SCIENTIFIC JOURNAL
CEREM-GO

DOI 10.37951/2675-5009.2026v7i20.206
ISSN 2675-5009
e26206
SCIENTIFIC ARTICLE - ORIGINAL

TRIPLE-NEGATIVE VERSUS NON-TRIPLE-NEGATIVE INVASIVE BREAST CARCINOMA: COMPARISON OF CLINICOPATHOLOGICAL CHARACTERISTICS, THERAPEUTIC PROFILE AND OUTCOMES IN A HOSPITAL COHORT

JUAREZ ANTÔNIO DE SOUSA[1], WALDEMAR NAVES DO AMARAL[1], ANDRÉ MAROCCOLO DE SOUSA[2], DÉBORA NASCIMENTO DIAS NEVES[3], LAURA DE SOUSA E SOUSA[4], LUIZA DE SOUSA E SOUSA[4], ANA LUIZA FLEURY CALAÇA[5]

1. Doutor, Professor do Departamento de Ginecologia e Obstetrícia da Faculdade de Medicina da Universidade Federal de Goiás (UFG), Goiânia, GO, Brazil.
2. Médico Residente de Cirurgia Geral, Universidade Estadual de São Paulo (USP), São Paulo, SP, Brazil.
3. Médica, Universidade Federal de Goiás (UFG), Goiânia, GO, Brazil.
4. Acadêmica de Medicina, Universidade UniEvangélica, Anápolis, GO, Brazil.
5. Médica Residente de Ginecologia e Obstetrícia, Maternidade Aristina Cândida, Goiânia, GO, Brazil.

ABSTRACT

Introduction: Triple-negative breast carcinoma (TNBC), defined by the absence of estrogen receptor, progesterone receptor, and HER2 expression, is an aggressive molecular subtype with unfavorable prognosis. Its characterization in Brazilian institutional cohorts contributes to understanding local disease particularities. **Objective:** To compare clinical-pathological characteristics, therapeutic profile, and clinical outcomes between triple-negative and non-triple-negative invasive breast carcinoma patients in a hospital cohort from Central-West Brazil. **Methods:** Retrospective cohort study with 97 patients with confirmed invasive breast carcinoma (DCIS excluded). Triple-negative (n=15) and non-triple-negative (n=82) groups were compared for sociodemographic, tumor, molecular, therapeutic, and outcome variables. Fisher's exact test was used for categorical and Mann-Whitney for continuous variables (significance level: 5%). **Results:** TNBC accounted for 15.5% of the cohort (n=15). The triple-negative group had significantly higher mean Ki-67 (54.0% vs. 15.5%; $p < 0.001$) and higher proportion of grade 3 tumors (40.0% vs. 9.8%; $p = 0.007$). Chemotherapy was performed in 93.3% of triple-negative vs. 51.2% of non-triple-negative cases ($p = 0.003$), predominantly neoadjuvant (93.3% vs. 22.0%; $p < 0.001$). No triple-negative patient received hormone therapy vs. 90.2% in the non-triple-negative group ($p < 0.001$). Death rates were significantly higher in the triple-negative group (26.7% vs. 2.4%; $p = 0.005$), as were recurrence rates (26.7% vs. 6.1%; $p = 0.030$). Kaplan-Meier curves demonstrated inferior overall survival in the triple-negative group (log-rank $p = 6.32 \times 10^{-4}$).
Conclusion: Triple-negative breast carcinoma was associated with higher tumor proliferation, greater use of neoadjuvant chemotherapy, and worse clinical outcomes compared to other subtypes. These findings reinforce the need for specific diagnostic and therapeutic strategies for this subgroup in regional clinical practice.

Keywords: Triple negative breast neoplasms, Molecular subtype, Prognosis, Ki-67, Neoadjuvant chemotherapy.

INTRODUCTION

Triple-negative breast carcinoma (TNBC) is defined by the simultaneous absence of estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2) expression. This molecular subtype accounts for approximately 15–20% of all invasive breast carcinomas and is recognized as having the most aggressive biological behavior, with a higher rate of cellular proliferation, a greater propensity for early systemic dissemination, and poorer overall survival compared with other subtypes.[1]

From a therapeutic perspective, the absence of the three main molecular targets — hormone receptors and HER2 — precludes the use of the two major classes of targeted therapy available for breast cancer treatment: hormone therapy and anti-HER2 agents. Systemic chemotherapy, preferably administered in the neoadjuvant setting, remains the mainstay of treatment, with pathological complete response rates ranging from 30% to 50%, depending on the regimen used. More recently, immunotherapy with the immune checkpoint inhibitor pembrolizumab has been incorporated into the neoadjuvant treatment of high-risk TNBC, representing a significant therapeutic advance for this subgroup.[2]

Characterizing the clinicopathological, therapeutic, and prognostic profile of TNBC in Brazilian institutional cohorts is relevant for several reasons. First, the epidemiological and molecular characteristics of TNBC may vary across populations, with a higher prevalence reported among younger women and women of African ancestry. Second, treatment patterns and clinical outcomes in Brazilian private healthcare settings may differ from those reported in large international clinical trials, particularly with regard to access to modern therapies. Third, regional data on TNBC in the Central-West region of Brazil remain scarce in the indexed literature.[3]

The present study aimed to compare clinicopathological characteristics, treatment profiles, and clinical outcomes between patients with TNBC and non-triple-negative breast carcinoma (non-TNBC) in a hospital cohort from a private healthcare institution in Goiás.

METHODS

The Study Design and Population

A retrospective cohort study was conducted with 97 patients with a histologically confirmed diagnosis of invasive breast carcinoma who were treated at a private referral hospital for oncology in Goiás (2007–2024). Two cases of ductal carcinoma in situ (stage 0) were excluded. The study was conducted in accordance with CNS Resolution No. 466/2012.

Definition of Groups

The triple-negative subtype was defined as the absence of ER, PR, and HER2 expression on immunohistochemical analysis. Patients were allocated to two groups: TNBC (n = 15) and non-TNBC (n = 82). The non-TNBC group included all other molecular subtypes: luminal A, luminal B, and HER2-enriched.

Variables Analyzed

The following variables were compared between groups: sociodemographic characteristics (age at diagnosis); tumor characteristics (clinical stage, tumor size, tumor grade, histological type, axillary involvement); molecular markers (Ki-67); surgical approach (type of surgery,

breast reconstruction); treatment modalities (chemotherapy — setting and type —, hormone therapy, and radiotherapy); and clinical outcomes (death and tumor recurrence).

Statistical Analysis

Between-group comparisons were performed using Fisher's exact test for categorical variables and the Mann–Whitney test for continuous variables (age, tumor size, and Ki-67), given the expected non-normality of the distributions. Overall survival was estimated using the Kaplan–Meier method and compared using the log-rank test. All analyses were performed using R software (version 4.x), with a significance level of 5%.

RESULTS

Prevalence and Overall Profile

TNBC accounted for 15.5% of the cohort (n = 15/97). Comparative characteristics between the groups are presented in Table 1. The mean age at diagnosis was 50.3 ± 10.3 years in the TNBC group vs. 55.8 ± 11.2 years in the non-TNBC group, with no statistically significant difference (p = 0.118), although there was a trend toward diagnosis at a younger age in the triple-negative group (Table 1).

Table 1. Comparison of Clinicopathological Characteristics, Treatment Profiles, and Outcomes Between the Triple-Negative and Non-Triple-Negative Groups (n = 97).

Variable	Triple-negative (n=15)	Non triple-negative (n=82)	p-value
Clinical Characteristics			
Age at diagnosis — mean ± SD (years)	50.3 ± 10.3	55.8 ± 11.2	0.118
Median (min–max)	53 (31–67)	56 (31–77)	—
Clinical stage			
I–II	12 (80.0%)	75 (91.5%)	0.183
III–IV	3 (20.0%)	7 (8.5%)	0.183
Tumor Characteristics			
Tumor size — mean ± SD (cm)	3.2 ± 2.2	2.3 ± 1.1	0.065
Median (min–max)	2.5 (0.9–10.0)	2.0 (0.5–6.0)	—
Tumor grade			
G1	2 (13.3%)	12 (14.6%)	0.007*
G2	7 (46.7%)	62 (75.6%)	—
G3	6 (40.0%)	8 (9.8%)	—
Ki-67 (%)			
Mean ± SD Média ± DP	54.0 ± 19.9	15.5 ± 12.8	< 0.001†
Median (min–max)	50 (10–80)	10 (5–60)	—
Axillary approach			
Negative	8 (53.3%)	61 (74.4%)	0.124
Positive	7 (46.7%)	21 (25.6%)	0.124
Histological type			
IDC	12 (80.0%)	68 (82.9%)	—

Figure 2. (A) Patient positioning for pre-oxygenation. (B) Video laryngoscopy.

ILC	0 (0.0%)	7 (8.5%)	—
Inflammatory carcinoma	1 (6.7%)	1 (1.2%)	—
Other	2 (13.3%)	6 (7.3%)	—
Treatments Received			
Chemotherapy	14 (93.3%)	42 (51.2%)	0.003
Neoadjuvant	14 (93.3%)	18 (22.0%)	< 0.001
Adjuvant	0 (0.0%)	22 (26.8%)	0.020
Radiotherapy	13 (86.7%)	62 (75.6%)	0.508
Hormone therapy	0 (0.0%)	74 (90.2%)	< 0.001
Surgical Approach			
Quadrantectomy	10 (66.7%)	55 (67.1%)	1.000
Unilateral mastectomy	1 (6.7%)	15 (18.3%)	0.453
Bilateral mastectomy	4 (26.7%)	12 (14.6%)	0.264
Breast reconstruction	15 (100.0%)	72 (87.8%)	0.345
Clinical Outcomes			
Death	4 (26.7%)	2 (2.4%)	0.005
Tumor recurrence	4 (26.7%)	5 (6.1%)	0.030

IDC: invasive ductal carcinoma; ILC: invasive lobular carcinoma. *p-value for the overall distribution of tumor grade between groups using Fisher's exact test. †Mann–Whitney test for comparison of mean Ki-67 values.

Tumor and Molecular Characteristics

The TNBC group had a higher proportion of grade 3 tumors (40.0% vs. 9.8%; p = 0.007) and a significantly higher mean Ki-67 (54.0 ± 19.9% vs. 15.5 ± 12.8%; p < 0.001). Mean tumor size was larger in the TNBC group (3.2 ± 2.2 cm vs. 2.3 ± 1.1 cm), although the difference did not reach statistical significance (p = 0.065). Axillary involvement was more frequent in the TNBC group (46.7% vs. 25.6%), without reaching statistical significance (p = 0.124). Stage III–IV disease was observed in 20.0% of the TNBC group vs. 8.5% of the non-TNBC group (p = 0.183).

Treatment Profile

Marked differences in treatment patterns were observed between the groups. Chemotherapy was administered in 93.3% of TNBC cases vs. 51.2% of non-TNBC cases (p = 0.003). Notably, 93.3% of TNBC cases received neoadjuvant chemotherapy, compared with only 22.0% of the non-TNBC group (p < 0.001). No patient in the TNBC group received hormone therapy, compared with 90.2% of the non-TNBC group (p < 0.001) — an expected finding given the definition of the subtype, which excludes hormone receptor expression. Radiotherapy was administered in similar proportions (86.7% vs. 75.6%; p = 0.508). The type of surgery did not differ significantly between the groups, with quadrantectomy predominating in both (66.7% vs. 67.1%; p = 1.000).

Clinical Outcomes and Survival

The proportion of deaths was significantly higher in the TNBC group (26.7%; 4/15) than in the non-TNBC group (2.4%; 2/82; p = 0.005). Similarly, the proportion of recurrences was higher in the TNBC group (26.7%; 4/15) than in the non-TNBC group (6.1%; 5/82; p = 0.030).

Figure 1 presents the Kaplan–Meier curves of overall survival stratified by triple-negative subtype. The TNBC group showed lower overall survival than the non-TNBC group (log-rank p = 6.32×10^{-4}) (Figure 1).

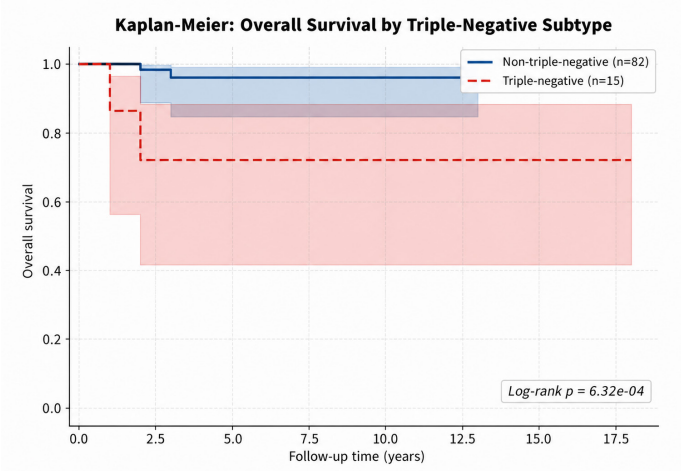

Figure 1. Kaplan–Meier curves of overall survival according to triple-negative subtype. The triple-negative group (n = 15) showed lower survival than the non-triple-negative group (n = 82). Log-rank p = 6.32×10^{-4}.

DISCUSSION

This study compared the clinicopathological, therapeutic, and prognostic profiles of TNBC with those of other molecular subtypes in a private hospital cohort from the Central-West region of Brazil. The findings confirm patterns described in the international literature, with TNBC showing greater tumor proliferation, more frequent use of neoadjuvant chemotherapy, and poorer clinical outcomes compared with the non-TNBC group.[4]

The prevalence of TNBC in this cohort (15.5%) is consistent with global estimates, which range from 10% to 20% of invasive breast carcinomas. The trend toward diagnosis at a younger age in the TNBC group (50.3 vs. 55.8 years), although not statistically significant in this sample, is consistent with literature data indicating a higher incidence of TNBC among premenopausal women and women of African ancestry.[5]

The mean Ki-67 value of 54.0% in the TNBC group, significantly higher than the 15.5% observed in the non-TNBC group ($p < 0.001$), reflects the high cellular proliferation characteristic of this subtype. This finding has direct therapeutic implications: tumors with high Ki-67 are recognized as being more chemosensitive, supporting the preferential use of neoadjuvant chemotherapy in TNBC. The proportion of patients receiving neoadjuvant chemotherapy in this group (93.3%) was markedly higher than the 22.0% observed in the non-TNBC group, reflecting current clinical practice for this subtype.[6]

The higher proportion of grade 3 tumors in the TNBC group (40.0% vs. 9.8%; p = 0.007) is consistent with the more aggressive biological behavior of this subtype. High histological grade, together with elevated Ki-67, constitutes a profile of high proliferative activity and

aggressiveness that supports the more intensive therapeutic approach observed in this group. The trends toward greater axillary involvement (46.7% vs. 25.6%) and larger tumor size (3.2 vs. 2.3 cm), although not statistically significant in this sample, are consistent with the greater local aggressiveness of TNBC.[7]

The proportions of deaths (26.7% vs. 2.4%; p = 0.005) and recurrences (26.7% vs. 6.1%; p = 0.030) were significantly higher in the TNBC group, and the Kaplan–Meier curves confirmed lower overall survival in this group (log-rank p = 6.32×10^{-4}). These results are consistent with the literature reporting lower five-year survival rates for TNBC compared with luminal and HER2-enriched subtypes receiving targeted therapy.[8]

Several limitations should be highlighted. The TNBC group was small (n = 15), limiting the statistical power of the comparisons and the stability of the survival estimates. Confidence intervals for estimates in the TNBC group are necessarily wide, and the results should therefore be interpreted as exploratory. Detailed molecular subtype data (luminal A vs. luminal B and HER2-enriched) were not available for the non-TNBC group, precluding within-group comparisons. The lack of data on pathological complete response to neoadjuvant chemotherapy represents another relevant limitation in the prognostic characterization of TNBC in this cohort.[9,10]

CONCLUSION

Triple-negative breast carcinoma accounted for 15.5% of this cohort and exhibited tumor characteristics indicative of greater biological aggressiveness — higher Ki-67 and a greater proportion of grade 3 tumors — compared with the other subtypes. The treatment profile was characterized by the nearly universal use of neoadjuvant chemotherapy and the absence of hormone therapy, reflecting the molecular characteristics of this subtype. The proportions of deaths and recurrences were significantly higher in the triple-negative group, with lower overall survival confirmed by Kaplan–Meier analysis.

These findings reinforce the importance of early identification of the triple-negative subtype at diagnosis to guide specific therapeutic strategies and of closer clinical follow-up in this subgroup. Larger patient series and the incorporation of data on response to neoadjuvant chemotherapy are needed to enable more robust prognostic analyses of TNBC in the regional context.

REFERENCES

1. Lehmann BD, Bauer JA, Chen X, Sanders ME, Chakravarthy AB, Shyr Y, et al. Identification of human triple-negative breast cancer subtypes and preclinical models for selection of targeted therapies. J Clin Invest. 2011;121(7):2750-67.

2. Dent R, Trudeau M, Pritchard KI, Hanna WM, Kahn HK, Sawka CA, et al. Triple-negative breast cancer: clinical features and patterns of recurrence. Clin Cancer Res. 2007;13(15):4429-34.

3. Schmid P, Cortes J, Pusztai L, McArthur H, Kümmel S, Bergh J, et al. Pembrolizumab for early triple-negative breast cancer. N Engl J Med. 2020;382(9):810-21.

4. Carey LA, Dees EC, Sawyer L, Gatti L, Moore DT, Collichio F, et al. The triple negative paradox: primary tumor chemosensitivity of breast cancer subtypes. Clin Cancer Res. 2007;13(8):2329-34.

5. Liedtke C, Mazouni C, Hess KR, André F, Tordai A, Mejia JA, et al. Response to neoadjuvant therapy and long-term survival in patients with triple-negative breast cancer. J Clin Oncol. 2008;26(8):1275-81.

6. Perou CM, Sørlie T, Eisen MB, van de Rijn M, Jeffrey SS, Rees CA, et al. Molecular portraits of human breast tumours. Nature. 2000;406(6797):747-52.

7. Foulkes WD, Smith IE, Reis-Filho JS. Triple-negative breast cancer. N Engl J Med. 2010;363(20):1938-48.

8. Instituto Nacional de Câncer José Alencar Gomes da Silva (INCA). Estimativa 2023: Incidência de Câncer no Brasil. Rio de Janeiro: INCA; 2022.

9. Gradishar WJ, Moran MS, Abraham J, Aft R, Agnese D, Allison KH, et al. NCCN Guidelines® Insights: Breast Cancer, Version 4.2023. J Natl Compr Canc Netw. 2023;21(6):594-608.

10. R Core Team. R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing; 2023. Disponível em: https://www.R-project.org/.

MAILING ADDRESS

JUAREZ ANTÔNIO DE SOUSA
Rua 13, 380 ap 5, Setor Oeste, Goiânia-GO, Brasil.
E-mail: juarez_antonio@ufg.br

EDITORIAL AND REVIEW

Received: 31/05/26. Accepted: 14/07/26. Published in: 09/09/2026.