The Impact of Mammographic Screening on the Surgical Management of Breast Cancer

Professor Irfan Amjad Lutfi[*], Dr. Imam Bakhsh[**], Dr. Hazrat Bilal[***], Nadeem Siyal[*], Sajid Ali[****], Dr. Yasir Ali Khoso[*****]

[*] National Institute of Cardiovascular Disease Karachi Pakistan
[**] Mekran Medical College Turbat Pakistan
[***] Jinnah Postgraduate Medical Centre (JPMC) /Jinnah Sindh Medical University (JSMU) Karachi Pakistan
[****]Quaid E Azam College of Nursing and Allied Health sciences Karachi-Pakistan
[*****]Jinnah postgraduate Medical Centre Karachi

Abstract-
Small size of tumors and less severe nodal invasion have been proven to indicate descending stage spread caused by mammography. New federal recommendations limit the use of screening in women aged 35 to 50. This study's objective is to assess the precise impact of mammographic testing practices on dense breast surgical treatment in females aged 35 to 50. The research is a population based retrospective evaluation of breast cancer diagnoses among women aged 35 to 50 from the VBCSS. For females admitted with non-screen-detected and screen detected breast cancer, the tumor stage and associated features at the initiation of treatment, along with the type of surgical treatment carried out, were noted. When compared to non-screened patients who presented with symptoms of the disease, screen detected cancerous cells in women aged 35 to 50 were related to a high frequency of stage 0 breast cancer, small size of tumor, fewer incidences of positive nodes, and high rates of breast conservation. Breast conservation rates are higher with mammography screening and less harsh surgical treatment of breast cancer. Individual mammography screening actions must consider the identified improvements in surgical intervention.
Keywords: Mammography, quality, breast cancer testing and treatment, and breast-conserving surgical intervention

I. INTRODUCTION

Both randomized clinical studies and reviews of extensive, population based coordinated screening programs have shown a considerable mortality decrease with mammograms. Furthermore, worries have been expressed regarding possible hazards and downsides of mammography screening, such as the possibility of diagnostic errors (Kerlikowske et al., 2013). Advanced screening mammography were released by the US Preventive Services Task Force in 2009, with guidelines for females ages 35 to 50 restricted to shared decision making and biannual screening for women fifty and older (Oluwole et al., 2003). Such suggestions have caused a great deal of debate because they differ from the previous US Preventive Services Task guide-lines, which called for regular testing every one to two years for all females beginning at age (Armstrong et al., 2007). The American Cancer Society now supports an informed decision making procedure in which women from forty to forty-four have the option to bother tests depending on personal preferences, as opposed to regular yearly testing being exclusively advised for women starting at the age of forty (Warner et al., 2012). The main contention has centered on how many lives have been saved in comparison to the dangers of screening, which include diagnostic errors and positive results (Moss, 2011). Despite divergent opinions regarding the advantages and disadvantages of mammograms, there is growing support for a more individualized strategy depending on medical choices and personal risk evaluation.

Mammographic screening's main objective is to lower the prevalence of the progressive disease. It is crucial to remember that mammograms cause a sizable downward phase movement, indicated by small size of tumor as well as some cases of +ve nodes at the treatment time that might affect the possibilities and results of cancer treatment (Jrgensen, 2012). Women who report small, node -ve malignancies are susceptible to be a part for breast auxiliary/lymph node staging. These advantages of surgical method testing could significantly affect satisfaction of patients, and cost of care (White et al., 2004).

After adopting the US Preventive Services Task Force (Task Force) guidelines in 2009, we have already demonstrated a reduction in state wide testing rates between low-risk females aged 35 to 50 (Olsen and Gtzsche, 2001). It is unclear how different screening practices in this age range have affected their surgical care. The goal of this study is to assess how state broad digital mammography trends affect surgical intervention for women between the ages of 35 and 50 who have been diagnosed with breast cancer (Lee et al., 2010). We postulate that testing methods have an impact on tumor axillary and size node status, which also has an impact on surgical intervention.

II. MATERIAL AND METHODS

Overview

Using data from the VBCSS, we identified individuals with melanoma who were reported between July 1, 2000, and Dec 31, 2019. A nationwide database of all screening mammography is part of the VBCSS, and patient, radiology, and pathology data are linked to it (Smith et al., 2009). It is a component of the National Cancer Institution's Population based Research Optimizing

Detection via Customized Routines initiative as well as the organization's Breast Cancer Surveillance Consortium (Duffy et al., 2004). The University of Vermont Institutional Review Board authorized this research with a disclaimer of consent form as well as in accordance with the Health Care Accountability and Portability Act. About five percent of the women in the VBCSS chose not to have their information utilized for research using an opt out procedure, and as a result, they weren't included in the analysis.

Every participant fills out a structured questionnaire with their health record and population data at every mammogram appointment at a breast imaging facility in Vermont. This material is then given to the VBCSS. Physicians and mammogram techs explain the mammogram results as well as the rationale for a visit. The VBCSS receives pathological findings for each breast specimen. Links to the VCR provide comprehensive information on all types of breast cancerous cells. Laboratory reports (by sample type) and data from the VCR were used to collect data on surgeries as well as therapies that were given.

Research Population

We detected 725 women (35 to 50 years old) with breast cancer diagnoses in the VBCSS files. Only initial breast tumor cancer cases identified during 2013 and 2019 using a recognized technique of diagnosis were eligible. People who developed an undetermined stage upon assessment (n = 50) had been excluded from the analysis.

Testing Categorization

The cases were divided into "screened" and "non-screened" groups. Screened cases included those who received a diagnosis of breast cancer in a year of testing or quick follow up mammography. Non-screened cases included those detected in females who had not had a testing mammography in the past year but who had symptoms and reported for a mammography.

Surgical Treatment and Tumor Categorization

Data from the required statewide Vermont Cancer Registry, which included the SEER (Surveillance, Epidemiology and End Results) summary stages (in situ, localized, geographic, or distal), estrogen receptors, tumor size, tumor stage, lymph node excision, and nodal status, were used to categorize breast cancers (negative vs. positive). For some studies, giant tumors were classified as those with a diameter larger than 20 millimeters.

Statistical Evaluation

According to testing categorization, descriptive statistics had been utilized to summarize sufferer characteristics, cancer features, and surgical treatment (non-screened vs. screened symptomatically). Such distinctions between tested and non-tested cases were evaluated using Pearson chi-square tests. All reported P values are two sided; significance is assumed when p is 0.05. With age and year of diagnosis taken into account, multivariable logistic regression was used to examine the prevalence of unfavorable tumor features by diagnostic classification. IBM SPSS was used for all data analysis.

III. RESULTS

Seven hundred twenty-five women between the ages of 35 and 50 were diagnosed with breast cancer between 2000 and 2019 with a specified stage and method of discovery. Table number 1 lists the demographic information for individual traits and females aged 35 to 50. 69 percent of breast cancer identified in sufferers aged 35 and 50 had a mammography screening as a contributing factor. 70.5 %, as well as 73.1%, correspondingly, of females with breast cancer, had no family or personal history of the disease.

Table no .1

DETAILS OF PATIENTS IN THE VBCSS FROM 2000 to 2019 (35 to 50 years)

Variables	Screened (Percentage) (n=490)	Non-screened (Percentage) (n=235	P-value
BMI			0.04
Less than 20 kg/m^2	6 (1.22 %)	8 (3.4 %)	
20 to 25 kg/m^2	245 (50 %)	113 (48.1)	
25 to 30 kg/m^2	124 (25.31 %)	49 (20.8 %)	
Above 30 kg/m^2	94 (19.3 %)	47 (20 %)	
Unknown	21 (4.3 %)	18 (7.6)	
1st Degree Family History			0.01
YES	100 (20.4 %)	168 (71.5 %)	
NO	353 (72.14 %)	33 (14.1 %)	
Unknown	37 (7.5)	34 (14.5 %)	
Qualification			<0.001
High School	11 (1.1 %)	16 (6.8 %)	
College	108 (22 %)	60 (25.6 %)	
College Degree	99 (20.2)	55 (23.6 %)	
Diploma	270 (55.1 %)	99 (41.1 %)	
Others	2 (0.2 %)	5 (2.2 %)	
Mammographic Density			0.15
Fat	9 (1.8 %)	4 (1.7 %)	
Fibro Glandular Density	117 (23.8)	50 (21.2 %)	
Heterogeneously Dense Breast	209 (42.8 5)	99 (42.3 %)	
Fully Dense	57 (11.6)	35 (14.6 %)	
Others	98 (20 %)	47 (20.3 %)	

In the screened population (29.6 %), the percentage of patients who had non-invasive to have non-invasive diseases was considerably high than in the non-detected people (eight percent) (P less than 0.001). In comparison to women in the non-screened group, screened females with the invasive illness were susceptible to have a low stage at diagnosis (P less than 0.001), a smaller tumor size (P less than 0.001), and a low tumor grade (p = 0.042).

Table no. 2

FEATURES OF BREAST CANCER IN THE VERNON BREAST CANCER SURVEILLANCE SYSTEM FROM 2000 to 2019 (35 to 50 years)

Variable	Screened Patients (Percent) (n=490)	Non-screened Patients (Percent) (n=235)	P-value

Diagnosis			Less than 0.001
Stage 0 Disease	144 (29.5 %)	17 (7 %)	
Invasive	346 (70.5 %)	218 (93.1 %)	
Severity at Diagnosis			< 0.001
Stage 0 disease	144 (29.5 %)	17 (7.1 %)	
Regional	223 (45.6 %)	103 (43.8 %)	
Localized	110 (22.7 %)	100 (42.6 %)	
Distant	5 (1.1 %)	12 (5.2 %)	
Others	5 (1.1 %)	3 (1.4 %)	
Size of Tumor			< 0.001
Stage 0 Disease	144 (29.5 %)	17 (7.1 %)	
Less than 2 cm	246 (50.3 %)	104 (44.4 %)	
2.1 to 5 cm	74 (15.1 %)	81 (34.4 %)	
Greater than 5 cm	13 (2.7 %)	23 (10 %)	
Not known	13 (2.7 %)	10 (4.4 %)	
Tumor Grade			0.02
Lower	91 (18.6 %)	35 (14.9 %)	
Moderate	193 (39.5 %)	94 (39.9 %)	
Higher	135 (27.6 %)	81 (34.4 %)	
Others	71 (14.4 %)	25 (10.9 %)	

Table 3 displays the surgery and therapy information for women with primary breast cancer. Compared to non-screened patients diagnosed, females aged Forty to 50 who had a screened mammography had a lower likelihood of needing lymph node surgery (30.9 % vs. 20.5 %, p 0.001). Additionally, comparable to symptomatic individuals who were not screened, females in the tested group were much more prone to get sentinel-node biopsies than a regional lymphadenectomy (21.4 percent vs. 13.5 percent, p = 0.0001). In contrast with the non-tested group, people undergoing diagnostic mammography experienced fewer positive nodes on average (22.5 percent vs. 43.5 percent, p = 0.0001). Compared to the screen detected group, individuals in the non-screen identified group had a higher likelihood of having complete surgery (31.2 percent vs. 25.4 percent, p = 0.0001). In a similar vein, the rate of breast conserving surgery was higher among those that had been screened and found cancer than in the group that had not (69.5 percent versus 58.6 percent, p = 0.0001). The other individuals either underwent no treatment or had an unspecified surgical procedure

Table no. 3

For women with metastatic breast cancer, surgery treatment and therapy data (2000 to 2019) Age 35 to 50

Variable	Screened (Percentage) (n=490)	Non-screened (Percentage) (n=235)	P-value
Lymph node dissection			Less than 0.001
Lymphadenectomy	150 (30.6 %)	48 (20.5 %)	
Sentinel Lymph Biopsy	104 (21.1 %)	23 (13.3 %)	
Regional nodes removal	228 (46.4 %)	154 (65.6 %)	
Not-known	10 (1.2 %)	3 (0.6 %)	
Inflammation of Lymph Nodes			Less than 0.001
Nodes negative	239 (48.9 %)	99 (41.8 %)	
+ve nodes Assessed	120 (22.5 %)	102 (43.5 %)	
No nodes Assessed	137 (28 %)	30 (13.2 %)	
Unknown	4 (0.4 %)	4 (1.7 %)	
Surgical Treatment of Tumors			Less than 0.001
No	20 (4 %)	22 (9.5 %)	
Breast Surgery	341 (69.7 %)	138 (58.8 %)	
Breast removal surgery (Mastectomy)	124 (25.4 %)	73 (31.2 %)	
Not-known	6 (1.2 %)	2 (0.9 %)	

The results from the multiple linear regression models are shown in Table No. 4. As well as after adjusting for year and age of onset, cancer cases between non-tested symptomatic females were more susceptible to have unfavorable tumor features and call for unpleasant therapies. In particular, breast tumors were invasive, greater in size, better rating, more commonly node positive (all p Less than 0.001), and might be identified with over-all operations (p = 0.005) in symptomatic non-tested women.

Table no. 4

OR for unfavorable tumor features adjusting for age and the year based on screening participation (2000 to 2019). Ages 35 to 50

	Odds Ratios (OR) (95 % CI/Confidence Interval)		
	Screened	**Non-Screened**	**P-value**
Invasive	0.5	2.425 (1.7, 3.45)	Less than 0.001
Last stage	0.5	1.37 (1.10, 2.18)	Less than 0.001
Big size	0.5	1.85 (1.45, 2.36)	Less than 0.001
Higher grade (versus low and moderate)	0.5	0.665 (0.52 to 0.845)	0.01
ER negative	0.5	0.75 (0.55, 1.015)	0.005
Any nodes wiped out	0.5	1.89 (1.44, 2.48)	Less than 0.001
Local nodes removal	0.5	0.97 (0.77 to 1.2)	Less than 0.001
Nodes positive	0.5	1.24 (0.98, 1.56)	Less than 0.001

Mastectomy	0.5	0.64 (0.5 , 0.81)	0.05

IV. DISCUSSION

Our data indicate that the other important clinical results are influenced by testing suggestions and should be taken into account when focusing on the harms and benefits in individualized testing guidelines, even though most of the conversation regarding breast cancer testing historically centers on survival (Malmgren et al., 2012). In particular, our study showed that, compared to women that are screened in the similar age range, the disease stage at diagnosis was higher in non-detected females aged 35 to 50. The median invasive tumor size is used by the Breast Health Global Initiative as a measure of the accuracy of detection for breast cancer as well as the capacity of a monitoring system to maximize early diagnosis. In our research, the contrast between screen detected, and non-screened clinical groups for breast cancer in women in their 40ge of forty showed that the former required less aggressive invasive treatment and had smaller tumor sizes. Women between the ages of 35 and 50 who didn't have diagnostic mammography were much more susceptible to axillary node autopsies and less inclined to receive breast conservation treatment. Malmgren et al., published similar findings, demonstrating that screening mammography reduced the rate of mastectomy in women aged 35 to 50 at a single organization before the USPSTF guidelines. Our research provides additional proof of the effect of cancer screening on surgical intervention by confirming this conclusion on a more extensive state wide scale.

However, not evaluated in our dataset, having more hurting surgical methods used to treat breast cancer might link to decreased quality of life and functional scores in survivors of the disease. Women who require more radical treatments like total mastectomy and axillary node dissection, particularly the teenage population of patients, report disruptions in their self-esteem, reproductive health, and behavior.

Although it is crucial to remember that our goal was to contrast women who were enrolled in screening programs with women who weren't, interval cases will unavoidably be present among the issues among the women taking part in a screening program. This research aimed to ascertain how cases between women participating in screening programs—both interval and screen detected cases compare to cases between many women not participating in a screening test as a whole. Interval cases will differ from true screen detected instances in terms of their characteristics (which are an interesting question in and of it). Similar to this, our community of screened women comprises a variety of females who are being checked for various reasons, such as the 1st time, the nth continuous yearly exam, five years later, etc. Future research could look at how the routinely screened cases were treated with respect to these specifics (ideally in a national dataset).

Limitations of the Study

One drawback is that some diagnostic classes were not identified because either 1) no mammogram data were available for the person during the cancer diagnosis, or 2) the exam's purpose was unknown (i.e., diagnostic). The first scenario was most commonly the case when data from the Vermont Cancer Registry came from a Vermont resident who might have had out-of-state breast screening. It should be noted that the 2nd scenario only happened seldom. According to Tabár et al. (2015), the database's restrictions are reflected in the incomplete information. For this study, care was made to complete the screening classification precisely so that the findings accurately depict the distinctions between malignancies found through testing and those found through symptomatic disease. We have no reason to think that instances with out-of-state scanning might produce different results, and leaving these cases out is very improbable to skew the data. The absence of information on routine screening compliance is another acknowledged disadvantage. As was previously mentioned, it is crucial to determine compliance rates or proportions, so the contrast among screened (including periods) and non-screened cohorts (Schulze et al., 2006) was made primarily to distinguish cancer detection between groups of women in a screening program compared to those who had "symptomatic" diagnostic imaging.

The limitations of our study are likewise typical of retrospective observational research. Women who undergo testing are frequently different from women who do not receive screening in a variety of ways (Kremer et al., 2012). Variations in breast cancer risk may impact our findings according to screening usage. The major cancer risk variables in the overall population (other than rare high genetic risk variants like BRCA 1/2) were screening mammography breast size and family background of cancer, which were corrected for in our multivariable adjusted regression models to reduce bias (Arndt et al., 2008).

Additionally, we could not evaluate more intricate elements of surgical management because we lacked information on the timing or dosage of neo-adjuvant, adjuvant, and radiation treatments. Furthermore, the relatively homogeneous Caucasian patient in our research population may limit the application of our findings to areas with a greater diversity of racial and ethnic groups. The fact that the VBCSS covers the entire state and includes breast cancer cases from every state health-care system, however Breast cancer migrates through fewer stages as a result of mammographic screening, and surgical treatment becomes less harsh. In comparison to non-screened women who show active disease, tested women aged 35 to 50 breast cancer patients who have been detected typically have small tumors, greater rates of DCIS, and fewer positive node cases. They undergo less drastic surgical treatments to treat breast cancer. In terms of patient satisfaction, illness connected to therapy, price, and standard of living of life, surgical intervention scope is important to consider. In deciding whether or not to get mammography, women, medical professionals, and policymakers ought to take these results into account.er, is a crucial strength of our data.

V. CONCLUSION

Breast cancer migrates through fewer stages as a result of mammographic screening, and surgical treatment becomes less harsh. In comparison to women who are not tested out and present with symptomatic illness, tested women aged 35 to 50 who have diagnosis of cancer have relatively small tumor sizes, high rates of DCIS, and a little case of +ve nodes. They gone through less painful surgical methods for the cure of breast cancer (Destounis, 2015). Regarding patient contentment, cost, and living standards, medical treatment scope is important to consider. In deciding whether or not to get a breast cancer screening, women, medical

professionals, and lawmakers ought to take these findings into account.

Abbreviations

Vermont Breast Cancer Surveillance System - VBCSS
Ductal Carcinoma in Situ – DCIS
Vermont Cancer Registry – VCR
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Authors' contributions
Dr. Irfan Amjad Lutfi, Nadeem Siyal, provided the idea of the study and designed experimental data. Dr. Imam Bakhsh, Dr. Hazrat Bilal collected the data for the current study. Dr. Yasir Ali Khoso, Sajid Ali analyzed the data and drafted the manuscript

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AUTHORS

First Author – Professor Irfan Amjad Lutfi
Head of Radiology Department Head of Stroke Intervention Services
National Institute of Cardiovascular Disease Karachi Pakistan

Second Author – Dr. Imam Bakhsh
Assistant Professor of General Surgery
Mekran Medical College Turbat Pakistan

Third Author – Dr. Hazrat Bilal
Associate professor of General surgery
Jinnah Postgraduate Medical Centre (JPMC) /Jinnah Sindh Medical University (JSMU)

Fourth Author - Nadeem Siyal
Manager Surgical ICu's
National institute of Cardiovascular Disease Karachi-Pakistan

Fifth Author - Sajid Ali
Assistant Professor
Quaid E Azam College of Nursing and Allied Health sciences Karachi-Pakistan

Sixth Author – Dr. Yasir Ali Khoso
Postgraduate Trainee General Surgery
Jinnah postgraduate Medical Centre Karachi

Correspondence Author – Professor Irfan Amjad Lutfi
Head of Radiology Department Head of Stroke Intervention Services
National institute of Cardiovascular Disease Karachi Pakistan