm and neuroendocrine neoplasm [8]. The Elston Ellis modification of Scarff Bloom Richardson or Nottingham histologic grade is used for the microscopic grading of breast carcinoma [Table/Fig-1] [9].

Breast cancer is categorised into four molecular subtypes: luminal A, luminal B, ERBB2/human epithelial growth factor receptor 2 (HER2) gene overexpressing (HER2), and basal-like or Triple-negative [10]. Luminal A subtypes are low-grade and account for 40-55% of cases. Compared to luminal A tumours, the prognosis for luminal B malignancies is poorer, ranging from 15% to 20%. HER2neu positive breast cancer is defined by HER2neu protein overexpression and a lack of expression in ER and PR. Triple-negative breast cancer, which accounts for 10-17% of all cases, is characterised by a negative expression of the ER, PR, and HER2neu proteins. Immunohistochemistry-based molecular subtyping can provide additional prognostic and predictive data [11] and help identify patients who may benefit from targeted therapies such as hormonal and anti-HER2 therapy [12].

Features	Score
<b>1. Tubule formation</b>	
>75% of tumour shows tubules	1
10-75% of tumour shows tubules	2
<10% of tumour shows tubules	3
<b>2. Nuclear size</b>	
Small, regular nuclei	1
Intermediate size	2
High-grade nuclei	3
<b>3. Mitotic counts</b>	
0-9 mitoses/10 HPF	1
10-19 mitoses/10 HPF	2
>20 mitoses/10 HPF	3
<b>Nottingham's combined histologic grade</b>	
Well-differentiated (Grade I)	3-5
Moderately-differentiated (Grade II)	6-7
Poorly-differentiated (Grade III)	8-9

**[Table/Fig-1]:** Elston Ellis's modification of Scarff-Bloom-Richardson Scoring or Nottingham histologic grade [9].

It is crucial that every woman has access to medical care facilities, starting with screening and progressing to advanced treatment. Such a concerted effort can help reduce the global burden of breast cancer [1]. Therefore, the present study was conducted among young females (<40 years old) with breast carcinoma regarding clinical symptoms, histological type, grade, IHC profile (ER, PR, HER2/neu), and molecular subtyping.

## MATERIALS AND METHODS

This ambispective cross-sectional study was conducted on 99 cases in the Department of Pathology at Sri Aurobindo Medical College and PG Institute, Indore, Madhya Pradesh, India, after obtaining approval from the Institutional Research Board and Ethical Clearance (reference No. SAIMS/IEC/40/23) from April 2022 to March 2024. For retrospective cases (April 2022 to September 2023), histopathology slides were retrieved from records in the Pathology Department, and relevant clinical data were taken from medical records and files.

**Inclusion and Exclusion criteria:** For all prospective cases (October 2023 to March 2024), core needle biopsies, lumpectomy, and total or modified mastectomy specimens received during the study period were included. All reported breast cancer cases (less than 40 years old) whose core needle biopsies, lumpectomy, and mastectomy tissues were received in 10% formalin in the pathology laboratory during the study period were then subjected to an IHC profile (ER, PR, HER2neu). All breast cancer cases 40 years of age and older, along with all benign breast diseases, were excluded from the study.

## Study Procedure

Out of 104 cases, 99 cases of breast carcinoma in young females (<40 years) proven on histopathology examination and immunohistochemistry, received from the general surgery and surgical Oncology Departments during the study period, were included. All relevant clinical details and informed consent were obtained by explaining them in their own understandable language. Biopsies, lumpectomy, and total or modified mastectomy specimens of breast carcinoma were fixed in 10% neutral buffered formalin, grossed as per prescribed standards, embedded in paraffin, and processed into 4-5 micron-thick sections. These sections were then stained with H&E and subjected to histopathological diagnosis and review by a pathologist. The 2019 WHO classification of breast cancer was applied for histological typing [8]. Grading was done according to

Elston Ellis's modification of the Scarff-Bloom-Richardson System scoring or Nottingham histologic grade as mentioned in [Table/Fig-1] [9]. Cases were subjected to hormonal status ER, PR, and HER2neu immunohistochemistry. The antibodies utilised were anti-oestrogen receptor antibody (EP1), anti-progesterone receptor antibody (EP2), and anti-HER2/ERBB2 antibody (EP3) from Biogenex, Fremont, CA 94538, USA. The Ventana Benchmark GXa fully automated IHC workstation was used for immunohistochemical staining. For each batch of IHC staining, appropriate positive controls (endometrial tissue for ER, PR, while a known HER2neu positive breast carcinoma case for HER2neu) and negative control (tonsil tissue) were added. The ER and PR scoring was done according to Allred scoring as mentioned in [Table/Fig-2] [9], and HER2 scoring was done according to guidelines given by the American Society of Clinical Oncology (ASCO)/College of American Pathologists (CAP) as mentioned in [Table/Fig-3] [13]. All 5 cases of HER2neu 2+ (equivocal) score were excluded from the study due to the unavailability of Fluorescence In-situ Hybridisation (FISH) in the laboratory.

Proportion score	
Score	Percentage of stained cells
0	No cells are ER positive
1	≤1% cells are ER positive
2	1-10% cells are ER positive
3	11-33% cells are ER positive
4	34-66% cells are ER positive
5	67-100% cells are ER positive
Intensity score	
Score	Intensity of staining
0	Negative
1	Weak
2	Intermediate
3	Strong
Allred score (Allred score=Proportion score + Intensity score)	
Allred score	Effect of hormone therapy
0-1	No effect
2-3	Small (20%) chance of benefits
4-6	Moderate (50) chance of benefits
7-8	Good (75%) chance of benefits

**[Table/Fig-2]:** Allred scoring system of scoring for ER and PR [9].

IHC score	ASCO/CAP guidelines
0 (Negative)	No staining or incomplete and faint/barely perceptible membrane staining in ≤10% of tumour cells
1+(Negative)	Score incomplete and faint/barely perceptible membrane staining in >10% of tumour cells
2+(Equivocal)	Score weak/moderate complete membrane staining in >10% of tumour cells OR complete and intense membrane staining in ≤10% of tumour cells
3+ (Positive)	Complete and intense membrane staining in >10% of tumour cells.

**[Table/Fig-3]:** ASCO/CAP guidelines 2018: Interpretation of HER2 immunohistochemistry [13].

Molecular subtyping was done into Luminal A, Luminal B, HER2neu overexpressed, triple-negative breast cancer, or basal-like based on parameters like ER, PR, and HER2neu IHC marker expressions, which are as follows [10]:

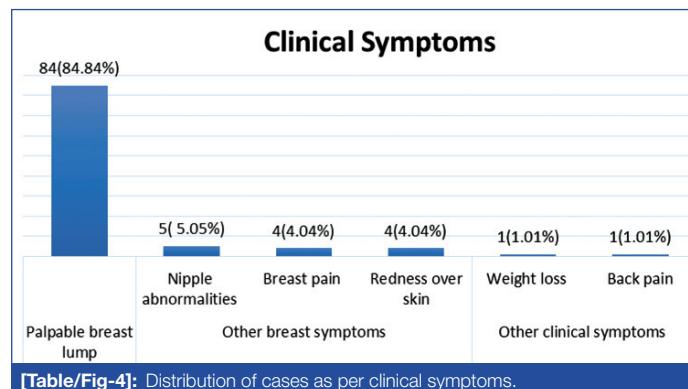
- Luminal A (ER+, PR+, HER2neu-)
- Luminal B (ER+, PR-, HER2neu-) and (ER+, PR+/-, HER2neu+)
- HER2neu (ERBB2 positive) (ER+, PR-, HER2neu amplified or overexpressed).
- Triple-negative breast cancer or basal-like (ER-, PR-, HER2neu-)

## STATISTICAL ANALYSIS

The data analysis was performed in Microsoft Excel Spreadsheets, and Word was utilised to generate tables and graphs. Proportions were described in percentages. The data was reported as mean±standard deviation. Each lesions were characterised using numbers and percentages.

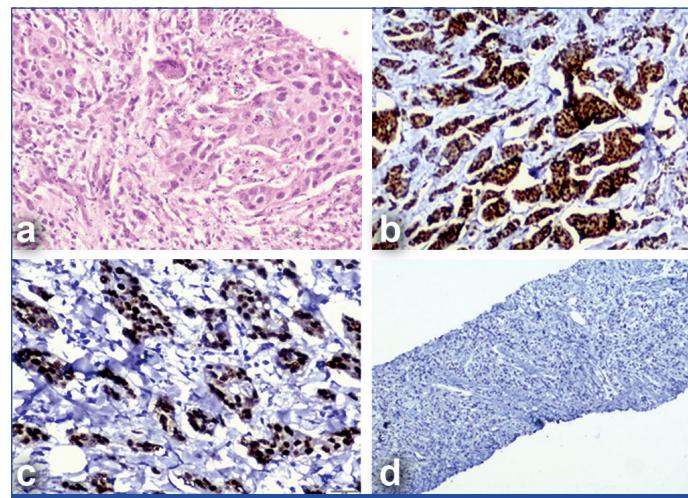
## RESULTS

Out of 104 cases, 99 cases of young females with breast carcinoma were included. The most common symptoms were palpable breast lumps in 84 cases (84.84%), followed by other breast symptoms in 13 cases (13.13%), including nipple abnormalities in 5 cases (5.05%), breast pain and redness overlying the skin, each with 4 cases (4.04%). Other clinical symptoms, such as weight loss and back pain, were each present in 1 case (1.01%) [Table/Fig-4].



[Table/Fig-4]: Distribution of cases as per clinical symptoms.

Invasive breast carcinoma (NST) was the most frequent histologic type of tumour [Table/Fig-5a-d], with 96 cases (96.96%), followed by mucinous adenocarcinoma with two cases (2.02%) [Table/Fig-6a-d], and papillary carcinoma with one case (1.01%) [Table/Fig-7a-d].

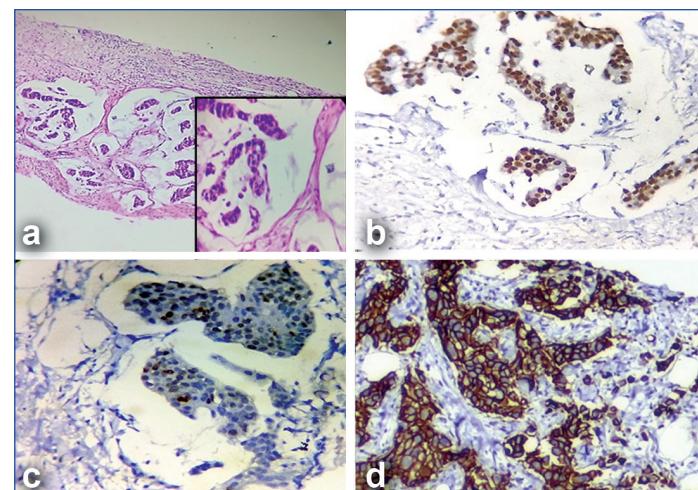


[Table/Fig-5]: a) Microscopy of invasive breast carcinoma (NST) shows tumour cells are arranged in tubules, lobules and cords infiltrating the stroma, histology Grade-III (H&E, 400X); b) IHC ER shows strong nuclear positivity for tumour cells (IHC,100X); c) IHC PR shows strong nuclear positivity for tumour cells (IHC,400X); d) IHC HER2neu shows negative staining for tumour cells (IHC,100X).

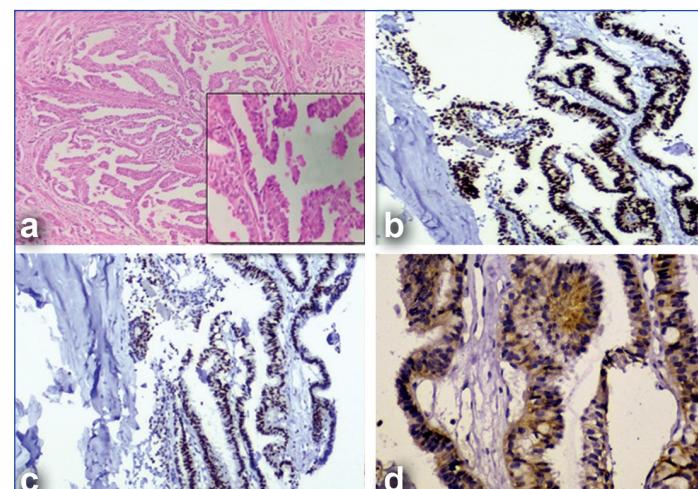
The most prevalent histological grade was Grade III, with 53 cases (53.53%), followed by Grade II with 43 cases (43.43%), and the least common was Grade I, with three cases (3.03%).

In Estrogen study, hormone receptors showed ER positivity in 57 cases (57.57%), followed by PR positivity in 51 cases (51.51%), and HER2neu positivity in only 33 cases (33.33%). HER2neu negative expression was seen in 66 cases (66.66%), followed by PR negativity in 48 cases (48.48%) and ER negative in 42 cases (42.42%).

All these cases were later classified into molecular subtypes as follows: Luminal A (ER+, PR+, HER2neu-) seen in 35 cases (35.35%), TNBC (ER-, PR-, HER2neu-) in 29 cases (29.29%),



[Table/Fig-6]: a) Microscopy of mucinous adenocarcinoma shows cluster of tumour cells separated by extracellular lakes of mucin (H&E 100X, inset 400X); b) IHC ER positive shows positive nuclear staining. (IHC, 100X); c) IHC PR shows positive nuclear staining (IHC,100X); d) IHC HER2neu shows complete, intense circumferential membranous positive staining in > 10% of tumour cells (IHC,400X).



[Table/Fig-7]: a) Microscopy of papillary carcinoma breast shows invasive carcinoma with >90% papillary architecture (H&E, 100X, inset 400X); b) IHC ER shows positive nuclear staining (IHC,100X); c) IHC PR shows positive nuclear staining; (IHC,100X); d) IHC HER2neu shows complete intense circumferential membranous positive staining in >10% tumour cells (IHC,100X).

Luminal B (ER+PR- HER2neu-) or (ER +, PR + or -, HER2neu+) in 22 cases (22.22%), and only 13 cases (13.13%) were in the HER2neu-enriched subtype [Table/Fig-8].

Variables	Number of cases for study (99)	Percentage (%)
<b>Clinical symptoms</b>		
A) Palpable breastlump	84	84.84%
B) Other breast symptoms	13	13.13%
Nipple abnormalities	05	5.05%
Breast pain	04	4.04%
Redness over skin	04	4.04%
C) Other clinical symptoms	02	2.02%
Weight loss	01	1.01%
Back pain	01	1.01%
<b>Histologic types</b>		
Invasive breast carcinoma (NST)	96	96.96 %
Mucinous adenocarcinoma	02	2.02%
Papillary carcinoma breast	01	1.01%
<b>Histological grade</b>		
I	03	3.03%
II	43	43.43%

III	53	53.53%
<b>Estrogen Receptor (ER) status</b>		
Positive	57	57.57%
Negative	42	42.42%
<b>Progesterone receptor (PR) status</b>		
Positive	51	51.51%
Negative	48	48.48%
<b>HER2neu status</b>		
Positive	33	33.33%
Negative	66	66.66%
<b>Molecular subtypes</b>		
Luminal A (ER+, PR+, HER2neu -)	35	35.35%
Luminal B (ER+PR- HER2neu-) and (ER+, PR + or -, HER2neu +)	22	22.22%
HER2 enriched (ER -, PR -, HER2neu +)	13	13.13%
TNBC (ER-, PR-, HER2neu-)	29	29.29%

**[Table/Fig-8]:** Clinicopathological, histological types, grades, immunohistochemistry and molecular subtypes in breast carcinoma of young females (<40 years age).

## DISCUSSION

During the two years of the study period, a total of 469 cases of all breast carcinomas were reported in the study institute, out of which young patients (<40 years) accounted for 104 cases (22.17%). Koshariya M et al., study in India showed that 25% of breast cancer cases occur in young females [3]. Guo R et al., found that breast cancer patients diagnosed between 1999 and 2017 in China showed that around 15% were diagnosed before the age of 40 [14]. Western population studies by Giaquinto AN et al., Anders CK et al., and Hassaine Y et al., accounted for 4%, 6.6%, and 5.66% of breast carcinoma cases in young females (<40 years), respectively [15-17]. Thus, breast carcinoma in younger females shows a higher incidence in developing countries compared to developed countries.

In the present study, out of 99 cases, the most common symptom was a palpable breast lump (84.84%), followed by other breast symptoms (nipple abnormalities 5.05%, redness overlying the skin 4.04%, and breast pain 4.04%), along with other clinical symptoms

such as weight loss (1.01%) and back pain (1.01%). In a study conducted by Koo MM et al., a breast lump (83%) was the most common presentation followed by other breast symptoms, nipple abnormalities (7%), and breast pain (6%). Other clinical symptoms unrelated to the breast, such as back pain (1%) and weight loss (0.3%), were seen in fewer patients [7].

In the present study, invasive breast carcinoma (NST) accounted for 96.96% of cases, making it the most frequent histologic type of tumour, which is consistent with studies by Albasri AM, (88.5%), Eric I et al., (70.95%), Fernandopulle SM et al., (92.3%), and Singh LJ et al., (88%) [Table/Fig-9] [4,18-20]. Previous studies have shown that invasive breast carcinoma (NST) was the most common subtype in both young (<40 years) and elderly groups [Table/Fig-10] [18,20-22].

In this study, the most prevalent histological grade was Grade III (53.53%), followed by Grade II (43.43%), with the least number of cases being Grade I (3.03%). Similar findings were observed in studies by Albasri AM et al., (Grade III-55.2%), Fernandopulle SM et al., (Grade III-59.3%), and Singh LJ et al., (Grade III-76.1%). On the other hand, a study by Eric I et al., showed Grade II (54.4%) as the most common grade of tumour [Table/Fig-9]. Studies by Albasri AM et al., (53.5%), Turhan N et al., (46.2%), and Lodi M et al., (47.1%) in elderly breast carcinoma patients indicated Grade II as the most common histologic grade [Table/Fig-10]. Therefore, younger females tend to have a higher grade of breast carcinoma compared to older patients.

The IHC positive expression of ER, PR, and HER2neu was seen in 57.57%, 51.51%, and 33.33% of cases, respectively, in the present study. Similar results of ER-positive cases were observed in a study conducted on young females by Albasri AM et al., (43.1%), Eric I et al., (54.4%), and Fernandopulle SM et al., (61.4%), while the study done by Singh LJ et al., showed a lesser number of ER positive (29.9%) and PR positive (26.5%) cases compared to HER2neu positive (55.6%) cases. HER2neu expression was negative in the majority of cases (66.66%) in the present Lodi M et al., (89.1%) [Table/Fig-10] study, which is similar to studies done by Albasri AM et al., (55.3%), Eric I et al., (75.9%), and Fernandopulle SM et al., (70.3%), while in the study done by Singh LJ et al., ER negative (68.4%) is more common than HER2neu negative cases (42.7%) [Table/Fig-9] [4,18-20].

Variables	Present Study (<40 years)	Albasri AM et al., 2021 [18]	Eric I et al., 2018 [4]	Fernandopulle SM et al., 2006 [19]	Singh LJ et al., 2019 [20]
<b>Histologic types</b>					
Invasive breast carcinoma (NST)	96 (96.96 %)	153 (88.5%)	56 (70.9%)	84 (92.3%)	103 (88%)
Mucinous adenocarcinoma	02 (2.02%)	-	-	2 (2.2%)	1 (0.9%)
Papillary breast carcinoma	01 (1.01%)	-	-	-	-
Lobular carcinoma	-	2 (1.1%)	11 (13.9%)	2 (2.2%)	7 (6%)
Others	-	5 (2.9%)	12 (15.2%)	3 (3.3%)	6 (5.1%)
<b>Histological grade</b>					
I	3 (3.03%)	13 (8.6%)	13 (16.5%)	7 (7.7%)	15 (12.8%)
II	43 (43.43)	55 (36.2%)	43 (54.4%)	24 (26.4%)	11 (9.4%)
III	53 (53.53%)	84 (55.2%)	23 (29.1%)	54 (59.3%)	89 (76.1%)
<b>Estrogen Receptor (ER) status</b>					
Positive	57 (57.57%)	69 (43.1%)	43 (54.4%)	51 (61.4%)	35 (29.9%)
Negative	42 (42.42%)	74 (51.7%)	36 (45.6%)	32 (38.5%)	80 (68.4%)
<b>Progesterone Receptor (PR) status</b>					
Positive	51 (51.51%)	66 (43.1%)	44 (55.75)	43 (51.8%)	31 (26.5%)
Negative	48 (48.48%)	87 (56.9%)	35 (44.3%)	40 (48.1%)	84 (71.8%)
<b>HER2neu status</b>					
Positive	33 (33.33%)	68 (44.7%)	19 (24.1%)	16 (29.6%)	65 (55.6%)
Negative	66 (66.66%)	84 (55.3%)	60 (75.9%)	38 (70.3%)	50 (42.7%)

**[Table/Fig-9]:** Comparison of clinicopathological, histological type and its grading, immunohistochemistry between study group (<40 years) with other studies of similar age group [4,18-20].

Variables	Present study (<40 years)	Albasri AM et al., 2021 [18]	Turhan N et al., 2022 [21]	Lodi M et al., 2024 [22]	Singh LJ et al., 2019 [20]
<b>Histologic types</b>					
Invasive breast carcinoma (NST)	96 (96.96%)	458 (85.6%)	24 (61.5%)	720 (73.3%)	381 (82.5%)
Mucinous adenocarcinoma	02 (2.02%)	-	-	23 (2.3%)	7 (1.5%)
Papillary breast carcinoma	01 (1.01%)	-	7 (17.9%)	-	
Lobular carcinoma	-	33 (6.2%)	4 (10.3%)	128 (13.0%)	11 (2.4%)
Others	-	15 (2.8%)	4 (10.3%)	111 (11.4%)	22 (13.6%)
<b>Histological grade</b>					
I	3 (3.03%)	51 (11.2%)	9 (23.1%)	221 (25.4%)	105 (22.7%)
II	43 (43.43%)	242 (53.5%)	18 (46.2%)	410 (47.1%)	67 (14.5%)
III	53 (53.53%)	160 (35.3%)	12 (30.8%)	239 (27.4%)	278 (60.2%)
<b>Estrogen Receptor (ER) status</b>					
Positive	57 (57.57%)	280 (65.9%)	37 (94.9%)	732 (88.2%)	220 (47.6%)
Negative	42 (42.42%)	145 (34.1%)	2 (5.1%)	98 (11.2%)	233 (50.4%)
<b>Progesterone receptor (PR) status</b>					
Positive	51 (51.51%)	301 (67.1%)	34 (87.2%)	620 (78.7%)	213 (46.1%)
Negative	48 (48.48%)	148 (32.9%)	5 (12.8%)	168 (21.3%)	240 (51.9%)
<b>HER2neu status</b>					
Positive	33 (33.33%)	132 (31%)	5 (12.8%)	86 (10.9%)	203 (43.9%)
Negative	66 (66.66%)	294 (69%)	34 (87.2%)	699 (89.1%)	249 (53.9%)

**[Table/Fig-10]:** Comparison of clinicopathological, histological type and its grading, immunohistochemistry between the study group (<40 years) and other studies of elderly patients (≥40 years of age) [18,20-22].

In the studies done in older breast carcinoma females, ER positive cases were reported by Albasri AM et al., (65.9%), Turhan N et al., (94.9%), and Lodi M et al., (88.2%), PR positive cases by Albasri AM et al., (67.1%), Turhan N et al., (87.2%), and Lodi M et al., (78.7%), HER2neu positive cases by Albasri AM et al., (31.0%), Turhan N et al., (12.8%), and Lodi M et al., (10.9%), and HER2neu negative cases by Albasri AM et al., (69.0%), Turhan N et al., (87.2%), and Lodi M et al., (89.1%) [Table/Fig-10] [18,20-22]. Thus, HER2neu is negative in the majority of cases, which is similar to the findings in young female cases.

In the present study, cases were categorised into molecular subtypes based on IHC staining characteristics. The results showed that the Luminal A subtype (35.35%) was the most common, followed by the TNBC subtype (29.29%), with the HER2neu enriched subtype being the least common (13.13%), which is similar to the study conducted by Tang J et al., In their study, the luminal A subtype (43.10%) was the most common, followed by the TNBC subtype (27.8%), and the HER2neu enriched type was the least common (11.0%) [23].

On the other hand, the study by Partridge AH et al., [24] showed that the luminal B subtype was the most common, and the HER2neu enriched subtype was the least common. Other studies by Albasri AM et al., (32.2%) and Gupta P et al., (22.2%) demonstrated TNBC as a common subtype in young females [Table/Fig-11] [18,23-25].

In studies conducted on older women by Albasri AM et al., (43.1%), Bulut G et al., (41.7%), Gupta P et al., (60.6%), and Tang J et al., (50.2%), the Luminal A subtype was the most common. Additionally, studies by Albasri AM et al., Bulut G et al., and Tang J et al., in elderly breast carcinoma cases showed TNBC ranging from 13.2% to 15.5% [Table/Fig-12] [18,23,25,26]. This indicates that young females tend to have more triple-negative cases than elderly women.

### Limitation(s)

The results cannot be generalised due to the limited sample size and the study being conducted at a single tertiary care hospital, which may restrict the present study findings from representing the overall population of the region.

Molecular subtypes	Present study	Albasri A M et al., 2021 [18]	Gupta P et al., 2018 [25]	Partridge A H et al., 2016 [24]	Tang J et al., 2011 [23]
Luminal A (ER+, PR+, HER2neu -)	35 (35.35%)	32 (21.5%)	16 (59.2%)	510 (26.6%)	90 (43.10%)
Luminal B (ER+, PR-, HER2neu -)	22 (22.22%)	28 (18.8%)	1 (3.7%)	698 (36.4%)	28 (13.4%)
HER2neu enriched (ER-, PR, HER2neu +)	13 (13.13%)	48 (32.2%)	4 (14.8%)	189 (9.9%)	23 (11%)
TNBC (ER-, PR-, HER2neu -)	29 (29.29%)	41 (32.2%)	6 (22.2%)	478 (24.9%)	58 (27.8%)

**[Table/Fig-11]:** Comparison of molecular subtypes in young patients (<40 years of age) between study group and other studies of young females [18,23-25].

Molecular subtypes	Present study (<40 years)	Albasri AM et al., 2021 [18]	Gupta P et al., 2018 [25]	Bulut G et al., 2020 [26]	Tang J et al., 2011 [23]
Luminal A (ER+, PR+, HER2neu -)	35 (35.35%)	163 (43.1%)	20 (60.6%)	30 (41.7%)	107 (50.2%)
Luminal B (ER+, PR-, HER2neu -)	22 (22.22%)	75 (19.8%)	1 (3.7%)	20 (27.8)	24 (11.3%)
HER2 enriched (ER-, PR -, HER2neu +)	13 (13.13%)	90 (23.8%)	2 (6.0%)	12 (16.7)	36 (16.9%)
TNBC (ER-, PR-, HER2neu -)	29 (29.29%)	50 (13.2%)	10 (30.3%)	10 (13.9)	33 (15.5%)

**[Table/Fig-12]:** Comparison of molecular subtypes between the young (<40 years) of present study and old patients (≥40 years of age) of other studies [18,23,25,26].

## CONCLUSION(S)

The present research paper establishes that breast carcinoma in young women (<40 years of age) is showing an increasing percentage of total carcinoma cases. Breast lumps are the most common presenting symptom, and invasive breast carcinoma (NST) is the most common histologic type. They are different from breast carcinoma occurring in older women. The main differences

observed are a higher histologic grade and a greater number of triple-negative cases in young females, while the luminal A subtype is relatively less common in younger breast carcinomas compared to the older age group. Hormonal (ER, PR) and HER2neu status assessment is useful not only in determining prognosis but also in predictive analysis.

**Author's contribution:** The work was carried out in collaboration with all the authors. Analysis and interpretation were done by Dr. Amit Varma and Dr. Prakhar Garg. Data collection and compilation was done by Dr. Nancy Jain and Dr. Pooja Nathani. The final manuscript was approved and overviewed by all the authors.

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