Impact of the COVID-19 Pandemic on Breast Cancer Care in Romania: A Cohort Analysis from the Oncological Institute of Bucharest

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Article

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Abstract

Background: The COVID-19 pandemic profoundly disrupted healthcare systems worldwide, raising concerns regarding delays in cancer diagnosis and treatment. How these disruptions affected breast cancer care during and after the pandemic remains incompletely understood, particularly in Eastern European oncology centers. **Methods:** We conducted a retrospective cohort study of breast cancer patients treated at the Oncological Institute of Bucharest, comparing a pandemic cohort (n = 73) with a post-pandemic cohort (n = 99) regarding age at diagnose, tumor laterality, tumor location, tumor stage, and time intervals across the diagnostic and treatment pathways. We measured the intervals between: GP referral and the patien's first presentation to the surgery unit; imaging diagnosis; the date of biopsy or surgery, biopsy result, and initiation of neoadjuvant treatement; the end of neoadjuvant treatement and surgery; surgery and adjuvant treatment; and the interval of time between chemotherapy sessions. **Results:** Between the two cohorts, the median age was similar (56 [47–67] vs. 59 [50–68] years). Similarities were also found in tumor laterality and quadrant location. In the post-pandemic cohort, 31.3% of patients were diagnosed with advanced stages, compared with 20.5% in the pandemic cohort, although this difference did not reach statistical significance. Our study showed that chemotherapy delivery was more efficient post-pandemic, with shorter intervals between treatment sessions (18 [17–19] vs. 21 [21,22] days). Referral-to-presentation times were also shorter post-pandemic (3 [1–8] vs. 6 [2–10] days). In contrast, during the post-pandemic year, the interval between the end of neoadjuvant therapy and surgery, remained prolonged. **Conclusions** During the COVID-19 pandemic, breast cancer care at a major oncology Romanian center was preserved through adapted clinical pathways. We also established that delays in surgical treatment happened in the post-pandemic period and a higher percentage of advanced-stage disease cases were diagnosed. Our findings may suggest that pre-hospital delays and residual system constraints contributed to stage migration in the post-pandemic group rather than deficiencies in oncology care.

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1. Introduction

The most frequently diagnosed malignancy in women remains breast cancer, worlwide, and represents a major contributor to global cancer-related mortality[1]. The incidence had continued to rise in all countries over recent decades, regardless of income level (low, middle or high). This reflects an improved detection rate, the important role of lifestyle-associated risk factors, and broader demographic changes. Due to better screening programmes, precise diagnose with molecular stratification, and extensive treatment strategies, survival rates have improved in many regions[2] but there are still global health inequalities worldwide. Early detection through structured screening programs is common in high-income countries, whereas in low-income countries, access to timely diagnosis and comprehensive treatment is limited[3].

In March 2020, the World Health Organization declared COVID-19 a global health emergency, triggering a reorganisation of healtcare systems worldwide.Pandemic management reshaped hospitals, diverted personnel, postponed elective procedures, and completely stoped screening[4]. As a result, breast cancer care (screening, diagnostic imaging, follow-up consultations, and elective procedures) was significantly impacted. Hospital resources suffered limitations, staff were redistributed (particularly critical care teams), and there was an important effort to minimize exposure to Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). There were declines in screening volumes as described in international reports[5], diagnostic tests were delayed, and treatment plans were modified. All these facts raised concerns about the stage of diagnosis and long-term outcomes.

Professional organizations released clinical guidelines during the COVID-19 pandemic to maintain and support the safe management of breast cancer patients. The European Society for Medical Oncology (ESMO), the Association of Breast Surgery (ABS), the National Institute for Health and Care Excellence (NICE), the Canadian Society of Breast Imaging (CSBI), and the Canadian Association of Radiology (CAR) developed recommendations that helped clinicians to diagnose and treat breast cancer during pandemic. The recommendations highlighted measures for infection control and included universal precautions, even for asymptomatic patiens, to minimize the risk of transmission among oncological patients[6].

The COVID-19 Pandemic Breast Cancer Consortium (CPBCC) was formed in the United States of America and released a decision-making guide for crisis circumstances[7]. The consortium pointed out that the long-term outcome of breast cancer patients will not be influenced by the temporary deferral of selected procedures[7]. It showed that reducing patient contact with healthcare facilities when possible was highly important to protect immunosupressed individuals and adapt treatment. The recommendations of CPBCC did not substitute individualized judgement; they just complemented it[7].

The risk of SARS-CoV-2 transmission among cancer patients was reduced by the use of masks, personal protective equipment (PPE), and specific patient pathways within the hospital, thereby limiting unnecessary movement. Telemedicine helped triage patients, provided follow-up consultations, assisted in the interpretation of laboratory and imaging results, and reduced hospital visits while also providing clinical oversight.

Additional measures were also applied: pre-appointment symptom screening, testing algorithms for surgical patients, and maintaining physical distancing by organizing the waiting areas and day hospital oncology unit to ensure physical distancing. Vulnerable cancer patients, which are immunosuppressed due to systemic therapy, were protected by implementing all these measures and receieved access to diagnosis and treatment during the pandemic time[6].

Breast imaging was also reorganized during the COVID-19 pandemic to reduce patient exposure to SARS-CoV-2[8]. The indications of breast imaging were based on clinical urgency, and remote interpretation of mammograms was also implemented[8].The evaluations were classified in low-

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priority or high-priority. Low-priority cases – such as benign breast pain, Breast Imaging Reporting and Data System (BI-RADS) low risk, routine implant surveillance, and cases with gynecomastia – were postponed[8]. High-priority cases – such as inflammatory breast cancer, breast malignancy associated with pregnancy, and clinical signs suggestive of malignancy – received assessment in a short time[7,8].

Screening programs suffered the most because they experienced the most significant changes. The National Health Service Breast Screening Programme in the United Kingdom (NHSBSP) was suspended, even though its mortality-reducing benefits were well known. Prior to the pandemic, the NHSBSP performed over 2.1 million mammograms annually, accounting for nearly 30% of breast cancer diagnoses and preventing an estimated 1,300 deaths each year [9,10]. Between March 2020 and June 2020, organized breast cancer screening programs were suspended in many regions. In Italy, a 2-month interruption in mammography services resulted in a 10.4% decrease in diagnoses of in situ neoplasia and increases in lymph node-positive (11.2%) and stage III cases (10.3%). The effect was particularly pronounced in tumours with high proliferation rates, which showed a 18.5% increase in lymph node positivity and a 11.4% increase in stage III diagnoses[11].A population-based study in England examined the impact of the first two years of the COVID-19 pandemic on breast cancer diagnosis. During the pandemic, there was a 9% decline in total breast consultations compared to 2019–2020, followed by a 9% increase in 2021–2022[12]. The number of patients starting breast cancer treatment dropped by 23% during the pandemic and increased by 2% in the post-pandemic year.

Among patients aged 70 and older, the number of new diagnoses fell to one-third of pre-pandemic levels. In the 50–69 age group, new diagnoses dropped by 26% in 2020–2021 but rose by 8% in 2021–2022[12]. A modelling study from England projected that disruptions in breast cancer screening may lead to 148–687 additional deaths[13].

Endocrine therapy, including aromatase inhibitors and luteinizing hormone-releasing hormone (**LHRH**) agonists, has proven to be a safe and effective option during the COVID-19 pandemic, when the surgery was delayed[7]. LHRH agonists can be administered at home and are available in formulations that require only once-every-3 month dosing.For patients with estrogen receptor-positive ductal carcinoma in situ (DCIS), preoperative endocrine therapy for up to six months may be considered[14].In cases of hormone receptor-positive, Human Epidermal Growth Factor Receptor 2 (HER2) negative tumours, neoadjuvant endocrine therapy administered for 6–12 months can safely defer surgery without compromising oncologic outcomes[14]. However, regular patient monitoring remains essential to ensure there is no disease progression.

Genomic assays, such as the **Oncotype DX test**, should be used to identify patients who are likely to benefit from chemotherapy. For patients with early-stage breast cancer who have already undergone surgery, adjuvant chemotherapy may be started within 12 weeks, without compromising survival outcomes[15]. Adjuvant trastuzumab therapy can also be shortened to six months with no loss of efficacy compared to the standard 12-month course[16]. To further reduce hospital exposure, Trastuzumab may be administered subcutaneously and as monotherapy in selected low-risk HER2-positive patients[16]. Cyclin-Dependent Kinase 4 and 6 (CDK4/6) inhibitors offer significant clinical benefit in the first- or second-line treatment of hormone receptor (HR) positive breast cancer; however, their use may be postponed when effective disease control is achievable with endocrine therapy alone[17].

Radiotherapy plays a critical role in the multimodal management of breast cancer, but during the COVID-19 pandemic, it suffered careful reviews, so elderly patients or those with comorbidities should have minimal exposure to SARS-CoV-2. High-priority candidates for radiotherapy include patients with inflammatory breast cancer, triple-negative tumors, HER2-positive subtypes, those under age 40, and those with incomplete responses to chemotherapy. For these patients, a hypofractionated regimen of 40 Gy in 15 fractions over 3 weeks is recommended[18].

Specialized breast surgery centres were either repurposed as COVID-19 treatment facilities or experienced resource reallocation, particularly through the redeployment of anaesthesiology personnel to support pandemic-related demands[7]. These changes led to delays in surgical care,

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which led to negative outcomes for breast cancer patients[19]. Taking all the facts in consideration, the decision to perform surgery, especially the prophylacted procedures, requires a multidisciplinary approach, as shown in the work of Nodiță et al. on prophylactic contralateral mastectomies[20].There is evidence that indicates that oncologic outcome is not compromised when postponing surgery up to 8 weeks after neodajuvant chemotherapy completion[21].Quality of life that oncologic patients have is a key indicator also. Previous studies, such as that reported by Mirică et al., have demonstrated a strong association between recovery, functional capacity, and psychological and social well-being[22]. 44% of the participants of a study conducted in the United States, with 609 breast cancer survivors, reported delays in their treatment during the pandemic[23]. 31.6% of the participants of a different study conducted in United Kingdom, with 234 breast cancer patients with a mean age of 51 years old, performed by Swainston et al., reported an emotional distress caused by modifications in their treatment, either the use of telemedicine or appointment cancellations[24].

Romanian National Institute of Public Health issued in 2021 a report about the National Health Assessment and Promotion Programme and Health Education that indicates an increase in breast cancer incidence among women from 2011 to 2019. However, in 2020, newly diagnosed cases reported a decline with a 54.1% detection rate compared to 62.5% in 2019 and 67.1% in 2018. The report acknowledged that the COVID-19 pandemic influenced the rates, but it doesn't analyze the mechanisms that drove this trend.

2. Materials and Methods

The study was conducted in Romania at the Oncological Institute of Bucharest (IOB) and was designed as a retrospective cohort study to assess the impact of the pandemic on the diagnosis and treatment timelines of newly diagnosed with breast cancer cases. The study was comparative – we divided the patients into two distinct cohorts. The pandemic cohort analysed data from patients admitted to the hospital between March 1st, 2020, and March 1st, 2021. The post-pandemic cohort analysed data from patients admitted to the hospital between March 1st, 2022, and March 1st, 2023. To have a clear contrast between the two cohorts, we decided to exclude the transitional year (March 2021 – March 2022). During the study period (1st of March 2020 – 1st of March 2021 and 1st of March 2022 - 1st of March 2023), we identified 641 female patients hospitalized in oncology or surgical units.

The inclusion criteria in the study were: female patients, aged over 18 years, with histopathologically confirmed diagnosis of breast cancer, newly diagnosed and suitable for surgical treatment.The exclusion criteria from the study were: patients younger than 18 years old, male patients, recurrent tumours, and patients with advanced, inoperabable cancer.

Pandemic cohort included 298 breast cancer patients, hospitalized, of whom only 73 met the inclusion criteria. Post-pandemic cohort included 343 breast cancer patients, hospitalized, of whom only 99 met the inclusion criteria.

We analized medical records to collect data for each eligible patient. We analized: date of imagistic diagnosis, type of imagistic diagnosis (mammogram, ultrasound or Magnetic Resonance Imaging - MRI), date of biopsy, systemic treatment (endocrine therapy and chemotherapy), date of surgical intervention and adjuvant treatment (chemotherapy and radiotherapy).

We calculated, for each patient, the time intervals, expressed in days, for a positive diagnosis and treatment. We analyzed the *referral delay*, which we defined between the issuance of the referral note (by the family doctor) and the patient's first presentation at IOB; the *diagnostic delay*, represented by the interval of time between imagistic confirmation of the diagnosis and biopsy; and the time from biopsy and initiation of neoadjuvant systemic therapy.For the cases that didn't receive neoadjuvant therapy, we calculated the *surgical delay*, defined as the interval from imaging confirmation or biopsy to surgery. In cases that receieved neoadjuvant therapy, we measured the *post-neoadjuvant interval*, defined as the time from completion of systemic therapy to surgery. The interval of time, expressed in days, between surgery and initiation of adjuvant therapy (chemotherapy, endocrine therapy, or radiotherapy), was defined as the adjuvant delay. We also calculated, for patients receiving chemotherapy, the interval between treatment sessions.

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Continuous variables were described in means ± standard deviations (SD).Categorical variables were described in percentages. We conducted a comparative analysis between the pandemic and post-pandemic cohorts, using independent-samples t-tests. We applied Chi-square tests to assess associations between categorical variables.A p-value of < 0.05 was considered statistically significant.The statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY) and for validating additional results, we used Python-based statistical libraries.Cases with incomplete data (due to treatment or imaging performed outside the institute) were excluded from the relevant interval analyses.

Key characteristics from the pandemic cohort (n = 73), shown in Table 1: For 32 of the 73 patients in the pandemic cohort, the dates of diagnostic breast imaging (ultrasound, mammography, or MRI) were unavailable because the examinations were performed at outside institutions.Within the pandemic cohort, 16 patients underwent surgery without a prior core biopsy, with the diagnosis established intraoperatively by extemporaneous histopathological evaluation. Thirteen patients had undergone biopsy at other healthcare institutions, for which the biopsy dates were unavailable. Neoadjuvant chemotherapy was administered in 43 patients; among these, 10/43 (23.3%) initiated treatment at outside institutions, with incomplete data on treatment initiation and number of cycles. A total of 26 patients received adjuvant chemotherapy, and 20 received postoperative radiotherapy.

Table 1. Baseline clinical and treatment characteristics of the pandemic cohort (n = 73).

Characteristic	n (%)
Diagnostic imaging dates unavailable (ultrasound, mammography, or breast MRI)	32 (43.8)
Direct surgery without prior core biopsy (diagnosis established intraoperatively by extemporaneous histopathology)	16 (21.9)
Biopsy performed at other healthcare institutions (biopsy date unavailable)	13 (17.8)
Neoadjuvant chemotherapy administered	43 (58.9)
Neoadjuvant therapy initiated at outside institutions (incomplete data on start date and number of cycles)	10 (23.3)
Adjuvant chemotherapy administered	26 (35.6)
Postoperative radiotherapy administered	20 (27.4)

Data are presented as the number of patients (as a percentage of the total cohort). Missing dates reflect investigations or treatments performed at other healthcare institutions prior to referral.

Key characteristics from the post-pandemic cohort (n = 99), shown in Table2: For 38 of the 99 patients in the post-pandemic cohort, dates of diagnostic breast imaging (ultrasound, mammography, or MRI) were unavailable because the examinations had been conducted at outside institutions.In the post-pandemic cohort, 24 patients proceeded to surgery without a prior biopsy, with histopathological confirmation obtained intraoperatively. Twelve patients had undergone biopsy at other healthcare institutions, but no documentation of the biopsy dates was available. Neoadjuvant chemotherapy was administered in 49 patients: among these, 15/49 (30.6%), initiated treatment at outside institutions, with incomplete data on treatment initiation and number of cycles. Adjuvant chemotherapy was administered to 33 patients, while 22 underwent postoperative radiotherapy.

Table 2. Baseline clinical and treatment characteristics of the post-pandemic cohort (n = 99).

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Characteristic	n (%)
Diagnostic imaging dates unavailable (ultrasound, mammography, or breast MRI)	38 (38.4)
Direct surgery without prior biopsy (histopathological confirmation obtained intraoperatively)	24 (24.2)
Biopsy performed at other healthcare institutions (biopsy date unavailable)	12 (12.1)
Neoadjuvant systemic therapy administered	49 (49.5)
Neoadjuvant therapy initiated at outside institutions	15 (30.6)
Adjuvant chemotherapy administered	33 (33.3)
Postoperative radiotherapy administered	22 (22.2)

*Data are presented as the number of patients (as a percentage of the total cohort). Missing imaging or biopsy dates reflect investigations performed at other healthcare institutions prior to referral.*A comparative analysis of clinical management characteristics between the pandemic and post-pandemic cohorts is presented in Table 3.

Table 3. Comparison of clinical management characteristics between the pandemic and post-pandemic cohorts.

Characteristic	Pandemic cohort (n = 73)	Post-pandemic cohort (n = 99)	p-value
Diagnostic imaging dates unavailable, n (%)	32 (43.8)	38 (38.4)	0.574
Direct surgery without prior biopsy, n (%)	16 (21.9)	24 (24.2)	0.862
Biopsy performed at other institutions, n (%)	13 (17.8)	12 (12.1)	0.408
Neoadjuvant chemotherapy administered, n (%)	43 (58.9)	49 (49.5)	0.285
Neoadjuvant therapy initiated at outside institutions*, n (%)	10 (23.3)	15 (30.6)	0.578
Adjuvant chemotherapy administered, n (%)	26 (35.6)	33 (33.3)	0.881
Postoperative radiotherapy administered, n (%)	20 (27.4)	22 (22.2)	0.548

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Percentages for neoadjuvant therapy initiated at outside institutions are calculated relative to the subgroup of patients who received neoadjuvant treatment in each cohort.Categorical variables were compared using the chi-square test.

Breast cancer care continued to function, despite healthcare constraints, according to our findings: there was no significant statistical differences between the two cohorts, pandemic and post-pandemic. Although operational workflows were temporarily modified during the pandemic, core oncologic treatment pathways—including indications for neoadjuvant therapy, surgery, and adjuvant treatments—remained largely consistent across both periods.

3. Results

A total of 73 patients were included in the pandemic cohort and 99 in the post-pandemic cohort. The baseline demographic and tumor characteristics of the two cohorts are presented in Table 4.

Table 4. Baseline demographic and tumor characteristics of the pandemic and post-pandemic cohorts.

Variable	Pandemic cohort (n = 73)	Post-pandemic cohort (n = 99)	p-value
Age, median [IQR], years	56 [47–67]	59 [50–68]	—
Tumor laterality – left, n (%)	38 (52.1)	56 (56.6)	0.58
Tumor laterality – right, n (%)	35 (47.9)	43 (43.4)	
Tumor location – upper outer quadrant, n (%)	34 (46.6)	38 (38.4)	0.38
Tumor location – multicentric / multiple quadrants, n (%)	18 (24.7)	24 (24.2)	
Tumor location – other locations, n (%)	21 (28.8)	37 (37.4)	
Stage at diagnosis – early stage (0–II), n (%)	58 (79.5)	68 (68.7)	0.11
Stage at diagnosis – advanced stage (III–IV), n (%)	15 (20.5)	31 (31.3)	

Age was reported as median Interquartile Range [IQR] and not included in between-group statistical testing due to non-normal distribution.

The median age was comparable between the pandemic and post-pandemic groups (56 [47–67] vs. 59 [50–68] years, respectively).

Tumor laterality was similarly distributed across cohorts, with left-sided tumors accounting for 52.1% of cases during the pandemic and 56.6% in the post-pandemic period, while right-sided tumors accounted for 47.9% and 43.4%, respectively.

Regarding tumor location, the upper outer quadrant was the most frequent site in both cohorts (46.6% during the pandemic and 38.4% post-pandemic), followed by multicentric disease (24.7% and

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24.2%, respectively). Tumors located in other quadrants (central, upper inner, lower outer, and lower inner) represented 28.8% of cases in the pandemic cohort and 37.4% in the post-pandemic cohort. No statistically significant differences in tumor laterality or location were observed between the two periods.

During the pandemic, 58 of 73 patients (79.5%) were diagnosed with early-stage breast cancer (stages 0–II), while 15 patients (20.5%) presented with advanced-stage disease (stages III–IV). In contrast, in the post-pandemic cohort, 68 of 99 patients (68.7%) were diagnosed at an early stage, whereas 31 patients (31.3%) had advanced-stage disease.

Although a higher proportion of advanced-stage cases was observed in the post-pandemic period compared with the pandemic period, this difference did not reach statistical significance ($p = 0.11$).

Time intervals across the diagnostic and treatment pathway are summarized in Table 5. The interval from referral to first hospital presentation was shorter in the post-pandemic period compared with the

pandemic period. Imaging-to-biopsy intervals were also reduced post-pandemic, although this analysis was limited by missing data due to external investigations.

No meaningful differences were observed in the time from biopsy to initiation of neoadjuvant therapy or from surgery to adjuvant chemotherapy between the two periods. In contrast, the interval from the end of neoadjuvant therapy to surgery was longer in the post-pandemic cohort.

Chemotherapy delivery was more efficient post-pandemic, as reflected by shorter intervals between chemotherapy cycles.

Table 5. Time intervals across the diagnostic and treatment pathway.

Time interval	Pandemic cohort	Post-pandemic cohort	Notes
Referral Letter (RL) to first hospital visit, days	6 [2–10] (n=68)	3 [1–8] (n=78)	Shorter post-pandemic
Imaging to biopsy, days	14 [4–33] (n=26)	7 [3–22] (n=43)	Descriptive only (missing data)
Biopsy to neoadjuvant therapy, days	40 [23–48] (n=25)	39 [30–49] (n=33)	Comparable
Imaging to surgery, days	28 [20–41] (n=17)	59 [27–80] (n=33)	Descriptive only (small n)
End of neoadjuvant to surgery, days	33 [28–44] (n=32)	38 [27–49] (n=33)	Delayed post-pandemic
Surgery to adjuvant chemotherapy, days	65.5 [49–79.5] (n=26)	65 [51–78] (n=32)	Comparable
Chemotherapy cycle interval, days	21 [21,22] (n=28)	18 [17–19] (n=32)	Shorter post-pandemic

As a measure to postpone surgery, during *pandemic period*, when access to the operating room was restricted, the administration of endocrine therapy to patients with hormone receptor - positive tumors was used. COVID-19 Polymerase Chain Reaction (PCR) testing was mandatory for all patients scheduled for surgery. Patients who had completed neoadjuvant chemotherapy were considered high priority, and surgery was performed as standard. Breast reconstructions were suspended during the pandemic. Also, all benign breast surgeries were postponed. During the post-pandemic period, breast cancer diagnoses and treatment returned to standard practice progressively.

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Neoadjuvant endocrine therapy was less commonly used. Surgical procedures were performed at maximum capacity, so surgical delays were uncommon. For early-stage breast cancer cases, the initial approach remained surgery, once again. The schedules for radiotherapy, hypofractionated, very frequently used in pandemic time, were also used in post-pandemic period, confirming their efficacy and advantages.

4. Discussion

Breast cancer care at IOB was preserved during pandemic, despite severe disruptions caused by COVID-19. Treatment timelines, especially initiation of systemic therapy (adjuvant chemotherapy), during the pandemic were comparable to those during the post-pandemic period. This proves that institutional protocols were implemented effectively, including the triage system, neoadjuvant endocrine therapy, and hypofractionated radiotherapy.

We did observe a higher percentage of advanced-stage breast cancer cases in the post-pandemic cohort, despite the better chemotherapy schedule and shorter refferal to presentation time intervals. We consider this a paradox and conclude that the delay occurred before the patients entered in the hospital. Access to primary care was reduced, screening was disrupted, and this might have led to delayed presentantions even after the restrictions were lifted.

In the post-pandemic period, we concluded that surgical services were overloaded. The delivery of chemotherapy improved, but the surgical timelines (especially following neoadjuvant treatment) were prolonged, reflecting a high number of cases and more complex cases. We conclude that the COVID-19 pandemic also affected personalized breast cancer care, including genetic testing and cascade screening, which play a very significant role in high-risk patients, and which are known to be underutilized even under non-pandemic conditions. The study by Agiannitopoulos et al. found that only 32.3% of families carrying pathogenic variants underwent cascade genetic testing[25]. During the pandemic, vulnerable patient populations had limited access to genetic counselling and testing.

Strengths and Limitations

Our study offers a real-world evaluation of breast cancer care during the COVID-19 pandemic and post-pandemic periods at a major oncology centre in Bucharest, Romania. A direct comparison was performend between two different cohorts that were clearly defined, offering a nuanced view of how breast cancer management was performed under constrained conditions caused by COVID-19.

Our study has several limitations. First, it is a retrospective study and a single-centre analysis, so the generalization of our findings is limitted to our centre.Second, we have a substantial number of patients which had imaging, biopsy or even neoadjuvant systemic therapy performed in external facilities. This resulted in incomplete data for some of the intervals.

The fact that we excluded the transitional year to achieve a clear separation between pandemic and post-pandemic period may have led to the omission of an important phase in the recovery of health care system.

Our study didn't capture psychological distress, economic status, acces to primary care, or telemedicine, even though these variables influenced delays in diagnosis and treatment.

5. Conclusions

We demonstrated in this study that breast cancer care remained functional during the COVID-19 pandemic at IOB, despite the changes in healthcare systems worldwide. Oncology services, neoadjuvant systemic therapy, and adjuvant therapy provided treatment in both periods analysed, indicating that clinical protocols were effectively adapted.

The higher proportion of advanced-stage breast cancer cases in the post-pandemic period highlights the long-lasting impact of the COVID-19 pandemic on health care systems. This likely reflects delays caused by reduced screening and reduced access to primary care.Even though oncology treatment intervals and diagnostic improved after the pandemic, the surgical timelines

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were prolonged, especially following neoadjuvant chemotherapy. Our findings underscore the importance of greater surgical capacity and better access to early diagnostic.

Overall, our results show that maintaining the appropriate oncological approach is possible during a public health crisis if substantial effort is made to address both patients and the cancer care delivery system.

Authors' Contributions: I.B, O.G, R.A.S., N.I., C.U. designed the study. O.G, C.G, V.T-G, N.I. performed the literature search and selection of articles. I.B, R.A.S., N.I. wrote the paper. All authors read and approved of the final manuscript.

Ethical Approval: The study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee, decision 9/28.03.2025.

Informed Consent Statement: Patient consent was not necessary due to the retrospective nature of the study.

Data Availability: All information in this review was documented by relevant references.

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Competing interests: The authors declare that they have no competing interests.

Final Remarks: The study provides a realistic image on how breast cancer care was provided in Romania, in the Oncological Institute during and after the COVID-19 pandemic. Our results show the resilience of the Romanian system, even under crisis conditions. The Oncological Institute of Bucharest ensured that the patients continued to receive appropiate breast cancer care by implementing hypo-fractionated radiotherapy protocols and selective use of neoadjuvant endocrine therapy.Further research is needed to evaluate long-term oncologic outcomes, patient satisfaction, quality of life, and the consequences of global crises on mental health.

Abbreviations

COVID-19 Coronavirus disease 2019
GP General practitioner
SARS-CoV-2 Severe Acute Respiratory Syndrome Coronavirus 2
ESMO European Society for Medical Oncology
ABS Association of Breast Surgery
NICE National Institute for Health and Care Excellence
CSBI Canadian Society of Breast Imaging
CAR Canadian Association of Radiology
CPBCC COVID-19 Pandemic Breast Cancer Consortium
PPE personal protective equipment
BI-RADS Breast Imaging Reporting and Data System
NHSBSP The National Health Service Breast Screening Programme in the United Kingdom
LHRH luteinizing hormone-releasing hormone
HER2 Human Epidermal Growth Factor Receptor 2
CDK4/6 Cyclin-Dependent Kinase 4 and 6
HR hormone receptor
IOB Oncological Institute of Bucharest
MRI Magnetic Resonance Imaging
SD standard deviations
SPSS Statistical Package for the Social Sciences
IQR Interquartile Range

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RL Referral Letter
PCR Polymerase Chain Reaction

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