

Impact of the COVID-19 pandemic on breast cancer biopsies: a retrospective comparative study

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Received: 16/09/2024

Accepted: 01/10/2024

Published: 01/12/2024

ABSTRACT

Aims: The purpose of this study is to evaluate and compare the quantity and pathological outcomes of diagnostic breast biopsy procedures performed in our interventional radiology unit before, during, and after the COVID-19 pandemic. This study aims to examine the influence of the COVID-19 pandemic on the quantity of biopsies performed and the rates of detecting malignancies during different time periods.

Methods: This retrospective study examined 365 patients who underwent diagnostic breast biopsies between January 2019 and January 2023. The study was approved by the hospital's ethics committee. After excluding 19 patients with inconclusive pathology results, a total of 346 patients were analyzed. Biopsies were performed utilizing 14-18 G tru-cut needles with the assistance of ultrasound guidance. Patients were classified into the following periods: pre-pandemic, pandemic, and post-pandemic. The histopathological findings were categorized as either benign or malignant. Statistical comparisons were conducted using the SPSS software, and a significance level of $p < 0.05$ was used.

Results: The average age of the patients was 53.7 ± 15.7 years. Out of the total of 346 biopsies, 165 (47.7%) were determined to be malignant, while 177 (51.2%) were found to be benign. The distribution of biopsies was as follows: 76 (22.0%) were conducted before the pandemic, 13 (3.8%) were conducted during the pandemic, and 257 (74.3%) were conducted after the pandemic. There was a substantial decline in the number of biopsies during the pandemic compared to before the pandemic, and a significant rise in the post-pandemic period compared to both the pandemic and pre-pandemic periods ($p = 0.024$ and $p = 0.041$, respectively). The incidence of malignancies during the post-pandemic period was significantly greater compared to both the pre-pandemic period ($p = 0.045$) and the pandemic period ($p = 0.027$).

Conclusion: The COVID-19 pandemic caused substantial disruptions in breast cancer diagnostics, as indicated by a decrease in the number of biopsies performed and delays in the detection of malignancies. Following the pandemic, there was a significant rise in the incidence of malignancies, which can be attributed to the delays in diagnosing and treating these conditions during the pandemic. These findings indicate the significance for stronger healthcare strategies to reduce the effects of future crises on cancer management.

Keywords: Breast cancer, COVID-19, biopsy, malignancy, diagnosis, pandemic

INTRODUCTION

The World Health Organization (WHO) officially declared the outbreak of COVID-19, caused by the SARS-CoV-2 virus, a public health emergency of international concern on January 30, 2020. Subsequently, on March 11, 2020, the WHO officially announced that COVID-19 had become a global pandemic.^{1,2} The COVID-19 pandemic has significantly challenged the medical community in numerous areas, notably affecting access to cancer diagnosis and treatment. One of the primary factors contributing to delays in cancer diagnosis and treatment has been the fear of infection while utilizing healthcare facilities amidst the rising number of COVID-19 cases. During the

COVID-19 pandemic, there was a significant decline in cancer diagnoses, with the most pronounced decrease observed in breast cancer diagnoses (51.8%).³

Breast cancer accounts for 14% of all cancer diagnoses and 30% of cancer cases diagnosed in women. The prevalence of breast cancer in our country is 47.7 cases per 100,000 women. Early diagnosis is critical in reducing breast cancer prognosis and mortality, and this is possible with screening programs.^{4,5}

Routine screening methods for breast cancer, such as mammography and breast ultrasound (US), are procedures

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Cite this article as: Taşkent İ, Ece B, Koyun M. Impact of the COVID-19 pandemic on breast cancer biopsies: a retrospective comparative study. *Kastamonu Med J.* 2024; 4(4):192-195.



that inherently require close physical contact, providing little opportunity to maintain physical distance. During these examinations, the patient's face can be as close as 20-30 cm to the radiologist's face. Similarly, during breast procedures guided by US, stereotactic, or MRI, such as biopsies, drainages, and clip placements, the interventional radiologist can be only 30 cm away from the patient's face. The risk of COVID-19 infection has been reported to increase with close physical proximity and prolonged contact.⁶⁻⁸

Moreover, during the COVID-19 pandemic, many patients have been hesitant to visit healthcare facilities due to concerns about infection risks and the imposition of movement restrictions, such as curfews and lockdowns. This has led to delays in routine screening and necessary breast procedures, potentially impacting early diagnosis and treatment outcomes.

Due to these reasons, unfortunately, breast cancer screening activities were suspended during the pandemic in our country, as in many other countries. Only urgent cancer-related medical activities were carried out.⁹

The aim of this study is to compare the number and pathological results of diagnostic breast biopsy examinations performed in our interventional unit during the pre-pandemic, pandemic, and post-pandemic periods. Additionally, this study seeks to investigate the impact of the COVID-19 pandemic on the number of biopsies conducted and the rates of malignancy detection across these different periods.

METHODS

This study received approval from the Kastamonu University Clinical Researches Ethics Committee (Date: 08.03.2023, Decision No: 2023-KAEK-27) and was designed as a retrospective analysis. A total of 365 patients who underwent diagnostic breast biopsies between January 2019 and January 2023 were reviewed. Patient demographics, BI-RADS data from mammography and ultrasound, and histopathology results were documented. 19 patients with unclear pathology results were excluded, leaving 346 patients in the final analysis. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Diagnostic breast biopsy procedures were performed using multiple biopsies with 14-18 G fully automatic tru-cut biopsy needles under ultrasound guidance. Additionally, tru-cut and fine-needle aspiration biopsies on pathological lymph nodes in the axilla were included. Patients were categorized into three groups: pre-pandemic, pandemic, and post-pandemic periods. Histopathological results were classified as benign or malignant.

The date of the first diagnosed COVID-19 case in Türkiye marked the beginning of the COVID period, while the start of controlled normalization measures in March 2021 signified

the onset of the post-COVID period. The data were analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows version 23 software (IBM SPSS Inc., Chicago, IL, USA). Normal distribution of the data was assessed using the Kolmogorov-Smirnov test. Numerical variables with a normal distribution are presented as mean±standard deviation (SD) values. Categorical variables are reported as the number (n) and percentage (%). For group comparisons, the independent samples t-test was used for data with a normal distribution, and the Mann-Whitney U test was used for data without a normal distribution. The Chi-square test was employed to compare categorical variables. A significance level of $p < 0.05$ was considered statistically significant.

RESULTS

The mean age of the patients was 53.7 ± 15.7 years. Among the 346 biopsies included in the study, 165 (47.7%) were malignant, and 177 (51.2%) were benign. The distribution of biopsies was as follows: 76 (22.0%) were performed in the pre-pandemic period, 13 (3.8%) during the pandemic, and 257 (74.3%) in the post-pandemic period. During the pandemic period, the number of diagnostic biopsy procedures significantly decreased compared to the pre-pandemic period, whereas in the post-pandemic period, there was a statistically significant increase in the number of biopsies compared to both the pandemic and pre-pandemic periods (Figure 1, Table 1). The malignancy rates in the post-pandemic period were statistically significantly higher compared to the pre-pandemic and pandemic periods (Figure 2, Table 2).

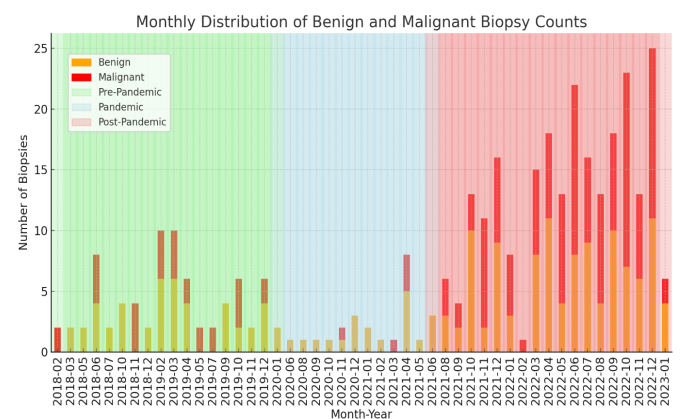


Figure 1. Monthly distribution of benign and malignant biopsy counts by periods

In the analysis performed to demonstrate the concordance between BI-RADS categories and histopathology results, we showed that 9.5% of patients categorized as BI-RADS 4A had malignant lesions, while the malignancy rate increased to 48.3% in the BI-RADS 4B category, 94.4% in the BI-RADS 4C category, and 99.0% in the BI-RADS 5 category (Figure 3, Table 3).

Table 1. Distribution of biopsy results and age distribution in periods

Period	Age (y)±mean SD	p value	Inadequate (n)	Inadequate (%)	Benign (n)	Benign (%)	Malignant (n)	Malignant (%)	Total (n)	Total (%)	p value
Prepandemic	53.26±15.7	0.94	0	0	46	60.5	30	39.5	76	22	0.041
During pandemic	53.0±11.2	0.81	0	0	11	84.6	2	15.4	13	3.8	0.024
Postpandemic	53.7±15.9		4	1.6	120	46.7	133	51.8	257	74.3	
Total	53.6±15.7		4	1.2	177	51.2	165	47.7	346	100	

Notes: "p-values" indicate the significance of comparisons between the postpandemic period and the prepandemic and pandemic periods, Abbreviations: SD: Standard deviation

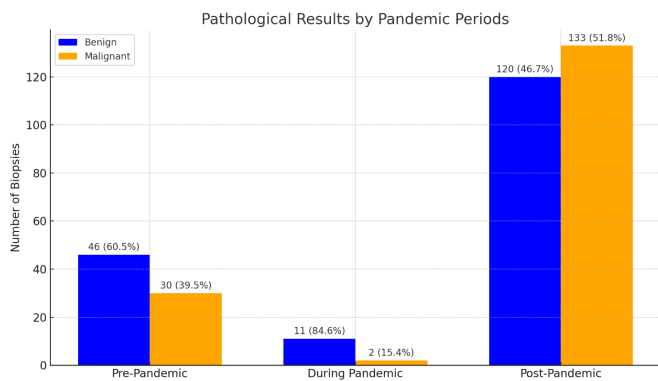


Figure 2. Pathological results by pandemic periods

Table 2. Comparison of benign and malignant biopsy outcomes in periods

Comparison	Benign (n)	Benign (%)	Malign (n)	Malign (%)	p value
Prepandemic vs postpandemic	46 vs 120	13.4 vs 35.0	30 vs 133	8.7 vs 38.8	0.045
During pandemic vs postpandemic	11 vs 120	84.6 vs 35.0	2 vs 133	15.4 vs 38.8	0.021

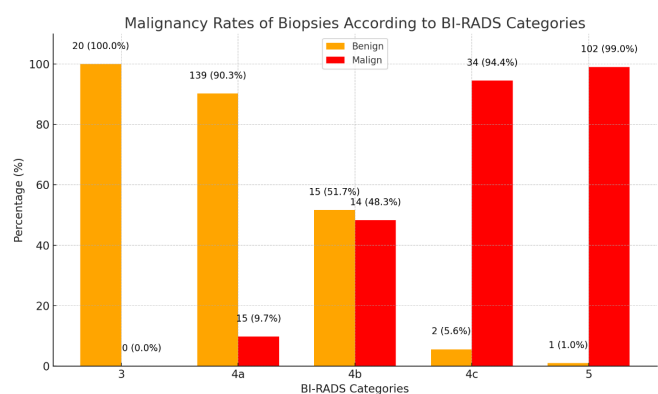


Figure 3. Malignancy rates across BI-RADS categories in biopsy results

Table 3. Malignancy rates of biopsies performed on patients according to BI-RADS categories

BI-RADS	Inadequate (n)	Inadequate (%)	Benign (n)	Benign (%)	Malign (n)	Malign (%)	Total (n)
3	0	0.0	20	100	0	0	20
4A	4	2.5	139	88.0	15	9.5	158
4B	0	0	15	51.7	14	48.3	29
4C	0	0	2	5.6	34	94.4	36
5	0	0	1	1.0	102	99.0	103
Total	4	1.2	177	51.2	165	47.6	346

BI-RADS: Breast imaging reporting and data systems

In a comparison of mammography rates in patients over 40 years of age, the mammography rate in the pre-pandemic period was 18.7%, significantly lower than the 37.5% observed in the post-pandemic period ($p=0.008$), indicating a significant increase in mammography screening in the post-pandemic period. In the comparison of mammography outcomes, the proportion of patients with BIRADS 4 and above (including categories 4A, 4B, 4C, and 5) did not significantly differ between the pre-pandemic and post-pandemic periods ($p=0.129$). Specifically, BIRADS 4 and above were observed in 50.0% of cases pre-pandemic and 52.6% post-pandemic (Table 4).

Table 4. Comparison of mammography rates in patients over 40 years

Period	n (>40y)	MMG (n)	MMG (%)	p value	>BI-RADS 4 (n)	>BI-RADS 4 (%)	p value
Prepandemic	64	12	18.7	0.008	6	50.0	0.129
Postpandemic	208	78	37.5		40	51.2	

Abbreviations: MMG: Mammography, BI-RADS: Breast imaging reporting and data systems

DISCUSSION

During the COVID-19 pandemic, challenges in breast cancer management extended beyond surgery delays to include issues in performing biopsies and evaluating histopathological results. The number of emergency and elective surgical interventions, as well as patient admissions to hospitals, significantly decreased compared to the pre-pandemic period. For instance, Filipe et al.¹⁰ observed a general reduction in the number of patients undergoing breast cancer surgery. Similarly, Dauti Işıklar et al.¹¹ reported a decrease in the number of patients visiting oncology clinics. Bulbul et al.⁴ demonstrated a significant reduction in breast cancer screening, especially in the initial months of the pandemic. Consistent with these findings, our study also identified a significant decline in the number of diagnostic breast biopsy procedures performed at our center during the COVID-19 pandemic.

Considering the doubling time of breast cancer, a certain period is required to observe the outcomes of delayed diagnosis and treatment. Citgez et al.¹² found in their study that the challenges faced in breast cancer management during the pandemic led to an increase in malignancy rates. In our study, statistically significant results were obtained due to the more than two-year period after the pandemic. The higher detection of malignancies in the post-pandemic period compared to both the pandemic and pre-pandemic periods indicates delays in diagnosis.¹³

The rise in mammography rates among individuals aged 40 and above following the pandemic (from 18.7% to 37.5%) could be explained by alterations in public health policies, increased awareness, or an accumulation of routine screenings caused by temporary disruptions caused by the pandemic. The observed increase was statistically significant, indicating a notable shift in screening practices or accessibility following the pandemic. The rise in the identification of BI-RADS 4 and higher lesions after the pandemic is in line with findings from other studies that have noted an increase in the number of advanced-stage cases and uncertain results after the resumption of regular screenings following pandemic-related lockdowns. For instance, a study conducted by Patt et al.¹⁴ observed a similar trend and attributed it to the delay of screening and diagnosis during the pandemic. This delay may have resulted in an accumulation of cases where the disease had progressed to more advanced stages by the time regular mammography screening resumed.¹⁵

Additionally, our study compared the concordance between US BI-RADS categories and histopathology results (Figure 3, Table 3). According to the results, 9.5% of patients in the BI-RADS 4A category were found to be malignant, compared to 48.3% in the BI-RADS 4B category, 94.4% in the BI-RADS 4C category, and 99% in the BI-RADS 5 category. These findings are consistent with the literature, further validating the reliability of the BI-RADS classification system in assessing the malignancy risk of breast lesions.¹⁶

Limitations

The main limitations of our study include the limited number of patients and its retrospective design. Another limitation is that it was a single-center study. Patient groups were classified as malignant/benign, but subtypes, disease grade, tumor size, stage, and survival rates were not evaluated. Therefore, multicenter studies with larger patient populations are needed.

CONCLUSION

In conclusion, the malignancy detection rate during the pandemic period was low, but it was significantly higher in the post-pandemic period compared to other periods. Due to delays in the diagnosis and treatment of breast malignancies during the pandemic, there was an increase in the malignancy detection rate not only compared to the pandemic period but also to the pre-pandemic period. We attribute this to the backlog of patients and delays in treatment approaches during the pandemic.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Kastamonu University Clinical Researches Ethics Committee (Date: 08.03.2023, Decision No: 2023-KAEK-27).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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