European Journal of Public Health, Vol. 35, No. 6, 1271–1280
© The Author(s) 2025. Published by Oxford University Press on behalf of the European Public Health Association.
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (https://creativecommons.org/licenses/by-nc/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact reprints@oup.com for reprints and translation rights for reprints. All other permissions can be obtained through our RightsLink service via the Permissions link on the article page on our site—for further information please contact journals.permissions@oup.com.
https://doi.org/10.1093/eurpub/ckaf108 Advance Access published on 8 July 2025

Causes of diagnostic and treatment delays in locally advanced breast cancer: a nationwide multicenter survey and electronic health records analysis in Turkiye

Guldeniz Karadeniz Cakmak[1,*], Ufuk Tali[1], Hakan Balbaloglu[1], Ilhan Tasdoven[1], Enver Ozkurt[2], Hasan Karanlik[3], İsmail Zihni[4], Lutfi Dogan[5], Mufide Akcay[6], Semra Gunay[7], Pelin Basım[8], G. Ozan Kucuk[9], Ahmet Pergel[10], Gokturk Maralcan[11], M. Umit Ugurlu[12], Gunay Gurleyik[13], Arzu Akan[14], Ali Uzunkoy[15], Emine Yıldırım[16], Hande Koksal[17], Elifcan Haberal[5], M. Ali Gulcelik[18], Barıs Morkavuk[18], Taner Kivilcim[7], B. Imge Ucar[19], H. Belma Kocer[20], Ozge Gumusay[21], Cihan Uras[22], Metin Varlı[23], Yeliz Ersoy[24], Beyza Ozcinar[25], Tolga Kafadar[26], Bartu Badak[27], Ahmet Dag[28], Atakan Sezer[29], Sibel Ozkan Gurdal[30], Orhan Agcaoglu[31], N. Zafer Canturk[32], O. Eren Yıldız[33], Kubilay Dalcı[34], Ayse Altinok[35], Aysegul Aktas[13], Abut Kebudi[7], Ece Dilege[31], H. Figen Batu[4], Veli Vural[4], Gurhan Sakman[34], Yasemin Bolukbasi[36], Selman Emiroglu[25], Neslihan Cabioglu[25], Oguzhan Deniz[1], A. İlker Filiz[37], A. Cihat Yildirim[19], Duygu Bayir[38], Ozgur Olmez[39], Bekir H. Bakkal[40], Burak Bahadir[41], Banu Alicioglu[42], M. Cagatay Buyukuysal[43], Yigit Ozaydın[1], Hamide Kaya[1], Nurullah Bakir[22], Mustafa Comert[1], Vahit Ozmen[2]

[1]Department of General Surgery, The School of Medicine, Zonguldak Bulent Ecevit University, Zonguldak, Turkiye
[2]Department of General Surgery, İstanbul Florence Nightingale Hospital, Istanbul, Turkiye
[3]Department of General Surgery, Oncology Institute, Istanbul University, Istanbul, Turkiye
[4]Department of General Surgery, Faculty of Medicine, Akdeniz University, Antalya, Turkiye
[5]Department of General Surgery, Ankara Oncology Training and Research Hospital, University of Health Sciences, Ankara, Turkiye
[6]Department of General Surgery, Faculty of Medicine, Ataturk University, Erzurum, Turkiye
[7]Department of General Surgery, Faculty of Medicine, Okan University, Istanbul, Turkiye
[8]Department of General Surgery, Faculty of Medicine, İstanbul Medipol University, Istanbul, Turkiye
[9]Department of General Surgery, Samsun Training and Research Hospital, University of Health Sciences, Samsun, Turkiye
[10]Department of General Surgery, Faculty of Medicine, Recep Tayyip Erdoğan University, Rize, Turkiye
[11]Department of General Surgery, Faculty of Medicine, Gaziantep SANKO University, Gaziantep, Turkiye
[12]Department of General Surgery, Faculty of Medicine, Marmara University, Istanbul, Turkiye
[13]Department of General Surgery, Istanbul Haydarpasa Numune Health Practice and Research Hospital, University of Health Sciences, Istanbul, Turkiye
[14]Department of General Surgery, Cemil Tascioglu Training and Research Hospital, University of Health Sciences, Istanbul, Turkiye
[15]Department of General Surgery, Faculty of Medicine, Harran University, Sanlı Urfa, Turkiye
[16]Department of General Surgery, Faculty of Medicine, Atlas University, Istanbul, Turkiye
[17]Department of General Surgery, Faculty of Medicine, Selçuk University, Konya, Turkiye
[18]Department of General Surgery, Gulhane Faculty of Medicine, University of Health Sciences, Ankara, Turkiye
[19]Department of General Surgery, Faculty of Medicine, Kutahya Health Sciences University, Kutahya, Turkiye
[20]Department of General Surgery, Faculty of Medicine, Sakarya University, Sakarya, Turkiye
[21]Department of Clinical Oncology, Faculty of Medicine, Acibadem University, Istanbul, Turkiye
[22]Department of General Surgery, Faculty of Medicine, Acibadem University, Istanbul, Turkiye
[23]Department of General Surgery, Faculty of Medicine, Mardin Artuklu University, Mardin, Turkiye
[24]Department of General Surgery, Faculty of Medicine, Bezmialem Vakif University, Istanbul, Turkiye
[25]Department of General Surgery, Faculty of Medicine, İstanbul University, Istanbul, Turkiye
[26]Department of General Surgery, Faculty of Medicine, Dicle University, Diyarbakır, Turkiye
[27]Department of General Surgery, Faculty of Medicine, Eskisehir Osman Gazi University, Eskişehir, Turkiye
[28]Department of General Surgery, Faculty of Medicine, Mersin University, Mersin, Turkiye
[29]Department of General Surgery, Faculty of Medicine, Trakya University, Edirne, Turkiye
[30]Department of General Surgery, Faculty of Medicine, Tekirdag Namik Kemal University, Tekirdag, Turkiye
[31]Department of General Surgery, Faculty of Medicine, Koc University, Istanbul, Turkiye
[32]Department of General Surgery, Faculty of Medicine, Kocaeli University, Kocaeli, Turkiye
[33]Department of General Surgery, Hatay Samandag Hospital, Hatay, Turkiye
[34]Department of General Surgery, Faculty of Medicine, Cukurova University, Adana, Turkiye
[35]Department of General Surgery, Medikapark Bahcelievler Hospital, Altınbas University, Istanbul, Turkiye
[36]Department of Radiation Oncology, Faculty of Medicine, Koc University, Istanbul, Turkiye
[37]Department of General Surgery, Istanbul Hospital, Baskent University, Istanbul, Turkiye
[38]Department of Clinical Oncology, Faculty of Medicine, Eskisehir Osman Gazi University, Eskisehir, Turkiye
[39]Department of Clinical Oncology, Faculty of Medicine, Zonguldak Bulent Ecevit University, Zonguldak, Turkiye
[40]Department of Radiation Oncology, Faculty of Medicine, Zonguldak Bulent Ecevit University, Zonguldak, Turkiye
[41]Department of Clinical Pathology, Faculty of Medicine, Zonguldak Bulent Ecevit University, Zonguldak, Turkiye
[42]Department of Radiology, Faculty of Medicine, Zonguldak Bulent Ecevit University, Zonguldak, Turkiye
[43]Department of Biostatistics, Faculty of Medicine, Zonguldak Bulent Ecevit University, Zonguldak, Turkiye

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025

*Corresponding author. Zonguldak Bulent Ecevit University, The School of Medicine, İbni Sina Kampüsü, Eski Kozlu Yolu, Kozlu, Esenköy, Zonguldak 67600, Turkiye. E-mail: gkkaradeniz@yahoo.com.

Abstract

Delays in breast cancer (BC) diagnosis and treatment negatively impact survival outcomes. Understanding patient- and provider-related factors behind these delays is crucial. This study aimed to identify nationwide reasons for delayed diagnosis and treatment of locally advanced BC in Turkiye. A prospective, multicenter hospital-based survey was conducted across 35 institutions between 2023 and 2024. Patient- and provider-related delays were assessed via a structured 61-item face-to-face survey, supplemented by clinical data from electronic health records. Delays exceeding 3 months were clinically categorized as significant. A total of 1322 women participated from seven regions across Turkiye. Factors contributing to diagnostic delays on a national level included economic reasons (5.5%), lack of family support (3.3%), lack of knowledge (12.4%), lack of time due to household work (3.8%), difficulty in finding an appointment (6.7%), pregnancy-related reasons (1.1%), fear of losing the breast (8.9%), fear of death (9.8%), and transportation difficulties (5.1%). Provider-related delays were infrequent. About 89.3% of the patients had the initial doctor appointment and 89.6% had the first specialist consultation within one month. Treatment planning was predominantly based on a multidisciplinary team decision in 88.3% of patients. Regarding treatment initiation, 93.2% started required treatment within 1 month of decision. Patient-related factors are the major causes of diagnostic delay in Turkiye. On the other hand, from the provider's perspective, the presence of multidisciplinary teams, including dedicated breast surgeons, represents a key factor in ensuring the timely implementation of diagnostic procedures and treatment strategies.

Introduction

Delays in the diagnosis and treatment of breast cancer (BC) are the leading cause of locally advanced disease with catastrophic consequences on prognosis [1]. More significantly, such delays contribute to patient anxiety and can potentially impact clinical and quality of life outcomes [2, 3]. One of the main reasons for the high mortality rate of BC is the delay in seeking medical care, which often leads to disease diagnosis in advanced or even metastatic stage [4]. While the incidence of BC is higher in high-income countries, the majority of BC-related deaths occur in low/middle-income countries. According to World Health Organization BC 5-year survival rates in high-income countries exceed 90%, compared with 66% in India and 40% in South Africa. Over 70% of BC patients in high-income countries are diagnosed in the early stages, whereas in low/middle-income countries, this proportion is typically no more than 20%–50% [5, 6]. Delayed diagnosis and treatment are linked to poorer survival outcomes and are among the key factors contributing to the significant differences in BC mortality rates across countries [7–10]. Inadequate healthcare services refer to the lack of sufficient diagnostic tools and treatment facilities, which can delay proper care and lead to poorer outcomes [3]. Additionally, low coverage signifies the failure to provide comprehensive BC care including screening, resulting in gaps in access to timely and effective treatment [11]. A key goal of early diagnosis programs is to reduce the prevalence of these barriers. This is also essential for the successful implementation of screening programs, as they depend on the ability to provide rapid, high-quality diagnosis, timely follow-up, and effective treatment for individuals with positive results in screening. There are three phases of delay in diagnosis and treatment initiation: patient delay (the time from the first notice of a symptom to consulting a doctor due to poor awareness, fear of death etc), diagnostic delay (the interval between the initial consultation to get the definitive diagnosis due to poor performance and referral issues), and treatment delay (the period between diagnosis to treatment initiation due to waiting lists and sub-optimal resources). Various financial, logistic, and psychosocial barriers cause the delay globally leading to inequities in BC value-based care [12]. Of these, patient delay is typically the longest; however, it is essential for specialist breast units to minimize diagnostic and treatment delays to improve the quality of BC care [13, 14]. National BC screening program plays a crucial role in facilitating early detection and effective treatment of the disease. This is achievable by sharing knowledge with the public through awareness programs that address BC issues and preventive measures. An assessment of broad health program planning and treatment campaigns, along with current levels of cancer awareness, is essential. Such efforts lay the foundation for improved monitoring and better survival outcomes. Documenting women's knowledge of BC and effective screening methods is key to diagnose the disease early. Well-established screening practices are vital for designing interventions that promote BC awareness and enhanced screening. In Turkiye, a national screening programme is active and free for all women older than 40 years of age every 2 years. The aim of this survey-based and electronic data analysis study was to determine nationwide and region relevant factors responsible for diagnostic and treatment delay in locally advanced BC patients. The study assessed the level of BC awareness among women and explored their knowledge of risk factors, warning signs, preventive measures, BC awareness, and practices of breast self-examination (BSE). Additionally, the study sought to evaluate provider-related risk factors for diagnostic and treatment delays.

Methods

Study design

A prospective multicenter hospital-based survey was designed with parallel analysis of electronic data system to assess the patient and healthcare provider-related reasons for the current state of delay in BC diagnosis and care in each state of Turkiye that enrolled women from January 2023 to December 2024 from seven geographic regions. Women newly (<6 months) diagnosed with locally advanced BC (AJCC TNM 8th edition), who agreed to respond to Turkish language surveys were eligible for the study, as determined through review of pathology records and clinic lists at participating sites. Locally advanced BC was defined as patients with breast tumors more than 5 cm in diameter, cancer involving the breast skin or underlying muscles, cancer with axillary lymph node involvement and inflammatory BC. Patients with a history of previous BC or recurrent disease, intellectual disability, or hearing impairment were excluded. Participants were informed about the study process and confidentiality of the data and their informed consent was obtained. The designed survey was used by a trained physician or nurse to obtain information during a face-to-face interview with patients. Study participants and physician completed surveys at baseline. Institutional review board approval for the study was obtained from the Zonguldak Bulent Ecevit University The School of Medicine Ethics Board (No = 2023/11).

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025

Survey

The 61-item cross-sectional survey was developed by the research team with experience in the BC diagnosis and treatment, including surgeons, pathologists, radiation oncologists, medical oncologists, and radiologist to analyse patient and provider-related delay variables. The survey included questions focused on socio-demographic factors including age, education, age at first marriage, marital status, occupation, menopausal status, residency, health insurance, daily exercise, body mass index (BMI), smoking, previous radiation therapy history, chronic disease, delay time, family history of BC, age at first pregnancy, the status of knowledge, and regular practice of BSE and clinical factors submitted by the physician including nodal status, type of first symptom, location of tumor, tumor type, self-reported date, and type of initial sign and symptom noticed by the patients. The date of the first symptom and their first medical consultation due to BC were questioned. This date was used as a reference to questions about whether she perceived symptoms, the time symptoms were present before first consultation and socioeconomic factors at the moment of first medical consultation. Patient-related delay variables included the questions: lack of family support, misinformed by unqualified practitioners, fear of diagnosis of cancer, fear of losing breast, fear of death, financial issues, lack of knowledge, engaged in family activities, pregnancy, taking alternative medicine, and poor access to health services. Provider-related delay variables were analysed via diagnostic and treatment timelines including radiologic work-up, pathologic reporting, staging procedures, time from diagnosis to operation/systemic treatment, and interval between surgery to the reporting of operative pathology. Clinical data including stage of disease, tumor size, and lymph node status also were extracted from patients' medical records via 'e-pulse electronic data system' which is a computer-based online database in Turkiye by reviewing the patients' medical records by an experienced medical coder. The primary outcome included diagnostic and treatment delay (day); defined as the interval between the date that patient noticed the first symptom until the date of histological diagnosis and the date of treatment initiation. The reasons for delay, reported by the patients, is divided into two categories: patient interval, defined as the time from experiencing the symptoms to the first medical consultation; and provider interval, defined as the time from the first presentation (first medical consultation) to the beginning of cancer treatment. To impose the clinical importance of diagnostic delay in bivariate analysis, the delay time was categorized to less or equal (no diagnostic delay) and longer (diagnostic delay) than 3 months. SPSS 29.0 for Windows used for statistical analysis. Descriptive statistics given with frequency and percent for qualitative variables where mean, standard deviation, median, minimum, and maximum values given for quantitative variables.

Results

This study was conducted with the collaboration of 64 researchers from 35 centers in seven regions of Turkiye who contributed to the survey development and implementation process. In total, 1322 surveys were evaluated. The median age of the patients was 51 years (range 22–84) with and mean height of 160.38 ± 6.94 cm, mean weight of 72.87 ± 14.32 kg, and the mean BMI was 28.3 ± 6.80 kg/m^2.

Regarding health insurance, 1228 patients had insurance (91.1% state, 9.9% private) and 92 patients (7%) had no health insurance. About 51.7% of the patients were primary school graduates and monthly income was under statutory minimum wage in 75.2%. Living areas varied significantly, with 252 patients (19.1%) residing in rural areas and 1065 patients (80.9%) in urban areas. When it comes to medical visits, 749 patients (56.8%) visited a doctor once a year. In terms of the first healthcare service utilized, 232 patients (17.5%) visited a family doctor first, while 1090 patients (82.5%) initially went to a hospital. Smoking habits were also surveyed, with 247 patients (21.1%) being smokers and 69 patients (0.3%) identifying as ex-smokers. When assessing comorbidities, 740 patients (56.1%) had additional diseases. Regarding marital status, 943 patients (71.3%) were married, with the mean age of marriage being 23.4 ± 6.38 years. In terms of menopausal status, 843 patients (63.9%) were postmenopausal. Regarding breast health history, 27.5% had previously experienced breast-related symptoms, 32.2% had a family history of BC with 19.8% diagnosed in the first degree relative. Hormone replacement therapy use was reported by 333 patients (25.2%). The median age of menarche was 13.0 (range 9–16) years, and the median age at first pregnancy was 23.0 (range 17–44) years. Regarding physical activity, 450 (34.1%) engaged in daily exercise. In terms of BSE, 838 (63.4%) knew how to perform a BSE, and the frequency varied, with only 293 patients (22.2%) performing it at least once a month. The first symptom reported by patients was a breast lump in 844 patients (64.1%). When it came to diagnosis, 694 patients (52.6%) discovered their condition through BSE, while 626 patients (47.4%) were diagnosed through screening programs. Regarding the time to seek medical attention, 878 patients (66.5%) visited a doctor within one month of noticing symptoms, while 218 patients (16.5%) sought medical attention after more than 3 months. Additionally, 114 patients (8.6%) tried alternative medicine before seeking medical help (Table 1).

A significant number of patients (67.5%) experienced fear of cancer when symptoms appeared, and among those, 293 patients (22.4%) delayed visiting a doctor due to this fear. Factors contributing to diagnostic delays on a national level included financial reasons (5.5%), lack of family support (3.3%), lack of knowledge (12.4%), lack of time due to household work (3.8%), difficulty in finding an appointment (6.7%), pregnancy-related reasons (1.1%), fear of losing the breast (8.9%), fear of death (9.8%), and transportation difficulties (5.1%) (Table 2).

In terms of diagnostic and treatment timeliness, 1259 patients (95.6%) reported that they were informed by the hospital about their diagnostic results. Tumor location and type showed that 626 patients (47.6%) had tumors in the right breast, and most tumors were ductal carcinoma (84%). The vast majority of the patients (1253 cases, 95.4%) were diagnosed using core biopsy. Seven hundred and twenty-seven (55.1%) patients were presented with T2 tumors, and 67.2% had lymph node involvement at the time of diagnosis (Table 3).

Thirty-two out of 35 centers serve via multidisciplinary teams (MDT) and treatment planning was predominantly based on a MDT, with 1167 patients (88.3%) receiving a treatment plan established by a board. The delays in appointments were uncommon, with 1179 patients (89.3%) had the initial doctor appointment and 1181 patients (89.6%) had the first specialist consultation within one month. In terms of diagnostic and follow-up tests, 1209 patients (91.8%) had a mammogram and 1272 patients (96.3%) had further imaging tests (such as ultrasound/MRI) within one month of their physician's order. Similarly, diagnostic core biopsies were performed, and pathologic results were reported within one month in 1263 (95.6%) and 1295 (98.1%) patients, respectively.

Regarding treatment initiation, 1231 patients (93.2%) started treatment within one month of diagnosis. Neoadjuvant therapy was initiated in 943 patients (71.4%) and adjuvant systemic therapy was initiated in 892 patients (67.5%) within one month of board's decision, when necessary. In terms of surgical pathology, 1254 patients (95.1%) had their pathology results within one month following surgery. For other adjuvant treatments, radiotherapy was initiated in 83.7% of the cases within 3 months. Additionally, chemotherapy interruptions due to side effects were reported by 124 patients (9.4%). Delays in adjuvant treatments due to appointment issues were experienced by 63 patients (4.8%), while 46 patients (3.5%) experienced delays due to surgical complications, and 34 patients (2.6%) faced delays due to medication supply issues (Table 4).

The factors contributing to diagnostic delays varied across regions. In the Black Sea Region, the most common reasons for

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025

Table 1. Patient demographics and breast cancer risk factors across regions

Regions	Black Sea	Central Anatolia	Marmara	Eastern/Southeastern Anatolia	Mediterranean	Aegean	Total n (%)
Education							
Primary school	179 (62.6)	70 (49)	228 (40.9)	107 (62.9)	63 (56.3)	35 (68.6)	682 (51.7)
High school	65 (22.7)	37 (25.9)	144 (25.8)	37 (21.8)	30 (26.8)	11 (21.6)	324 (24.5)
University	42 (14.7)	36 (25.2)	186 (33.3)	26 (15.3)	19 (17.0)	5 (9.8)	314 (23.8)
No response							2
Profession							
Have a job	212 (74.1)	93 (65.0)	276 (49.9)	140 (82.4)	64 (56.6)	42 (82.4)	827 (62.8)
No job	74 (25.9)	50 (35.0)	277 (50.1)	30 (17.6)	49 (43.4)	9 (17.6)	489 (37.2)
No response							6
Income							
0–250 $	113 (39.5)	44 (30.8)	167 (30.2)	96 (56.5)	18 (15.9)	18 (35.3)	456 (34.7)
250–500 $	109 (38.1)	71 (49.7)	223 (40.3)	50 (29.4)	57 (50.4)	23 (45.1)	533 (40.5)
500–1000 $	55 (19.2)	26 (18.2)	144 (26.0)	23 (13.5)	36 (31.9)	7 (13.7)	291 (22.1)
>1000 $	9 (3.1)	2 (1.4)	19 (3.4)	1 (0.6)	2 (1.8)	3 (5.9)	36 (2.7)
No response							6
Insurance							
No	20 (7.0)	1 (0.7)	44 (7.9)	10 (5.9)	14 (12.4)	3 (6.0)	92 (7.0)
Yes	266 (93.0)	141 (99.3)	515 (92.1)	160 (94.1)	99 (87.6)	47 (94.0)	1 (93.0)
No response							12
Residency							
Urban	204 (71.6)	125 (87.4)	499 (89.7)	122 (72.2)	81 (71.7)	34 (66.7)	1065 (80.9)
Rural	81 (28.4)	18 (12.6)	57 (10.3)	47 (27.8)	32 (28.3)	17 (33.3)	252 (19.1)
No response							5
Distance to health facility							
<10 km	178 (62.5)	90 (62.9)	351 (62.9)	102 (60.4)	96 (85.0)	38 (74.5)	855 (64.8)
≥4. km	107 (37.5)	53 (37.1)	207 (36.1)	67 (39.6)	17 (15)	13 (25.4)	464 (35.2)
No response							3
Hospital visit frequency for any reason							
Once a month	21 (7.3)	7 (4.9)	31 (5.6)	22 (12.9)	16 (14.2)	10 (19.6)	107 (8.1)
Every 3 months	118 (41.3)	48 (33.6)	167 (30.0)	51 (30.0)	60 (53.1)	19 (37.3)	463 (35.1)
Once a year	147 (51.4)	88 (61.5)	358 (64.4)	97 (57.1)	37 (32.7)	22 (43.1)	749 (56.8)
No response							3
Which healthcare facility did you initially seek care from?							
Hospital	242 (84.6)	79 (55.2)	485 (86.8)	147 (86.5)	100 (88.5)	37 (72.5)	1090 (82.5)
Family doctor	44 (15.4)	64 (44.8)	74 (13.2)	23 (13.5)	13 (11.5)	14 (27.5)	232 (17.5)
No response							0
Smoking							
No	234 (81.8)	84 (59.2)	450 (80.6)	141 (82.9)	86 (76.1)	47 (92.2)	1042 (78.9)
Yes	52 (18.2)	58 (40.8)	108 (19.4)	29 (17.1)	27 (23.9)	4 (7.8)	278 (21.1)
No response							2
Do you have any other diseases besides breast cancer?							
No	106 (37.2)	61 (42.7)	262 (47.0)	72 (42.4)	60 (53.1)	19 (37.3)	580 (43.9)
Yes	179 (62.8)	82 (57.3)	296 (53.0)	98 (57.6)	53 (46.9)	32 (62.7)	740 (56.1)
No response							2
Marital status							
Not married	63 (22.0)	70 (49.0)	158 (28.3)	40 (23.5)	33 (29.2)	15 (29.4)	379 (28.7)
Married	223 (78.0)	73 (51.0)	401 (71.7)	130 (76.5)	80 (70.8)	36 (70.6)	943 (71.3.3)
No response							0
First marriage age Mean ± SD	23.5 ± 7.16	22.78 ± 5.77	23.83 ± 5.88	22.02 ± 6.68	22.67 ± 5.94	21.45 ± 6.78	
Menopause status							
Premenopause	171 (59.8)	29 (20.3)	196 (35.2)	54 (31.8)	3 (2.7)	24 (47.1)	477 (36.1)
Postmenopause	115 (40.2)	114 (79.7)	361 (64.8)	116 (68.2)	110 (97.3)	27 (52.9)	843 (63.9)
No response							2
Have you had breast problems before?							
No	210 (73.4)	76 (53.1)	424 (76.0)	129 (75.9)	80 (70.8)	39 (76.5)	958 (72.5)
Yes	76 (26.6)	67 (46.9)	134 (24.0)	41 (24.1)	33 (29.2)	12 (23.5)	363 (27.5)
No response							1
Do you have a relative in your family who has had breast cancer?							
No	206 (72.0)	72 (50.3)	377 (67.7)	127 (74.7)	82 (73.2)	30 (58.8)	864 (67.8)
Yes	80 (28.0)	71 (49.7)	180 (32.3)	43 (25.3)	30 (26.8)	21 (41.2)	425 (32.2)
No response							3
If yes, who?							
Non-First degree	209 (73.1)	48 (53.3)	374 (66.9)	126 (74.1)	83 (73.5)	29 (56.9)	869 (68.5)
First degree	39 (13.6)	25 (27.8)	118 (21.1)	29 (17.1)	24 (21.2)	16 (31.4)	251 (19.8)
Second degree	38 (13.3)	17 (18.9)	67 (12.0)	15 (8.8)	6 (5.3)	6 (11.8)	149 (11.7)

(continued)

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025

Table 1. Continued

Regions	Black Sea	Central Anatolia	Marmara	Eastern/Southeastern Anatolia	Mediterranean	Aegean	Total n (%)
No response							53
Have you used oral contraseptives or hormone replacement therapy?							
No	228 (79.7)	63 (44.1)	438 (78.5)	135 (79.4)	80 (72.1)	42 (82.4)	986 (74.8)
Yes	58 (20.3)	80 (55.9)	120 (21.5)	35 (20.6)	31 (27.9)	9 (17.6)	333 (25.2)
No response							3
Menarche age Median (Min-Max)	13 (9-16)	13 (11-16)	13 (9-16)	13 (9-16)	13 (11-16)	12 (11-16)	
First pregnancy age Median (Min-Max)	22 (15-38)	22 (14-38)	24 (15-42)	22 (15-42)	23 (16-44)	20 (14-36)	
Do you exercise daily?							
No	187 (65.4)	69 (48.3)	372 (66.9)	130 (76.9)	75 (66.4)	35 (68.6)	868 (65.9)
Yes	99 (34.6)	74 (51.7)	184 (33.1)	39 (23.1)	38 (33.6)	16 (31.4)	450 (34.1)
No response							4
Did you receive radiation therapy in your childhood?							
No	281 (98.3)	140 (97.9)	548 (98.0)	169 (99.4)	113 (100.0)	50 (98.0)	1231 (93.1)
Yes	5 (1.7)	3 (2.1)	11 (2.0)	1 (0.6)	0 (0.0)	1 (2.0)	91 (6.9)
No response							0
Do you know how to perform breast self-examination (BSE)?							
No	75 (26.2)	76 (53.1)	192 (34.3)	79 (46.5)	47 (41.6)	15 (29.4)	484 (36.6)
Yes	211 (73.8)	67 (46.9)	367 (65.7)	91 (53.5)	66 (58.4)	36 (70.6)	838 (63.4)
No response							0
How often do you perform BSE?							
Once every 3 months or never	106 (37.2)	47 (32.9)	280 (50.2)	109 (65.3)	71 (62.8)	20 (39.2)	633 (48.1)
At least once a week	114 (40.0)	96 (67.1)	128 (22.9)	29 (17.4)	2 (1.8)	22 (43.1)	391 (29.7)
At least once a month	65 (22.8)	0 (0.0)	150 (26.9)	29 (17.4)	40 (35.4)	9 (17.6)	293 (22.2)
No response							5
First symptom of the disease							
Only a lump in the breast	174 (61.5)	81 (57.0)	390 (69.9)	96 (56.5)	61 (54.0)	42 (82.4)	844 (64.1)
A lump and other symptoms in the breast	53 (18.7)	39 (27.5)	89 (15.9)	49 (28.8)	52 (46.0)	3 (5.9)	285 (21.6)
Symptoms other than a lump in the breast	56 (19.8)	22 (15.5)	79 (14.2)	25 (14.7)	0 (0.0)	6 (11.8)	188 (14.3)
No response							5
How was your disease diagnosed?							
Self-examination	172 (60.1)	73 (51.0)	260 (46.6)	88 (52.1)	70 (61.9)	31 (60.8)	694 (52.6)
Screening	114 (39.9)	70 (49.0)	298 (53.4)	81 (47.9)	43 (38.1)	20 (39.2)	626 (47.4)
No response							2
How many days after noticing your breast complaint did you seek medical attention?							
Within 1 month	211 (73.8)	93 (65.0)	333 (59.8)	115 (67.6)	86 (76.1)	40 (78.4)	878 (66.5)
Within 1–3 months	23 (8.0)	42 (29.4)	118 (21.2)	23 (13.5)	11 (9.7)	7 (13.7)	224 (17.0)
More than 3 months	52 (18.2)	8 (5.6)	106 (19.0)	32 (18.8)	16 (14.2)	4 (7.8)	218 (16.5)
No response							2
Have you tried alternative medicine before visiting health facility?							
I have not tried	277 (96.9)	77 (53.8)	526 (94.4)	166 (97.6)	110 (98.2)	49 (96.1)	1205 (91.4)
I have tried	9 (3.1)	66 (46.2)	31 (5.6)	4 (2.4)	2 (1.8)	2 (3.9)	114 (8.6)
No response							3

delay were difficulty in making an appointment and fear of losing the breast. In the Mediterranean and Eastern Anatolia regions, fear of death, lack of knowledge, and lack of time due to daily work were the primary reasons. In Southeastern Anatolia, Marmara, Aegean, and Central Anatolia regions, the most common reasons included lack of knowledge, economic difficulties, fear of death, and fear of losing breast.

Discussion

Early diagnosis combined with appropriate treatment significantly improves patient survival rates in BC [15, 16]. However, delays in decision-making and difficulties in accessing treatment can negatively impact prognosis with variances between nations. Therefore, identifying national factors contributing to diagnostic delays and developing strategies to eliminate them are crucial for effective BC management and value-based care in Turkiye where screening is all covered by social security system. This study examining the relationship between diagnostic and treatment delays attributed to patients and systemic factors, based on regional survey assessments conducted across Turkiye, indicated that patient-related factors contribute significantly to delays in BC diagnosis. The causes of delay have largely been investigated in various countries globally. Zhang *et al.* investigated diagnostic delays in China on 283 female patients and found that 35.8% of patients did not seek medical care for at least 90 days after the onset of symptoms [17]. The most

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025

Table 2. Patient-related delay factors

	Black Sea	Central Anatolia	Marmara	Eastern/Southeastern Anatolia	Mediterranean	Aegean	Total *n* (%)
Did you have a fear of cancer when you were diagnosed with a breast complaint?							
I did not experience it	95 (33.3)	59 (41.8)	157 (28.2)	57 (33.5)	50 (44.2)	10 (19.6)	428 (32.5)
I did	190 (66.7)	82 (58.2)	400 (71.8)	113 (66.5)	63 (55.8)	41 (80.4)	889 (67.5)
No response							5
If yes, did it delay your application to the doctor?							
No	246 (86.6)	71 (51.1)	422 (76.3)	141 (83.4)	96 (85.0)	40 (78.4)	1016 (77.6)
Yes	38 (13.4)	68 (48.9)	131 (23.7)	28 (16.6)	17 (15.0)	11 (21.6)	293 (22.4)
No response							13
Did your financial situation delay your hospital visit?							
No	265 (93.0)	133 (93.0)	526 (94.4)	159 (93.5)	113 (100.0)	50 (98.0)	1246 (94.5)
Yes	20 (7.0)	10 (7.0)	31 (5.6)	11 (6.5)	0 (0.0)	1 (2.0)	73 (5.5)
No response							3
Did your family support delay your hospital visit?							
No	282 (98.6)	136 (95.1)	533 (95.3)	164 (96.5)	113 (100.0)	51 (100.0)	1279 (96.7)
Yes	4 (1.4)	7 (4.9)	26 (4.7)	6 (3.5)	0 (0.0)	0 (0.0)	43 (3.3)
No response							0
Did lack of knowledge about breast cancer delay your hospital visit?							
No	254 (88.8)	136 (95.1)	470 (84.1)	148 (87.1)	103 (91.2)	47 (92.2)	1158 (87.6)
Yes	32 (11.2)	7 (4.9)	89 (15.9)	22 (12.9)	10 (8.8)	4 (7.8)	164 (12.4)
No response							0
Did being too involved with housework delay your hospital visit?							
No	265 (92.7)	142 (99.3)	540 (96.6)	163 (95.9)	111 (98.2)	51 (100.0)	1272 (96.2)
Yes	21 (7.3)	1 (0.7)	19 (3.4)	7 (4.1)	2 (1.8)	0 (0.0)	50 (3.8)
No response							0
Did being pregnant delay your hospital visit?							
No	284 (99.3)	143 (100.0)	548 (98.0)	169 (99.4)	113 (100.0)	51 (100.0)	1308 (98.9)
Yes	2 (0.7)	0 (0.0)	11 (2.0)	1 (0.6)	0 (0.0)	0 (0.0)	14 (1.1)
No response							0
Did the fear of losing your breast delay your hospital visit?							
No	265 (92.7)	139 (97.2)	485 (86.8)	157 (92.4)	112 (99.1)	47 (92.2)	1205 (91.1)
Yes	21 (7.3)	4 (2.8)	74 (13.2)	13 (7.6)	1 (0.9)	4 (7.8)	117 (8.9)
No response							0
Did the fear of dying from breast cancer delay your hospital visit?							
No	262 (91.6)	133 (93.0)	482 (86.2)	156 (91.8)	111 (98.2)	49 (96.1)	1193 (90.2)
Yes	24 (8.4)	10 (7.0)	77 (13.8)	14 (8.2)	2 (1.8)	2 (3.9)	129 (9.8)
No response							0
Did the difficulty of reaching health facility delay your hospital visit?							
No	270 (94.4)	138 (96.5)	520 (93.0)	166 (97.6)	112 (99.1)	49 (96.1)	1255 (94.9)
Yes	16 (5.6)	5 (3.5)	39 (7.9)	4 (2.4)	1 (0.4)	2 (3.9)	67 (5.1)
No response							0
Did you experience appointment delay?							
No	265 (92.7)	139 (97.2)	508 (90.9)	161 (94.7)	113 (100.0)	47 (92.2)	1233 (93.3)
Yes	21 (7.3)	4 (2.8)	51 (9.1)	9 (5.4)	0 (0.0)	4 (7.8)	89 (6.7)
No response							0

significant contributors to diagnostic delay were lack of awareness, inadequate family support, and older age. Notably, diagnostic delays were particularly prolonged among women living in rural areas which is concordant with our data. Similarly, a study conducted in Zimbabwe evaluating the reasons for late presentation showed that 72.6% of patients sought medical care at an advanced stage. The most frequently cited reason for diagnostic delay was lack of awareness (66%), followed by financial difficulties (18%). Additionally, 67.1% of the patients lived in rural areas and had a low level of education, while 74% were unaware of BSE [18]. A 2014 study in Morocco analysing diagnostic delays and underlying causes in women with advanced BC demonstrated that 70.1% of delays were patient-induced, while 13.9% were due to healthcare system inefficiencies. The most common reasons for delay included not taking symptoms seriously (55.9%), seeking traditional treatments (12.7%), and fear of cancer diagnosis and treatment (11.9%). Women living in rural areas with limited access to healthcare facilities experienced significantly longer diagnostic delays [19]. Consistent with these

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025

Table 3. Tumor characteristics and biology

Regions	Black Sea	Central Anatolia	Marmara	Eastern/Southeastern Anatolia	Mediterranean	Aegean	Total *n* (%)
Tumor in which breast?							
Right	131 (46.0)	58 (40.6)	266 (48.0)	94 (55.6)	47 (41.6)	30 (58.8)	626 (47.6)
Left	154 (54.0)	85 (59.4)	288 (52.0)	75 (44.4)	66 (58.4)	21 (41.2)	689 (52.4)
Tumor							
Ductal	229 (80.1)	135 (94.4)	475 (85.6)	151 (88.8)	77 (68.1)	39 (78.0)	1106 (84.0)
Lobular	34 (11.9)	7 (4.9)	55 (9.9)	12 (7.1)	11 (9.7)	9 (18.0)	128 (9.7)
Other	23 (8.0)	1 (0.7)	25 (4.5)	7 (4.1)	25 (22.1)	83 (6.3)	83 (6.3)
Biopsy technique							
Core	259 (90.9)	135 (94.4)	541 (97.8)	166 (97.6)	102 (91.1)	50 (98.0)	1253 (95.4)
Fine needle	11 (3.9)	1 (0.7)	3 (0.5)	2 (1.2)	0 (0.0)	0 (0.0)	17 (1.3)
Incisional	0 (0.0)	2 (1.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.2)
Excisional	15 (5.3)	5 (3.5)	9 (1.6)	2 (1.2)	10 (8.9)	1 (2.0)	42 (3.2)
Location of tumor							
Upper outer	113 (39.5)	67 (46.9)	263 (47.0)	97 (57.1)	50 (44.2)	29 (56.9)	619 (46.8)
Lower outer	22 (7.7)	15 (10.5)	89 (15.9)	16 (9.4)	27 (23.9)	3 (5.9)	172 (13.0)
Upper inner	119 (41.6)	45 (31.5)	150 (26.8)	40 (23.5)	18 (15.9)	17 (33.3)	389 (29.4)
Lower inner	32 (11.2)	16 (11.2)	57 (10.2)	17 (10.0)	18 (15.9)	2 (3.9)	142 (10.7)
Size of tumor							
T1	100 (35.0)	62 (43.4)	133 (23.9)	47 (27.6)	48 (42.5)	11 (21.6)	401 (30.4)
T2	163 (57.0)	76 (53.1)	318 (57.1)	91 (53.5)	53 (46.9)	26 (51.0)	727 (55.1)
T3	14 (4.9)	4 (2.8)	87 (15.6)	20 (11.8)	11 (9.7)	11 (21.6)	147 (11.1)
T4	8 (2.8)	1 (0.7)	19 (3.4)	12 (7.1)	1 (0.9)	3 (5.9)	44 (3.3)
Tumor biology							
Luminal A	133 (46.5)	62 (43.4)	233 (41.7)	65 (38.2)	21 (18.6)	23 (45.1)	537 (40.6)
Luminal B	111 (38.8)	39 (27.3)	226 (40.4)	73 (42.9)	15 (13.3)	16 (31.4)	480 (36.3)
Triple −	9 (3.1)	36 (25.2)	68 (12.2)	16 (9.4)	18 (15.9)	10 (19.6)	157 (11.9)
HER-2 +	33 (11.5)	6 (4.2)	32 (5.7)	16 (9.4)	59 (52.2)	2 (3.9)	148 (11.2)
Axillary lymph node status							
N0	139 (48.6)	87 (60.8)	115 (20.7)	32 (18.8)	43 (38.1)	18 (35.3)	434 (32.9)
N1	130 (45.5)	44 (30.8)	348 (62.6)	112 (65.9)	67 (59.3)	28 (54.9)	729 (55.3)
N2	15 (5.2)	11 (7.7)	77 (13.8)	17 (10.0)	3 (2.7)	3 (5.9)	126 (9.6)
N3	2 (0.7)	1 (0.7)	16 (2.9)	9 (5.3)	0 (0.0)	2 (3.9)	30 (2.3)
Distant metastasis							
No metastasis	281 (98.3)	136 (95.1)	531 (95.5)	156 (91.8)	106 (93.8)	49 (96.1)	1259 (95.5)
Metastasis	5 (1.7)	7 (4.9)	25 (4.5)	14 (8.2)	7 (6.2)	2 (3.9)	60 (4.5)

findings, our study revealed that low education and income levels, rural residency, and long distances to healthcare centers were key factors negatively affecting the diagnostic process. Regional analyses identified lack of knowledge (12.4%) and fear of a cancer diagnosis (22.4%) as the most common reasons for diagnostic delay. Nationwide, 91.4% of patients with breast complaints opted for medical treatment, while 8.6% resorted to alternative therapies. Regional data showed that the highest prevalence of alternative treatment use was in the Central Anatolia Region with 46.2% of incidence. Izzati *et al.* conducted a study assessing BSE awareness and practice among female university students reviewing 12 studies from different databases found that BSE awareness was generally low among students. However, educational interventions were shown to improve knowledge levels and increase BSE practice rates [20]. In our study, an assessment of BSE awareness which is a crucial screening method revealed that 36.6% of patients had no knowledge of the practice. Regional analysis identified the Central Anatolia Region as having the lowest awareness, with 53.1% of patients unaware of BSE. Conversely, the highest awareness levels were recorded in the Black Sea Region, where 73.8% of patients were familiar with the practice. These findings highlight the need for more comprehensive and widespread educational interventions in regions with lower awareness levels. Khan *et al.* reported that 84% of BC patients experienced a diagnostic delay of more than 3 months, primarily due to low education levels, rural residency, and insufficient knowledge about the disease [21]. In contrast, our study found that 13.8% of patients had a delay of more than 3 months between symptom onset and seeking medical care. Compared to the findings of Khan *et al.*, this suggests that Turkiye's widespread network of early cancer detection centers under the Ministry of Health, along with audiovisual awareness campaigns, may contribute to earlier diagnoses. Additionally, the lack of a gatekeeping mechanism in Türkiye's primary care system may be a contributing factor to this outcome. Nevertheless, evidence in the literature remains inconclusive regarding the impact of gatekeeping on diagnostic delays [22].

Our study also examined provider-related factors contributing to delays in diagnosis and treatment. The proportion of patients whose pathological results took more than 3 months post-biopsy was only 1.4%. This delay may be attributed to the high population density in the region and the resulting burden on healthcare services. On the other hand, the time between hospital admission to radiologic evaluation, biopsy intervention, and pathological results after core biopsy were reported within 1 month in more than 95% of the cases. In terms of treatment initiation after diagnosis, 93.2% of patients began treatment within the first month as required (surgery, neoadjuvant systemic therapy, or radiotherapy). The most significant cause of delays in postoperative chemotherapy protocol and radiotherapy was treatment-related side effects, with a statistical significance ($P < .05$). In the analysis of Jassem *et al.* including 6588 female BC patients across 12 countries to assess diagnostic and treatment delays, the delays were categorized as patient-induced and system-induced, like ours. Their study reported a median patient-induced delay of 4.7 weeks (range 3.4–6.2 weeks) and a median system-induced delay of 11.1 weeks (range 8.3–24.7 weeks) [6]. Given that 93.2% of patients in our study cohort-initiated treatment within the first month. A similar analysis by Ozmen *et al.* in 2011, which evaluated factors affecting BC diagnosis and treatment delays in Turkiye, reported a longer provider delay time of 10.5 weeks [10]. The data presented here suggest that Turkiye's healthcare system has improved over the past decade in terms of oncologist and surgical

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025

Table 4. Provider-related diagnostic and treatment delay factors

Region	Black Sea	Central Anatolia	Marmara	Eastern/Southeastern Anatolia	Mediterranean	Aegean	Total *n* (%)
After undergoing a diagnostic test for breast cancer, have you been informed about the results?							
Yes	268 (93.7)	139 (97.2)	528 (95.1)	162 (95.9)	113 (100.0)	49 (96.1)	1259 (95.6)
No	18 (6.3)	4 (2.8)	27 (4.9)	7 (4.1)	0 (0.0)	2 (3.9)	58 (4.4)
No response							5
What is the time between the last chemotherapy and radiotherapy?							
0–1 month	169 (59.1)	97 (67.8)	331 (59.3)	95 (55.9)	46 (41.8)	42 (82.2)	780 (59.2)
1–3 months	48 (16.8)	40 (28.0)	160 (28.7)	57 (33.5)	38 (34.5)	6 (11.8)	349 (26.5)
More than 3 months	69 (24.1)	6 (4.2)	67 (12.0)	18 (10.6)	26 (23.6)	3 (5.9)	189 (14.3)
No response							4
Did you have to pause treatment due to side effects?							
Yes	18 (6.3)	4 (2.8)	52 (9.3)	14 (8.2)	35 (31.0)	1 (2.0)	124 (9.4)
No	268 (93.7)	139 (97.2)	507 (90.7)	156 (91.8	78 (69.0)	50 (98.0)	1198 (90.6)
Did you have any problems with your systemic treatment appointment?							
Yes	11 (3.8)	1 (0.7)	22 (3.9)	14 (8.3)	14 (12.4)	1 (2.0)	63 (4.8)
No	275 (96.2)	142 (99.3)	537 (96.1)	155 (91.7)	99 (87.6)	50 (98.0)	1258 (95.2)
Did your systemic treatment get delayed due to surgical complications?							
Yes	7 (2.5)	1 (0.7)	22 (3.9)	1 (0.6)	15 (13.3)	0 (0.0)	46 (3.5)
No	278 (97.5)	142 (99.3)	536 (96.1)	168 (99.4)	98 (86.7)	51 (100.0)	1273 (96.5)
Did your systemic treatment delayed due to supply problems?							
Yes	3 (1.0)	1 (0.7)	12 (2.2)	5 (2.9)	13 (11.5)	0 (0.0)	34 (2.6)
No	283 (99.0)	142 (99.3)	546 (97.8)	165 (97.1)	100 (88.5)	51 (100.0)	1287 (97.4)
No response							0
Has the patient been discussed in multidisciplinary team meeting?							
Yes	226 (79.0)	128 (89.5)	519 (92.8)	139 (81.8)	112 (99.1)	43 (84.3)	1167 (88.3)
No	60 (21.0)	15 (10.5)	40 (7.2)	31 (18.2)	1 (0.9)	8 (15.7)	155 (11.7)
What is the initial appointment time?							
0–1 month	3 (1.1)	0 (0.0)	8 (1.4)	4 (2.4)	1 (0.9)	0 (0.0)	16 (1.2)
1–3 months	268 (94.0)	130 (90.9)	472 (84.6)	157 (92.4)	105 (92.9)	47 (92.2)	1179 (89.3)
More than 3 months	14 (4.9)	13 (9.1)	78 (14.0)	9 (5.3)	7 (6.2)	4 (7.8)	125 (9.5)
Time between symptom onset and doctor's visit							
0–1 month	245 (85.7)	122 (85.3)	450 (80.6)	143 (84.6)	103 (91.2)	45 (88.2)	1108 (83.9)
1–3 months	11 (3.8)	0 (0.0)	13 (2.3)	3 (1.8)	1 (0.9)	0 (0.0)	28 (2.1)
More than 3 months	30 (10.5)	16 (13.3)	95 (17.0)	23 (13.6)	9 (8.0)	6 (11.8)	182 (13.8)
Interval between initial visit and specialist examination							
0–1 month	268 (93.7)	136 (95.8)	478 (86.0)	149 (87.6)	105 (92.9)	45 (88.2)	1181 (89.6)
1–3 months	0 (0.0)	0 (0.0)	7 (1.3)	3 (1.8)	0 (0.0)	0 (0.0)	10 (0.8)
More than 3 months	18 (6.3)	6 (4.2)	71 (12.8)	18 (10.6)	8 (7.1)	6 (11.8)	127 (9.6)
Time between the physician's order and mammography results							
0–1 month	232 (81.8)	135 (94.4)	522 (94.2)	160 (94.1)	113 (100.0)	47 (92.2)	1209 (91.8)
1–3 months	46 (16.1)	1 (0.7)	15 (2.7)	6 (3.5)	0 (0.0)	2 (3.9)	70 (5.3)
More than 3 months	8 (2.8)	7 (4.9)	17 (3.1)	4 (2.4)	0 (0.0)	2 (3.9)	38 (2.9)
What is the other radiological examination time (US/MRI, etc)?							
0–1 month	278 (97.2)	134 (93.7)	535 (95.9)	165 (97.1)	111 (98.2)	49 (96.1)	1272 (96.3)
1–3 months	1 (0.3)	1 (0.7)	6 (1.1)	4 (2.4)	0 (0.0)	0 (0.0)	12 (0.9)
More than 3 months	7 (2.4)	8 (5.6)	17 (3.0)	1 (0.6)	2 (1.8)	2 (3.9)	37 (2.8)
Time between biopsy order and intervention							
0–1 month	276 (96.5)	132 (92.3)	530 (94.8)	164 (97.0)	112 (99.1)	49 (96.1)	1263 (95.6)
1–3 months	0 (0.0)	0 (0.0)	5 (0.9)	1 (0.6)	0 (0.0)	0 (0.0)	6 (0.5)
>3 months	10 (3.5)	11 (7.7)	24 (4.3)	4 (2.4)	1 (0.9)	2 (3.9)	52 (3.9)
Time to pathological results after biopsy							
0–1 month	282 (98.6)	139 (97.2)	543 (97.3)	169 (99.4)	111 (99.1)	51 (100.0)	1295 (98.1)
1–3 months	0 (0.0)	0 (0.0)	6 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)	6 (0.5)
>3 months	4 (1.4)	4 (2.8)	9 (1.6)	1 (0.6)	1 (0.9)	0 (0.0)	19 (1.4)

(continued)

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025

Table 4. Continued

Region	Black Sea	Central Anatolia	Marmara	Eastern/Southeastern Anatolia	Mediterranean	Aegean	Total *n* (%)
Time between diagnosis and the initiation of treatment (any)							
0–1 month	259 (90.6)	124 (86.7)	530 (95.0)	161 (94.7)	110 (97.3)	47 (92.2)	1231 (93.2)
1–3 months	0 (0.0)	1 (0.7)	10 (1.8)	2 (1.2)	0 (0.0)	0 (0.0)	13 (1.0)
More than 3 months	32 (11.1)	4 (2.7)	20 (3.5)	3 (1.7)	3 (2.6)	3 (5.8)	65 (4.9)
Time to surgery (upfront or after neoadjuvant therapy)							
0–1 month	162 (56.6)	80 (55.9)	258 (46.2)	74 (43.5)	93 (82.3)	42 (82.4)	709 (53.7)
1–3 months	3 (1.0)	4 (2.8)	43 (7.7)	2 (1.2)	0 (0.0)	0 (0.0)	52 (3.9)
More than 3 months	121 (42.3)	59 (41.3)	257 (46.1)	94 (55.3)	20 (17.7)	9 (17.6)	560 (42.4)
Time to start neoadjuvant treatment							
0–1 month	68 (23.7)	103 (73.0)	274 (49.1)	113 (66.4)	21 (18.5)	27 (52.9)	606 (45.8)
1–3 months	62 (21.6)	17 (11.8)	111 (19.8)	16 (9.4)	10 (8.8)	10 (19.6)	226 (17.1)
More than 3 months	9 (3.1)	1 (0.6)	8 (1.4)	5 (2.9)	1 (0.8)	4 (7.8)	28 (2.1)
No neoadjuvant therapy	147 (51.3)	22 (15.3)	165 (29.5)	36 (21.1)	81 (71.6)	10 (19.6)	461 (34.8)
Time to report permanent section pathology results after surgery							
0–1 month	269 (94.1)	140 (97.9)	541 (97.3)	154 (90.6)	113 (100.0)	37 (72.5)	1254 (95.1)
1–3 months	10 (3.5)	0 (0.0)	14 (2.5)	10 (5.9)	0 (0.0)	13 (25.5)	47 (3.6)
More than 3 months	7 (2.4)	3 (2.1)	1 (0.2)	6 (3.5)	0 (0.0)	1 (2.0)	18 (1.4)
Time to start adjuvant systemic treatment							
0–1 month	60 (20.9)	34 (23.7)	204 (36.5)	58 (34.1)	17 (15.0)	25 (49.0)	398 (30.1)
1–3 months	87 (30.4)	32 (22.3)	125 (22.4)	49 (28.8)	25 (22.1)	10 (19.6)	328 (24.8)
More than 3 months	44 (15.3)	32 (22.3)	142 (25.4)	38 (22.3)	6 (5.3)	6 (11.7)	268 (20.3)
No adjuvant systemic treatment	95 (33.2)	43 (30.0)	87 (15.5)	25 (14.7)	65 (57.)	10 (19.6)	325 (24.6)
Time to start radiation treatment							
0–1 month	41 (14.3)	13 (9.0)	257 (46.0)	49 (28.8)	10 (8.8)	15 (29.4)	385 (29.1)
1–3 months	98 (34.2)	46 (32.1)	190 (34.0)	61 (35.8)	14 (12.3)	10 (19.6)	419 (31.7)
More than 3 months	76 (26.5)	40 (27.9)	52 (9.3)	38 (22.3)	20 (17.6)	6 (11.7)	232 (17.5)
No radiation therapy	71 (24.8)	44 (30.7)	59 (10.5)	22 (12.9)	69 (61.0)	20 (39.2	285 (21.5)

referral times, accessibility of mammographic evaluations, and overall healthcare infrastructure, leading to reduced delays.

MDTs are the key element of modern cancer care and have been reported to improve the accuracy of treatment recommendations, provide comprehensive patient evaluations, and enhance adherence to clinical guidelines in BC management [23]. In our study, 88.3% of patients underwent MDT evaluations for diagnosis and treatment. The findings indicate that regions with specialized healthcare centers and MDT experienced more efficient diagnostic and treatment processes serving to improve value-based health care all around country which is one of the major aims of European code of cancer [24]. This is highlighted in the position paper for the standardization of surgical practices in Turkiye [25]. Moreover, screening practice of Turkish women should be upgraded to diagnose BC in early stages [26]. One point that should be emphasized is that, even though it is covered by governmental insurance, the BC screening program in Turkiye has not yet reached the full extent of the targeted population. This aligns with the data presented, which includes patients with locally advanced BC. However, the diagnostic and treatment initiation periods observed are shorter than those in various developed countries. This highlights the critical importance of the fact that majority of the patients in our study were evaluated in breast centers employing dedicated breast surgeons and physicians. Accordingly, it is reasonable to conclude that, even in cases where patients present with advanced disease due to patient-related delay factors, the presence of MDT with expertise in BC care constitutes the most critical determinant in facilitating timely diagnostic and therapeutic interventions from the provider-related perspective.

There are various limitations of the presented study, including the uneven distribution of surveys across regions, which limits the power of comparisons regarding patient-related delay factors attributed to those regions. Moreover, due to the nature of survey-based studies, response bias and question misinterpretation may have limited generalizability and precluded quantitative analysis. This may account for the higher-than-expected proportion of employed women observed in the study compared to national figures. On the other hand, the high response rate and solid patient data from a prospective registry database—with accurate dates of diagnostics and treatment initiations submitted by the principal physician from each center—allowed us to perform analyses regarding the providers' point of care.

Conclusion

In the present study, we conducted a needs assessment in Turkiye to develop contextualized quality improvement interventions aimed at addressing identified gaps and barriers contributing to diagnostic and treatment delays for BC from both the patient's and provider's perspectives. This comprehensive survey highlights the multifaceted reasons related to patient-related factors contributing to diagnostic delays in locally advanced BC in Turkiye, including socioeconomic challenges, lack of knowledge, and psychological barriers such as fear of cancer and its consequences. The data underscore the need for targeted interventions, such as improving public awareness of breast health, expanding access to healthcare services, and providing psychological support to patients, to shorten patient-related diagnostic delays, and ultimately improve survival outcomes. On the other hand, from the provider's perspective, the presence of MDT, including dedicated breast surgeons, represents a key factor in ensuring the timely implementation of diagnostic procedures and treatment strategies. The nationwide data regarding provider-related factors emphasized the optimized diagnostic and treatment timelines with improved healthcare access covered by social security system.

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025

Acknowledgement

The project team presents their sincere thanks to Miss Yuval Cohen (y.cohen@globalsurgeryfoundation.org) and Mrs. Nefti Bempong (nefti.bempong@unitar.org) for their kind support all through the project implementation.

Conflict of interest: None declared.

Funding

The project was funded by United Nations Institute for Training and Research and The Global Surgery Foundation and Zonguldak Bulent Ecevit University (GSFA.2023.NF.009.ZBEU_Zonguldak Bulent Ecevit University).

Data availability

Data available on request.

Key points

- The reasons contributing to diagnostic delays in locally advanced BC in Turkiye is multifaceted and specifically is attributed to patient-related factors.
- Patient-related factors include socioeconomic challenges, lack of knowledge, and psychological barriers such as fear of cancer and its consequences.
- The data underscore the need for targeted interventions, such as improving public awareness of breast health, expanding access to healthcare services, and providing psychological support to patients.
- From the provider's perspective, the presence of multidisciplinary teams, including dedicated breast surgeons, represents a key factor in ensuring the timely implementation of diagnostic procedures and treatment strategies.
- The nationwide data regarding provider-related factors emphasized the optimized diagnostic and treatment timelines with improved healthcare access covered by social security system.

References

1 An D, Choi J, Lee J *et al.* Time to surgery and survival in BC. *BMC Surg* 2002;**22**:388. https://doi.org/10.1186/s12893-022-01835-1

2 Konieczny M, Cipora E, Roczniak W *et al.* Impact of time to initiation of treatment on the quality of life of women with BC. *Int J Environ Res Public Health* 2020;**17**:8325. https://doi.org/10.3390/ijerph17228325

3 Jaiswal K, Hull M, Furniss AL *et al.* Delays in diagnosis and treatment of BC: a safety-net population profile. *J Natl Compr Cancer Netw* 2018;**16**:1451–7. https://doi.org/10.6004/jnccn.2018.7067

4 Foroozani E, Ghiasvand R, Mohammadianpanah M *et al.* Determinants of delay in diagnosis and end stage at presentation among BC patients in Iran: a multi-center study. *Sci Rep* 2020;**10**:21477. https://doi.org/10.1038/s41598-020-78517-6

5 World Health Organisation. Breats Cancer Fact Sheet. 2024. https://www.who.int/news-room/fact-sheets/detail/breast-cancer.

6 Jassem J, Ozmen V, Bacanu F *et al.* Delays in diagnosis and treatment of BC: a multinational analysis. *Eur J Public Health* 2014;**24**:761–7. https://doi.org/10.1093/eurpub/ckt131

7 Hutajulu SH, Prabandari YS, Bintoro BS *et al.* Delays in the presentation and diagnosis of women with BC in Yogyakarta, Indonesia: a retrospective observational study. *PLoS One* 2022;**17**:e0262468. https://doi.org/10.1371/journal.pone.0262468

8 Unger-Saldaña K, Peláez-Ballestas I, Infante-Castañeda C. Development and validation of a questionnaire to assess delay in treatment for BC. *BMC Cancer* 2012;**12**:626. https://doi.org/10.1186/1471-2407-12-626

9 Tesfaw A, Demis S, Munye T *et al.* Patient delay and contributing factors among BC patients at two cancer referral centres in Ethiopia: a cross-sectional study. *J Multidiscip Healthc* 2020;**13**:1391–401. https://doi.org/10.2147/JMDH.S275157-

10 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. https://doi.org/10.1093/eurpub/cku086

11 Castaldi M, Smiley A, Kechejian K *et al.* Disparate access to BC screening and treatment. *BMC Women's Health* 2022;**22**:249. https://doi.org/10.1186/s12905-022-01793-z

12 Hoveling LA, Schuurman M, Siesling S *et al.* Diagnostic delay in women with cancer: what do we know and which factors contribute? *Breast (Edinburgh, Scotland)* 2025;**80**:104427. https://doi.org/10.1016/j.breast.2025.104427

13 Martinez A, Daubisse-Marliac L, Lacaze JL *et al.*; EvaSein Group. Treatment time interval in BC: a population-based study on the impact of type and number of cancer centres attended. *Eur J Cancer Care* 2022;**31**:e13654. https://doi.org/10.1111/ecc.13654

14 Rubio IT, Marotti L, Biganzoli L *et al.* EUSOMA quality indicators for non-metastatic BC: an update. *Eur J Cancer* 2024;**198**:113500. https://doi.org/10.1016/j.ejca.2023.113500

15 Allemani C, Matsuda T, Di Carlo V *et al.*; CONCORD Working Group. Global surveillance of trends in cancer survival 2000-14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. *Lancet* 2018;**391**:1023–75. https://doi.org/10.1016/S0140-6736(17)33326-3

16 Siegel RL, Kratzer TB, Giaquinto AN *et al.* Cancer statistics, 2025. *CA: Cancer J Clin* 2025;**75**:10–45. https://doi.org/10.3322/caac.21871

17 Zhang H, Wang G, Zhang J *et al.* Patient delay and associated factors among Chinese women with BC: a cross-sectional study. *Medicine (Baltimore)* 2019;**98**:e17454. https://doi.org/10.1097/MD.0000000000017454

18 Muchuweti D, Nyandoro G, Muguti EG *et al.* Factors contributing to delayed BC presentation: a prospective study at Parirenyatwa group of hospitals, Harare, Zimbabwe 2010–2013. *J Cancer Tumor Int* 2017;**5**:1–10.

19 Maghous A, Rais F, Ahid S *et al.* Factors influencing diagnosis delay of advanced BC in Moroccan women. *BMC Cancer* 2016;**16**:356. https://doi.org/10.1186/s12885-016-2394-y

20 Nur Anis I, Che M, Noor Hidayah Abu B *et al.* Breast self-examination among female students: a systematic review. *Int J Educ Res* 2018;**6**:2411–5681.

21 Khan A, Khan K, Raza A *et al.* Patient self delay among women with BC. *J Ayub Med Coll Abbottabad* 2018;**30**:558–61.

22 Harris M, Vedsted P, Esteva M *et al.* Identifying important health system factors that influence primary care practitioners' referrals for cancer suspicion: a European cross-sectional survey. *BMJ Open* 2018;**8**:e022904. https://doi.org/10.1136/bmjopen-2018-022904

23 Rosell L, Alexandersson N, Hagberg O *et al.* Benefits, barriers and opinions on multidisciplinary team meetings: a survey in Swedish cancer care. *BMC Health Serv Res* 2018;**18**:249. https://doi.org/10.1186/s12913-018-2990-4

24 Güler SA, Cantürk NZ. Multidisciplinary BC teams and proposed standards. *Turk J Surg* 2014;**31**:39–41. https://doi.org/10.5152/UCD.2014.2724

25 Emiroglu M, Karaali C, Oztop MB *et al.* National consensus on oncoplastic breast conserving surgery in Turkey: position paper for the standardization of surgical practice. *Turk J Surg* 2020;**36**:271–7. https://doi.org/10.47717/turkjsurg.2020.4639

26 Mert T. Evaluation of knowledge and practice regarding mammography among a group of Turkish women attending a tertiary hospital. *Turk J Surg* 2022;**38**:230–6. https://doi.org/10.47717/turkjsurg.2022.5672

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025

© The Author(s) 2025. Published by Oxford University Press on behalf of the European Public Health Association.
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (https://creativecommons.org/licenses/by-nc/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact reprints@oup.com for reprints and translation rights for reprints. All other permissions can be obtained through our RightsLink service via the Permissions link on the article page on our site—for further information please contact journals.permissions@oup.com.
European Journal of Public Health, 2025, 35, 1271–1280
https://doi.org/10.1093/eurpub/ckaf108
Original Manuscript

Downloaded from https://academic.oup.com/eurpub/article/35/6/1271/8193945 by Koc University Library user on 29 December 2025