# The Investigation of CA 15-3 Antigen Levels in Local and Immigrant Women Patients Diagnosed with Breast Cancer in Gaziantep

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## Introduction

Cancer, like in the rest of the world, represents a significant public health issue in Turkey and is considered the second leading cause of death after cardiovascular diseases. Globally, cancer ranks second among causes of death, and according to projections, it is expected to become the leading cause by 2030 (1). An epidemiological study has found that breast cancer accounts for 25% of all cancer cases and 15% of cancer-related deaths among women (2). Since breast cancer is the most common type of cancer among women, raising awareness for early detection and strengthening screening programs are of utmost importance. In Turkey, the incidence of breast cancer, which was 24/100,000 according to data from 1993, had risen to nearly 50/100,000 by 2010 (3). A study conducted in 2019 reported that approximately 4,300 women lost their lives due to breast cancer in Turkey (4). CA 15-3 antigen is an epitope located on a large mucin-like glycoprotein encoded by the MUC-11 gene. MUC-1, encoded by the MUC-11 gene, is a glycoprotein with intense O-linked glycosylation on its extracellular domain (5). MUC-1 proteins are normally found in the glandular epithelium of various organs, providing a protective and lubricating effect to the surrounding cells. Furthermore, MUC-1 proteins play a role in protecting the body from infections by covering the apical surfaces of epithelial cells in the stomach, intestines, lungs, eyes, and other organs, preventing pathogens from reaching the cell surface (6). CA 15-3 is a mucin antigen particularly associated with breast cancer, and its use in detecting cancer-related changes is becoming increasingly important. MUC-1 proteins bind pathogens through oligosaccharides, preventing them from reaching the cell surface and serving a protective role in the extracellular space (6). Overexpression of MUC-11 has been frequently associated with colon, breast, ovarian, lung, and pancreatic cancers (6). A study conducted by Kozan and colleagues in Turkey found that BRCA mutations increased the risk of breast cancer in women, particularly with advancing age (7). Moreover, in another study, the ratio of CEA and CA 15-3 antigens was compared, and it was observed that this ratio was significantly higher in breast cancer patients (8). These findings support the role of CA 15-3 antigen as an important biomarker in the diagnosis and follow-up of breast cancer and emphasize its clinical value.

The aim of this study is to examine the relationship between clinical-pathological characteristics, such as age, and CA 15-3 antigen levels in immigrant and local female patients diagnosed with breast cancer. Additionally, by evaluating the diagnostic and prognostic value of the CA 15-3 biomarker, the study aims to determine the effects of age and clinical features on CA 15-3 levels and explore the role of this biomarker in the clinical management of immigrant and local female patients. Through the findings, the study aims to contribute to the development of strategies for breast cancer diagnosis and treatment based on the demographic

and clinical characteristics of immigrant and local female groups from a public health perspective.

**Materials and Methods**:

This study is based on the results of blood samples sent for CA 15-3 test analysis in a hospital in Gaziantep, which were obtained from patients diagnosed with breast cancer. Our study is a retrospective study, and the results of CA 15-3 tests routinely requested from the Obstetrics and Gynecology outpatient clinic were retrieved from the hospital archive covering a 10-year period. The analysis of the CA 15-3 test was performed using the Beckman DxI 800 analyzer, employing the chemiluminescence immunoassay method, with a kit specifically produced for the Beckman autoanalyzer under the name Br 15-3.

The data obtained from the study were analyzed using SPSS 20.0 software. Descriptive statistics such as mean, standard deviation, and percentage distributions were provided. Independent samples t-test was used for the comparison of variables consisting of two parameters, while chi-square analysis was used for the comparison of categorical variables, and the results were evaluated at a 95% confidence level ($p<0.05$).

The study was conducted in accordance with international declarations and guidelines and was approved by the Gaziantep University Ethics Committee and Research Institute, under approval number 2023/186.

**Results**

As shown in Table 1, an independent samples t-test was performed to determine whether CA 15-3 results differ by age groups among Turkish citizens. The test revealed that the mean CA 15-3 antigen level was significantly higher in women aged 50 and older ($p<0.001$).

**Table 1.** Comparison of CA 15-3 levels according to age in Turkish women diagnosed with breast cancer

| Age | N | Mean | Std. Deviation | t | p |
|------|------|-------|----------------|-------|------|
| >50 | 6778 | 25,58 | 58,45 | 4,826 | .001 |
| <50 | 5273 | 20,71 | 50,35 | | |

The chi-square analysis performed in Table 2 also showed that CA 15-3 levels were significantly higher in Turkish patients over the age of 50 compared to those under 50 ($p<0.001$).

**Table 2.** Comparison of CA 15-3 level difference according to age in Turkish women diagnosed with breast cancer

| | | Result_Grup | | Total | $\chi^2$ | p |
|---|---|---|---|---|---|---|
| | | Normal | High | | | |
| Age_Grup | <50 | 4859 | 414 | 5273 | 66,762 | 0.001 |
| | >50 | 5935 | 843 | 6778 | | |
| Total | | 10794 | 1257 | 12051 | | |

**Table 3.** Comparison of CA 15-3 levels according to age in Syrian women diagnosed with breast cancer

| Syrian age grup | N | Mean | Std. Deviation | t | p |
|---|---|---|---|---|---|
| >50 | 97 | 42,58 | 91,295 | 0,667 | 0,167 |
| <50 | 143 | 35,66 | 69,126 | | |

In Table 4, an independent samples t-test conducted between Turkish and Syrian patients aged 50 and over found that the proportion of Syrian women was statistically significantly higher than that of Turkish citizens (p>0.05).

**Table 4.** Comparison of CA 15-3 antigen elevation in Turkish patients over 50 years age and Syrian patients over 50 years age.

| Nationality | N | Mean | Std. Deviation | t | p |
|---|---|---|---|---|---|
| TC | 6778 | 25,5894 | 58,45148 | 2,815 | 0,005 |
| Syrian | 97 | 42,5806 | 91,29527 | | |

However, an independent samples t-test conducted to determine the difference in CA 15-3 levels between Turkish and Syrian patients under 50 showed that the difference between the groups was not statistically significant (p>0.05) (Table 5).

**Table 5.** Comparison of CA 15-3 antigen elevation in Turkish patients under 50 years of age and Syrian patients under 50 years of age

| Nationality | N | Mean | Std. Deviation | t | p |
|---|---|---|---|---|---|
| TC | 5273 | 20,7103 | 50,35687 | 2,569 | 0,001 |
| Syrian | 143 | 35,6643 | 69,12602 | | |

Another independent samples t-test performed on Turkish and Syrian patients showed that the mean CA 15-3 level was higher in Syrian women than in Turkish women, and this difference was statistically significant (p<0.05) (Table 6).

3

**Table 6.** Comparison of CA 15-3 antigen mean of Turkish and Syrian patients

| Nationalty | N | Mean | Std. Deviation | t | p |
|---|---|---|---|---|---|
| TC | 12051 | 23,4545 | 55,10725 | 2,938 | 0,004 |
| Syrian | 240 | 38,4597 | 78,73056 | | |

Additionally, the chi-square analysis showed that CA 15-3 levels were higher in Turkish patients compared to Syrian patients, and this difference was statistically significant (p<0.05) (Table 7).

**Table 7.** Comparison of CA 15-3 antigen mean difference between Turkish and Syrian Patients

| | | Result_Grup CA 15-3 | | Total | $\chi^2$ | p |
|---|---|---|---|---|---|---|
| | | Normal | High | | | |
| Nationality | TC | 10794 | 1257 | 12051 | 11,026 | 0,001 |
| | Syrian | 199 | 41 | 240 | | |
| Total | | 10993 | 1298 | 12291 | | |

In Table 8, the chi-square analysis conducted on all female patients showed that CA 15-3 antigen levels were statistically significantly higher in patients aged 50 and over compared to those under 50 (p<0.001).

**Table 8.** Comparison of the mean elevation of CA 15-3 antigen in all female patients in patients over 50 years of age compared to patients under 50 years of age

| | | Result_Grup CA 15-3 | | Total | $\chi^2$ | p |
|---|---|---|---|---|---|---|
| | | Normal | High | | | |
| Age Grup | <50 | 4976 | 440 | 5416 | 60,857 | 0,001 |
| | >50 | 6017 | 858 | 6875 | | |
| Total | | 10993 | 1298 | 12291 | | |

As seen in Table 9, an independent samples t-test conducted to determine the difference between the groups revealed that the mean CA 15-3 level in the patient group was statistically significantly higher than that of the control group (p<0.001).

**Table 9.** Comparison of the CA 15-3 antigen mean of the patient group and the healthy group

| Grup | N | Mean | Std. Deviation | t | p |
|---|---|---|---|---|---|
| Patient | 12558 | 23,6341 | 55,57289 | 3,967 | 0,001 |
| Control | 514 | 13,9079 | 6,47944 | | |

## Discussion

Although CA 15-3 antigen has been studied in many breast cancer studies using blood samples, it has been emphasized that this antigen alone is not sufficient for the diagnosis of breast cancer. Therefore, despite studies that use different tumor markers along with CA 15-3 antigen, the significance of high levels of this antigen in the prognosis of breast cancer patients still remains relevant. In our study, we investigated the relationship between the elevation of CA 15-3 antigen and age in breast cancer patients.

A similar study was conducted by Park and colleagues in 740 breast cancer patients, where no significant relationship was found between CA 15-3 levels and age in patients above and below 35 years old. However, in our study, it was determined that CA 15-3 antigen levels were significantly higher in breast cancer patients aged 50 and over (p<0.01) (Table 1). The possible reason for the differing results in Park and colleagues' findings could be the smaller sample size compared to our study and the average age being 35. Additionally, we believe that the statistical findings obtained in our study are more meaningful.

When examining the CA 15-3 antigen results in immigrant Syrian patients living in our region, we observed that patients aged 50 and over showed higher values compared to those under 50. However, this difference was not statistically significant. Interestingly, we found that CA 15-3 levels were significantly higher in Syrian women compared to Turkish women with breast cancer (Table 4). Although there are no studies in the literature regarding this, it can be hypothesized that Syrian patients' inadequate knowledge about breast cancer prevention, early lactation due to early marriages, and the effects of climate change on the MUC-1 gene could explain these findings. Additionally, the smaller sample size of Turkish patients compared to Syrian patients might have led to the statistical significance of these differences.

In conclusion, this study demonstrates that age and ethnicity may affect CA 15-3 levels in women diagnosed with breast cancer. Specifically, it was found that CA 15-3 levels were higher in women aged 50 and over, higher in Turkish women compared to those under 50, but higher in Syrian women compared to Turkish women. Furthermore, the higher mean CA 15-3 levels in the patient group compared to the control group highlight that cancer may have different effects in different groups, emphasizing the importance of personalized health approaches. These findings suggest that public health policies should develop individualized approaches to minimize health inequalities between local and immigrant populations.

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