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The impact of education level on breast cancer stage at diagnosis: Data from Eastern and Southeastern Türkiye

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Abstract

Breast cancer is the most common cancer in women and the leading cause of cancer-related mortality. Its incidence and early diagnosis rates vary between countries, ethnic groups, and regions. This study examines the impact of educational status on tumor size, axillary involvement, and disease stage in breast cancer patients from Eastern and Southeastern Türkiye. A total of 51 breast cancer patients undergoing surgery at our hospital between August 2023 and January 2025 were evaluated. Four with recurrent cancer were excluded, leaving 47 patients. A significant relationship was found between education level and axillary involvement ($p = 0.021$). The highest rate of negative axillary involvement was in primary school graduates (89.47%), while the lowest was in high school graduates (37.50%). No significant relationship was found between literacy status and axillary involvement ($p = 0.147$). Educational level significantly affected axillary involvement in breast cancer, with the lowest rates observed in primary school graduates and the highest in high school graduates. The lack of a significant difference between literate and illiterate groups suggests that visual and auditory media-based awareness campaigns are effective throughout society. Countries should emphasize visual and auditory breast cancer education to maximize outreach.

Keywords: Breast cancer, education, literacy, axillary involvement

Introduction

Breast cancer accounts for 25.9% of all cancers in women in Türkiye, making it the most common cancer and the leading cause of cancer-related mortality among women [1]. Despite significant advances in the diagnosis and treatment of breast cancer, its incidence continues to rise. The incidence was 24 per 100,000 in 1993, rising to 32 in 2002, 47 in 2017, and 52 in 2019 [2-4]. According to the 2020 report of the International Agency for Research on Cancer, in 2018, an estimated 2.1 million new breast cancer cases and 627,000 breast cancer-related deaths occurred globally [3].

Early detection of breast cancer is crucial, as the success of treatment is very high when diagnosed in the early stages. For this reason, breast cancer screening programs are implemented in many countries, including our country. A study based on an international survey found that low educational level is one of the reasons for delayed diagnosis in developed countries [5]. Another study conducted in Türkiye in 2014 reported that having at least a high school education facilitates early diagnosis [6].

The incidence of breast cancer and early diagnosis rates vary not only between countries but also among different ethnic groups and regions within the same country. In this study, we investigated the possible effects of the educational status of breast cancer patients from Eastern and Southeastern Türkiye on tumor size, axillary involvement, and disease stage.

Material and Methods

This study was designed as a retrospective clinical study. A total of 51 patients diagnosed with breast cancer and admitted to our hospital for surgery between August 2023 and January 2025 were evaluated. The study setting was a secondary care private hospital. Regarding the patient selection process, four patients

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who presented with recurrent cancer were excluded to maintain a homogenous study group of primary diagnoses, and 47 patients were ultimately included in the study. The patient selection process is illustrated in Figure 1.

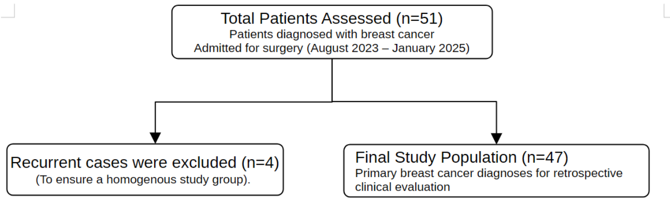

Figure 1. Study flowchart

Data was collected using the hospital record system and the online patient tracking system developed by our clinic. Tumor size was obtained from ultrasound and magnetic resonance imaging (MRI) reports at the time of initial diagnosis. If there was a discrepancy between the ultrasound and MRI reports, the MRI measurement was accepted as accurate. Staging was performed for each patient. Patients were contacted to obtain information about their educational level, number of pregnancies, and family history. Abortions were included in the pregnancy count.

The education levels of the patients were categorized as Primary School Graduate (covering 5 to 8 years of schooling), High School Graduate (12 years of schooling), and University Graduate. Since the mandatory education period in our country was extended from 5 to 8 years, individuals who received 5 and 8 years of education were evaluated within the same group. Additionally, regardless of their formal education status, patients were further sub-grouped based on their literacy status.

Ethical approval for the study was obtained from the Scientific Research Ethics Committee of Gazi Yaşargil Training and Research Hospital (Date: November 7, 2025; Reference No: 701). All participants provided written informed consent prior to enrollment.

Data were analyzed using IBM SPSS Statistics for Windows, version 26.0. Descriptive statistics were presented as mean ± standard deviation (SD) and minimum-maximum values for continuous variables, while categorical data were expressed as frequencies (n) and percentages (%). The Independent Samples t-test was employed to compare continuous variables between two independent groups, such as literacy and family history. For comparisons involving three-level groups, specifically education level, One-Way ANOVA was applied. The relationships between continuous variables were evaluated using Pearson Correlation Analysis. A two-tailed p-value of < 0.05 was considered statistically significant for all analyses.

Results

The demographic and clinical characteristics of the patients are presented in Table 1. Education levels are categorized as illiterate, primary education graduate (8 years of education), high school graduate (12 years of education), and university graduate. Among the patients, 23.4% were illiterate, 40.4% were primary school graduates, 17% were high school graduates, and 19.2% held a university or higher degree. Regarding family history, 78.7% had no family history of breast cancer, while 21.3% had a positive family history. Family history was categorized as negative or positive.

Table 1. Demographic and clinical characteristics of the patients

Demographic and clinical characteristics	n (%) / Data
Total number of patients	47
Age	
Minimum	35
Maximum	77
Mean	52
Standard deviation	11.83
Educational status	
Illiterate	11 (23.4%)
Primary school graduate	19 (40.4%)
High school graduate	8 (17%)
University graduate	9 (19.2%)
Number of patients with tumor size measured by USG	18 (38%)
Number of patients with tumor size measured by MRI	29 (62%)
Stage at diagnosis	
Number of stage I patients	4 (9%)
Number of stage II patients	34 (72%)
Number of stage III patients	9 (19%)
Number of patients with a family history of breast cancer	10 (21%)
Number of patients with no pregnancy history	12 (26%)
Number of patients with three or fewer pregnancies	17 (36%)
Number of patients with more than three pregnancies	8 (17%)
Number of axilla-negative patients	30 (64%)
Tumor size	
Minimum	10 mm
Maximum	71 mm
Mean	31 mm
Surgical procedure	
Mastectomy (+/- axillary dissection)	22 (46.8%)
Skin-sparing mastectomy (+/- axillary dissection)	4 (8.5%)
Breast-conserving surgery (+/- axillary dissection)	21 (44.7%)

A total of 22 patients (46.8%) underwent mastectomy, while 4 patients (8.5%) underwent skin-sparing mastectomy. Breast-conserving surgery was performed in 21 patients (44.7%). Table 1 presents the other demographic and clinical characteristics of the patients.

Table 2 presents the descriptive statistics for age, tumor size, axillary involvement, number of pregnancies, and disease stage in breast cancer patients. The mean age of participants was 52.06 years (range: 35-81). The mean tumor size was 31.47 mm (range:

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10-71 mm). The mean number of metastatic axillary lymph nodes was 1.06, with a maximum of 14 metastatic nodes. The mean number of pregnancies was 3.51, ranging from 0 to 14.

The mean tumor size was 30.64 mm in illiterate patients and 31.72 mm in literate patients; this difference was not statistically significant (p = 0.840). Similarly, no significant difference was found between these groups regarding disease stage (p = 0.445). The mean tumor size was 32.27 mm in patients without a family history and 28.50 mm in those with a family history, but this difference was not significant (p = 0.497). No significant difference was found between the groups in terms of disease stage (p = 0.891).

Table 2. Descriptive statistics of clinical characteristics of breast cancer patients

Variables	Mean	Standard deviation	Min	Max
Age	52.06	11.83	35	81
Tumor size (mm)	31.47	15.35	10	71
Number of metastatic axillary lymph nodes	1.06	2.46	0	14
Number of pregnancies	3.51	3.41	0	14

In Table 3, the relationship between the participants' education level, literacy status, and family history of breast cancer with axillary lymph node involvement (negative or positive) was examined. A statistically significant relationship was found between the education level variable and axillary involvement (χ^2 = 9.690; p = 0.021). The highest rate of negative axilla involvement was observed in primary school graduates (89.47%), while the lowest rate was found in high school graduates (37.50%). Among high school graduates, the rate of positive axillary involvement was the highest at 62.50%.

No significant relationship was found between literacy status and axillary involvement (p = 0.147); the rate of negative axilla involvement was 69.44% in literate individuals and 45.45% in illiterate individuals. No significant difference was observed in terms of family history (p = 0.526); the rate of positive axillary involvement was 40.00% in individuals with a family history, while it was 35.14% in those without a family history.

Table 3. Distribution of axillary lymph node ınvolvement according to education level, literacy, and family history

Variables		Negative	Positive	X^2	p
Education level	**Illiterate**	5 (45.45)	6 (54.55)	9.690	**0.021***
	Primary school graduate	17 (89.47)	2 (10.53)		
	High school graduate	3 (37.50)	5 (62.50)		
	University graduate	5 (55.56)	4 (44.44)		
Literacy status	**No**	5 (45.45)	6 (54.55)	2.100	0.147
	Yes	25 (69.44)	11 (30.56)		
Family history	**No**	24 (64.86)	13 (35.14)	0.081	0.526
	Yes	6 (60.00)	4 (40.00)		

In Table 4, the variables of age and number of pregnancies were compared between patients with negative and positive axillary lymph node involvement using an independent samples t-test. According to the analysis, the mean age of patients in the axilla-negative group was 52.83 ± 11.59, while in the axilla-positive group, this mean was 50.71 ± 12.50. However, this difference between the groups was not statistically significant (t = 0.588; p = 0.559). Similarly, in terms of the number of pregnancies, the axilla-negative group had a mean of 3.23 ± 2.37, while the axilla-positive group had a mean of 4 ± 4.77, and this difference was also not significant (t = -0.738; p = 0.465).

Table 4. Comparison of age and number of pregnancies according to axillary lymph node ınvolvement

Variables	Negative	Positive	t	p
Age	52.83 ± 11.59	50.71 ± 12.5	0.588	0.559
Number of pregnancies	3.23 ± 2.37	4 ± 4.77	-0.738	0.465

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In Table 5, Pearson correlation coefficients were evaluated between age, tumor size, axillary involvement, number of pregnancies, and stage in breast cancer patients. No significant relationship was found between tumor size and the other variables. A statistically significant positive correlation was found between age and number of pregnancies (r = 0.334, p = 0.022), and between axillary involvement and stage (r = 0.469, p = 0.001), which was naturally expected. Low-level correlations that were not statistically significant were observed between other variables.

Table 5. Correlation analysis between clinical and demographic variables

Variables		**Age**	**Tumor size**	**Axilla status**	**Number of pregnancies**
Tumor size (mm)	**r**	-0.020			
	p	0.892			
Axilla status	**r**	-0.021	-0.051		
	p	0.888	0.731		
Number of pregnancies	**r**	0.334	-0.062	-0.115	
	p	**0.022***	0.679	0.440	
Stage	**r**	-0.255	0.230	0.469	0.042
	p	0.083	0.119	**0.001***	0.778

Discussion

This study examined the impact of educational status on breast cancer awareness and clinical stage, revealing that there is no linear correlation between education level and awareness. The most significant finding of our study is that the rate of axillary lymph node involvement was significantly lower in primary school and university graduates compared to high school graduates. Furthermore, no statistically significant difference was found between literate and illiterate groups in terms of diagnostic stage. These results indicate that early diagnosis in breast cancer depends not only on education level but also on social awareness mechanisms and psychological factors.

When our findings are evaluated in light of global and local data, the course of breast cancer across different societies is remarkable. Breast cancer is the most common cancer in women across all populations; however, it is more frequently diagnosed in some societies, while in others, it is detected at a more advanced stage. This makes treatment more difficult and reduces survival rates. In countries with the highest breast cancer incidence, such as Australia-New Zealand (100/100,000), North America (95/100,000), and Northern Europe (90/100,000), the mortality rate is approximately 13/100,000. In contrast, in North Africa, where breast cancer is much less common (53/100,000), the mortality rate is 19% [7].

This variability in early diagnosis rates also differs according to the level of development and ethnicity**.** According to the 2024 update from the American Cancer Society, the early-stage diagnosis rate is 68% in white women, while it is 58% in Black women, with a higher incidence of detecting tumors larger than 5 cm [8]. Another study found that Hispanic women born in the United States have a 38% higher breast cancer incidence compared to those born outside the United States [9].

In many high-income countries with historically high breast cancer incidence, death rates have decreased since the early 1990s. This trend is attributed to treatment breakthroughs, advances in early detection through screening, and increased awareness [10]. In contrast, in the developing world, factors such as insufficient public awareness, lack of organized screening programs, and the unavailability of accessible and effective treatments for breast cancer have led to delays in treatment and higher mortality rates [11]. According to the "Türkiye Combined Database" data, 45.5% of patients diagnosed with breast cancer are diagnosed at an early stage, 43% at a locally advanced stage, and 11.5% at a metastatic stage [2].

There are important links between the literature examining the causes of diagnostic delays in our country and the educational factor that our study focuses on. In a study published by Özmen et al. in 2014, the reasons for diagnostic delays originating from both patients and the healthcare system were investigated. The study found that delays were more significant in the patient group aged 30-39. Additionally, lack of trust in the healthcare system and the effectiveness of treatment were identified as contributing factors to diagnostic delays in the same study [6]. Considering all these data, it can be inferred that the reasons for delayed diagnosis of breast cancer, as much as the causes of the disease itself, stem from geographic, educational, and socioeconomic factors. This study focuses on investigating the impact of educational status as one of these potential causes.

The non-linear relationship between education level and awareness identified in our study parallels some findings in the literature. In the study by Özmen and colleagues, it was noted that having at least a high school education and the habit of self-examination contribute to early diagnosis [6]. A study conducted in Denmark, which has free screening programs like in our country, showed that both low and high educational levels are associated with lower participation in screening programs

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compared to individuals with a moderate level of education [12]. This situation is similar to our finding that axillary involvement was higher in high school graduates. In this context, we can conclude that there is no linear correlation between the level of education and breast cancer awareness. A study conducted in our country found that among emotion-focused coping strategies, the denial attitude was higher in individuals with a high educational level [13]. This situation could be considered a potential reason for delayed diagnosis in individuals with higher education.

On the other hand, in our study, no statistically significant difference was found between literate and illiterate groups. The widespread presence of social media posts and news related to awareness may be a contributing factor to this finding. Visual and auditory announcements and informational content seem to generate sufficient awareness and encourage early hospital visits, even among illiterate individuals.

Conclusion

In this study, we investigated the effects of educational status on tumor size, axillary involvement, and disease stage in patients from the Eastern and Southeastern regions of Türkiye. While no statistically significant correlation was observed between educational level and tumor size or disease stage, a statistically significant difference was found between educational level and axillary involvement. According to the results, axillary involvement was lowest in primary school graduates and highest in high school graduates.

However, no statistically significant difference was found between literate and illiterate groups. This may indicate that visual and auditory information provided through social media or traditional media is effective in society. It would be appropriate for countries to emphasize auditory and visual education on breast cancer.

In our study, we examined the impact of education level on the stage of breast cancer at diagnosis. However, it should be noted that education level itself is influenced by several other factors that can affect the cancer stage at diagnosis, such as socioeconomic status, healthcare accessibility, participation in screening programs, and rural versus urban residence. These potential confounding factors represent a limitation of our study and should be considered when interpreting the results.

The relatively low number of cases and the fact that the cases consisted of patients from a private hospital are limitations of this study, as the socioeconomic status of patients applying to a private hospital may be higher than that of the general population, even among the group with a lower education level. Due to the retrospective and descriptive nature of our study, a formal power analysis was not performed, and the sample size was determined by the available patient population meeting the inclusion criteria during the study period. Similar studies with larger and multi-center cohorts may provide more comprehensive insights and higher statistical power.

Ethical Approval

Ethical approval for the study was obtained from the Scientific Research Ethics Committee of Gazi Yaşargil Training and Research Hospital (Date: November 7, 2025; Reference No: 701).

Patient Consent

Written informed consent was obtained from all participants prior to the study.

Conflict of Interest

The authors confirms the absence of any conflicts associated with this work.

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References

1. T.C. Sağlık Bakanlığı Sağlık Bilgi Sistemleri Genel Müdürlüğü. Sağlık İstatistikleri Yıllığı 2022. Ankara: T.C. Sağlık Bakanlığı; 2024.
2. T.C. Sağlık Bakanlığı Halk Sağlığı Genel Müdürlüğü. Türkiye Kanser İstatistikleri 2015. https://hsgm.saglik.gov.tr/depo/birimler/kanser-db/Dokumanlar/Istatistikler/Trkiye_Kanser_statistikleri_2015.pdf?utm access date: 10.02.2026
3. Wild CP, Weiderpass E, Stewart BW, eds. World Cancer Report: Cancer Research for Cancer Prevention. Lyon, France: International Agency for Research on Cancer; 2020.
4. Fidaner C, Eser SY, Parkin DM. Incidence in Izmir in 1993-1994: first results from Izmir Cancer Registry. Eur J Cancer. 2001;37:83-92.
5. Jassem J, Bacanu F, Eglitis J, et al. Patient-related factors influencing time between first signs of breast cancer (BC) and appointment for medical visit (AMV): an international survey. 48th Annual Meeting of the American Society of Clinical Oncology, 1-5 June 2012. Chicago, Illinois, USA, abstract 9046.
6. Ozmen V, Boylu S, Ok E, et al. Factors affecting breast cancer treatment delay in Turkey: a study from Turkish Federation of Breast Diseases Societies. Eur J Public Health. 2015;25:9-14.
7. Bray F, Laversanne M, Sung H, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2024;74:229-63.
8. Giaquinto AN, Sung H, Newman LA, et al. Breast cancer statistics 2024. CA Cancer J Clin. 2024;74:477-95.
9. Keegan THM, John EM, Fish KM, et al. Breast cancer incidence patterns among California Hispanic women: differences by nativity and residence in an enclave. Cancer Epidemiol Biomarkers Prev. 2010;19:1208-18.
10. Wojtyla C, Bertuccio P, Wojtyla A, La Vecchia C. European trends in breast cancer mortality, 1980-2017 and predictions to 2025. Eur J Cancer. 2021;152:4-17.
11. Shetty MK, Longatto-Filho A. Early detection of breast, cervical, ovarian and endometrial cancers in low resource countries: an integrated approach. Indian J Surg Oncol. 2011;2:165-71.
12. Jensen LF, Pedersen AF, Andersen B, Vedsted P. Identifying specific non-attending groups in breast cancer screening--population-based registry study of participation and socio-demography. BMC Cancer. 2012;12:518.
13. Erbay E, Albayrak H, Erim F, Bek F. Meme kanseri hastalarının baş etme stratejilerinin sosyo-demografik değişkenler açısından incelenmesi. Tıbbi Sosyal Hizmet Dergisi. 2017;37-56.