

Original Article

EORTC QLQ-BR45-based assessment of quality of life in breast cancer survivors: A comprehensive study

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ABSTRACT

Objectives: Breast cancer is the most common cancer and the leading cause of cancer-related deaths among women worldwide. Due to advancements in early detection and treatment, the number of survivors has increased, yet they often face ongoing physical and psychological challenges. This study aims to investigate the factors affecting quality of life (QoL) among breast cancer survivors in India, using the EORTC QLQ BR45 questionnaire along with its core questionnaire, the EORTC QLQ C30. The research will examine physical, psychological, social, and spiritual QoL aspects, aiming to identify areas for targeted interventions to improve survivors' QoL.

Material and Methods: For the study, Breast cancer patients who had received Adjuvant radiotherapy at our center between 2020 and 2021 were selected. Since the EORTC QLQ BR45 has only been officially validated in English so far, patients who could read and understand English were selected for the study. Thus, a total of 40 subjects were selected. The questionnaires (QLQ-C30 and QLQ-BR45) were completed by the patients, and statistical analysis was performed.

Results: The mean score of the QLQ C30 Questionnaire global health status was 58.33 ± 15.38 , the functional scale was 65.58 ± 19.44 , and the symptom scale was 22.83 ± 11.37 .

Using the EORTC QLQ BR45 Questionnaire, among the functional scales, high mean scores were observed for body image (93.54 ± 9.3), future perspective (86.66 ± 25.9), and sexual functioning (90.41 ± 16.4). Among the symptom scales, low mean scores for systemic therapy side effects (9.04 ± 12.4), arm symptoms (15.55 ± 18.2), breast symptoms (8.12 ± 10.7), endocrine therapy symptoms (7.75 ± 7.7), skin mucositis symptoms (3.88 ± 7.4), and endocrine sexual symptoms (5.41 ± 7.6). Sociodemographic factors such as age, obesity, menstrual status, and presence of addictions, as well as clinicopathological factors such as stage of disease, nodal involvement, type of surgery, and receipt of neo-adjuvant chemotherapy (NACT), are determinants of QoL in breast cancer survivors.

Conclusion: This study describes QoL in breast cancer survivors who may experience a relatively high QoL. The QLQ BR45 symptom scale scores were low in our study patients, but the low functional domain scores were of concern and could rightly be targeted as areas of urgent intervention. QoL studies are essential, as they equip clinicians and patients with the data needed to make an informed decision about the modality best suited for them.

Keywords: Breast cancer, EORTC QLQ BR45, QoL, Survivorship

INTRODUCTION

Breast cancer stands as the most prevalent form of cancer among women globally and represents the leading cause of cancer-related deaths among them.^[1] Annually,

approximately 2.3 million new cases of female breast cancer are diagnosed, accounting for 11.7% of all cancer cases, thereby surpassing lung cancer in frequency.^[2] Between 1965 and 1985, India witnessed a notable 50% rise in breast cancer

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incidence rates. Over the past 26 years, every Indian state has experienced an increase in age-standardized incidence rates of breast cancer in females, marking a 39.1% overall rise.^[3] According to Globocan 2022, the number of new cases of breast cancer is 192020 (13.6%), and the number of deaths due to breast cancer is 98337 (10.7%) in India.^[2]

The number of breast cancer survivors has also risen due to advancements in early detection and treatment. However, the disease and its therapies often result in enduring physical and psychological challenges for survivors.^[1] Common issues following treatment, such as cardiotoxicity from adjuvant therapies, ovarian failure, and concerns over fertility preservation, body image, self-esteem, and sexuality, as well as pain, lymphedema, osteoporosis, and long-term survival, can significantly impact their quality of life (QoL)^[1]. QoL is a complex concept encompassing physical, psychological, social, and spiritual well-being. It serves as a crucial measure of outcomes for breast cancer survivors, reflecting the broader effects of the disease and its treatment on their overall well-being. Numerous studies indicate that breast cancer survivors typically report lower QoL compared to women who have not experienced breast cancer.^[4]

This research paper aims to investigate the factors influencing the QoL among breast cancer survivors in India. While other validated questionnaires, such as the EORTC QLQ BR23, have been utilized in the Indian context, this study marks the first attempt to correlate clinicopathological factors with QoL domains using the QLQ BR45 questionnaire specifically in India. The research will comprehensively explore the physical, psychological, social, and spiritual dimensions of QoL experienced by breast cancer survivors. The outcomes of this study are expected to pinpoint specific areas where targeted interventions can be implemented to enhance the QoL of this population.

The purpose of this research paper is to explore the factors that affect QoL in breast cancer survivors in India. While other validated questionnaires, such as the EORTC QLQ BR23, have been utilized in studies involving the Indian population, a notable gap remains in research investigating the correlation between clinicopathological factors and QoL domains using the QLQ BR45 questionnaire, specifically in India. This study represents the pioneering use of the EORTC QLQ BR45 questionnaire in Western India and is, to our knowledge, the second of its kind in the country.

The study will examine the physical, psychological, social, and spiritual dimensions of QoL in breast cancer survivors. The findings will help identify areas where interventions can be targeted to improve QoL in this population.

Aims and objectives

To assess QoL in different domains with the EORTC QLQ

BR45 (along with the core EORTC QLQ C30 questionnaire) questionnaire and test for its correlation with various clinicopathological indicators.

MATERIAL AND METHODS

Type of study

It was a cross-sectional study. This study thus offers a "snapshot" of the outcome and the traits connected to the condition at a particular moment.

Selection of subjects

For the study, Breast cancer patients who had received Adjuvant radiotherapy at our center between 2020 and 2021 were selected. Since the EORTC QLQ BR45 has only been officially validated in English so far, patients who could read and understand English were selected for the study. Thus, a total of 40 subjects were selected.

Selection of setting and conduct

The study was conducted at the Radiation Oncology OPD of the All India Institute of Medical Sciences, Jodhpur. After obtaining ethical committee approval, the breast cancer survivors were asked to complete the EORTC QLQ-C30^[5] and EORTC QLQ-BR-45^[6] questionnaires. Various relevant clinical and histopathological characteristics, as well as treatment factors, were collected. The patients who received adjuvant RT at our center between 2019 and 2021 and who were on regular follow-up were screened for the study. The QoL questionnaires were administered to patients from September to November 2023, spanning a three-month period.

Statistical analysis

The Quality-of-Life measures of different domains, collected using the EORTC QLQ C30 and EORTC QLQ BR-45 questionnaires, were tested for Mean values of domain scores. These scores were then analyzed for a statistically significant relationship with clinicopathological factors using the Mann-Whitney test through IBM SPSS Statistics software version 26, after all necessary assumptions were met.

Higher functional domain scores signified better daily functioning, and higher Symptom domain scores indicated a poorer QoL.

RESULTS

A total of 107 patients treated at our center were approached; out of those, only 40 fulfilled the eligibility criteria for our study. The baseline characteristics of the study participants are presented in [Table 1].

Table 1: The baseline socioeconomic, demographic and clinical characteristics of the patients enrolled in our study.

Baseline characteristics			
Age, in years Mean \pm SD	Mean (Range)- 53.17 \pm 11.67 (31-75) Age < 50 years- 26 (65%) Age > 50 years- 14 (35%)	Received NACT?	Yes-19(47.5%) No-21(52.5%)
Laterality	Left- 23(57.5%) Right- 17(42.5%)	Received chemotherapy?	Yes-35(87.5%) No-5(12.5%)
BSA	Mean \pm SD- 1.68 \pm 0.16 (1.29-1.96)	Type of Surgery	Breast-conserving Surgery-9 (22.5%) Modified Radical Mastectomy-31(77.5%)
BMI	Mean \pm SD (Range)- 27.38 \pm 4.52 (19.2-40.6) Overweight-4 (10%) [BMI=23.0–24.9 kg/m ²] Obese-29 (72.5%) [BMI= \geq 25.0 kg/m ²]	Radiotherapy Technique	3DCRT-37(92.5%) VMAT-3(7.5%)
Presence of Comorbidities	Comorbidities present-16(40%) Comorbidities absent-24(60%)	Nodes Dissected	Mean \pm SD- (Range)-16.85 \pm 7.85 (0-35)
Addictions	Present- 2 (5%) Absent- 38 (95%)	Node Positivity	Positive-21(52.5%) Negative- 19(47.5%)
Menopausal state	Pre-menopausal- 18(45%) Post-menopausal- 22(55%)	Tumor Subtype	HR +/ Her2neu -18(45%) Triple positive- 8(20%) Her2 enriched- 6(15%) TNBC- 7(17.5%)
Clinical Stage	Stage 1- 1 (2.5%) Stage 2- 24 (60%) Stage 3- 8 (20%) Stage 4- 1 (2.5%) Not available- 6 (15%)	Tumour- large axis diameter	Mean \pm SD- 4.1 \pm 3.1 (0-14) cm
		Median time to follow up	40.1 months

SD: Standard deviation NACTaa: Neoadjuvant chemotherapy, 3DCRT: 3-dimensional conformal radiation therapy, VMAT: Volumetric modulated arc therapy, HR: Hormone receptor, TNBC: Triple negative breast cancer, BMI: Body mass index.

The mean score of Global health status was 58.33 \pm 15.38. Among the functional scales, high mean scores (>66.66) were observed for Physical functioning (73.33), Role functioning (78.54), and Cognitive functioning (88.31), whereas low mean scores (<33.33) were noted for Emotional functioning (52.49) and Social functioning (36.63). Among symptom scales, nausea and vomiting, dyspnea, and diarrhoea had a score of zero. Low mean scores (\leq 33.33) were observed for Insomnia (29.98), Appetite loss (19.98), Constipation (16.67), and financial difficulties (33.33). High mean scores (>66.66) were seen for fatigue (48.88) and Pain (56.67) [Table 2].

Among the QLQ BR45 Functional domains, high scores were seen in the Body Image (93.54 \pm 9.33), Future perspective (86.67 \pm 25.93), and Sexual functioning scores (90.42 \pm 16.40). Among the symptom domains, 'Upset by hair loss' (40 \pm 14.9) and 'Arm symptoms' (15.56 \pm 18.28) were the highest [Tables 3 and 4]. There are fewer entries in the Sexual Enjoyment and Upset by Hair Loss domains, as there is a provision for "Not applicable(NA)" as an entry for the questionnaire for these two domains.

The mean functional and symptom scores are also displayed in [Figures 1 and 2].

Table 2: The mean QoL domain scores of our patients in the QLQ C30 Questionnaire.

QLQ C30 Questionnaire	Mean	SD
1. Global health status/QoL	58.33	15.38
2. Functional scales		
Physical functioning	73.33	18.54
Role functioning	78.54	20.46
Emotional functioning	52.49	25.69
Cognitive functioning	88.31	9.69
Social functioning	36.63	22.82
3. Symptom scales		
Fatigue	48.88	23.84
Nausea and vomiting	0	0
Pain	56.67	26.1
Dyspnea	0	0
Insomnia	29.98	17.23
Appetite loss	19.98	9.3
Constipation	16.67	4.24
Diarrhoea	0	0
Financial difficulties	33.33	21.59

QoL: Quality of life, SD: Standard deviation

Table 3: The mean QoL domain scores of our patients in the QLQ BR45 Questionnaire.

QLQ BR45 Questionnaire	N	Minimum	Maximum	Mean	SD	Variance
1. Functional scales						
• Body image	40	75.00	100.00	93.5417	9.33843	87.206
• Future perspective	40	.00	100.00	86.6667	25.93000	672.365
• Sexual functioning	40	33.33	100.00	90.4167	16.40283	269.053
• Sexual enjoyment	11	33.33	66.67	60.6061	13.48400	181.818
• Breast satisfaction	40	.00	100.00	63.3333	32.29141	1042.735
2. Symptom scales						
• Systemic therapy side effects	40	.00	52.38	9.0476	12.42689	154.428
• Upset by hair loss	5	33.33	66.67	40.0000	14.90712	222.222
• Arm symptoms	40	.00	66.67	15.5556	18.28341	334.283
• Breast symptoms	40	.00	58.33	8.1250	10.75622	115.696
• Endocrine therapy symptoms	40	.00	30.00	7.7500	7.71233	59.480
• Skin mucosis symptoms	40	.00	33.33	3.8889	7.46417	55.714
• Endocrine sexual symptoms	40	.00	33.33	5.4167	7.67716	58.939

N: Number of patients, SD: Standard deviation.

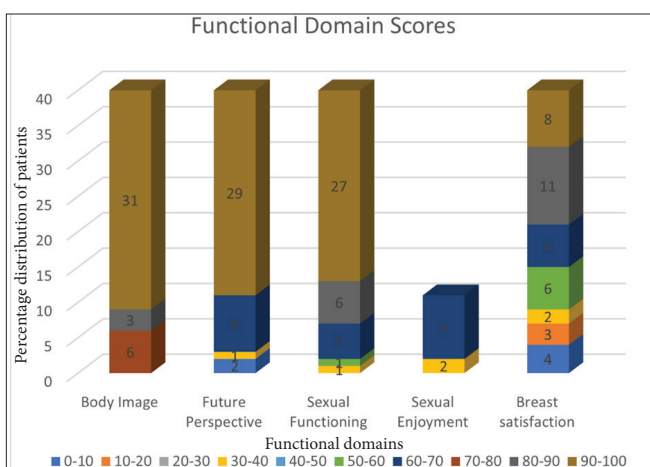


Figure 1: Mean QLQ BR45 functional domain scores of breast cancer survivors. There were zero patients falling within the 20–30 score interval for the functional domains displayed.

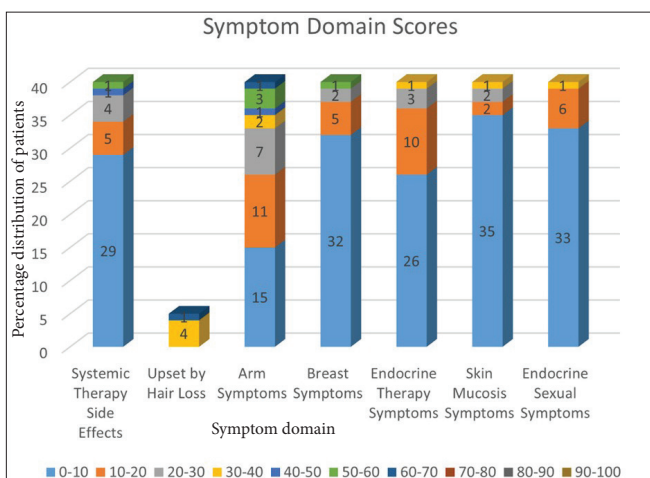


Figure 2: Mean QLQ BR45 symptom domain scores of breast cancer survivors. The 70–80, 80–90, and 90–100 colour bands are not visible because no patients had symptom scores within these higher intervals, resulting in zero-frequency categories that are not rendered in the stacked bar chart.

Table 4: QLQ BR45 scores of breast cancer survivors segregated as high(>66.66), intermediate (33.34-66.66) and low(≤33.33) scores.

QoL domain	Patients with score ≤33.33 [n (%)]	Patients with score 33.34-66.66 [n (%)]	Patients with score >66.66 [n (%)]
1. Functional scales			
• Body image	0	0	40(100%)
• Future perspective	3(7.5%)	0	37(92.5%)
• Sexual functioning	1(2.5%)	1(2.5%)	38(95%)
• Sexual enjoyment	2(5%)	0	9(22.5%)
• Breast satisfaction	9(22.5%)	6(15%)	25(62.5%)
2. Symptom scales			
• Systemic therapy side effects	38(95%)	2(5%)	0
• Upset by hair loss	4(10%)	0	1(2.5%)
• Arm symptoms	35(87.5%)	4(10%)	1(2.5%)
• Breast symptoms	39(97.5%)	1(2.5%)	0
• Endocrine therapy symptoms	40(100%)	0	0
• Skin mucosis symptoms	40(100%)	0	0
• Endocrine sexual symptoms	40(100%)	0	0

QoL: Quality of life

The Mann-Whitney test was used to assess whether there were significant differences in mean Functional and symptom scores of patients due to various clinicopathological factors.

Clinicopathological factors affecting functional domain scores:

We found that patients aged more than 50 years showed higher sexual functioning scores (16.29 vs 22.77, p value = 0.038). Individuals who were obese (BMI ≥ 25) had lower Body image scores (27.09 vs. 18, p value = 0.015). Premenopausal status was associated with better Breast satisfaction scores (24.61 vs. 17.14, p-value = 0.04). There was no difference in Functional scores based on stage [Table 5].

0.018). Individuals who underwent BCS over MRM had higher Skin Mucosis domain scores (29.61 vs. 17.85, p = 0.001). Node positivity was associated with higher skin mucosis symptom scores (25.08 vs 16.06, p value = 0.005). Late-stage disease was associated with higher arm symptoms (18.37 vs. 27.83, p = 0.022) and skin mucosis symptoms (18.82 vs. 26.28, p = 0.04) [Table 6].

Table 5: Factors affecting QLQ BR45 mean Functional domain scores in breast survivors

Characteristic		Body image	Future perspective	Sexual functioning	Sexual enjoyment	Breast satisfaction
Age	<50 yrs	18	17.64	16.29	5.43	22.32
	>50 yrs	21.85	22.04	22.77	7	19.52
	p-value	0.283	0.194	0.038	0.491	0.469
Obesity	BMI <25	27.09	22.64	22	7	18.73
	BMI ≥ 25	18	19.69	19.93	5.63	21.17
	p-value	0.015	0.416	0.566	0.564	0.562
Laterality	NS					
Addictions	No	21.14	20.21	20.59	6	20.8
	Yes	8.25	26	18.75	0	14.75
	p-values	0.1	0.703	1	*	0.541
Comorbidities	NS					
Menstrual status	Pre	18.67	18.22	21.58	7	24.61
	Post	22	22.36	19.61	5.17	17.14
	p-value	0.317	0.184	0.533	0.455	0.04
Received NACT?	Yes	23.17	22.48	21.24	6.08	19.17
	No	17.55	18.32	19.68	5.9	21.97
	p-value	0.08	0.178	0.632	1	0.449
Type of surgery	BCS	21.22	21.22	20.28	7	18.94
	MRM	20.29	20.29	20.56	5.63	20.95
	p-value	0.84	0.886	0.968	0.564	0.657
Node positivity	Positive	19.47	18.55	17.95	5.43	18.16
	Negative	21.43	22.26	22.81	7	22.62
	p-value	0.584	0.212	0.114	0.491	0.225

The bold values show significant p value. * Shows insufficient data to run Test of statistical significance. BMI: Body mass index, NS: Non significant, BCS: Breast conservation surgery, MRM: Modified radical mastectomy, QLQ: Quality of life questionnaire.

Clinicopathological factors affecting symptom domain scores :

Individuals who were obese showed higher Systemic therapy side effects scores(14.32 vs 22.84, p value 0.028). A history of addictions or substance abuse was associated with higher scores in the Endocrine therapy domain(19.68 vs 36, p value=0.026). Receipt of NACT was associated with a higher score on the Breast Symptom domain (16.63 vs. 24.79, p =

There were no significant differences in Functional and Symptom domain scores based on Laterality and Presence of other Comorbidities.

A Kruskal-Wallis test was conducted to compare grades and subtypes with quality-of-life domains, revealing no significant difference in domain scores between the same.

Table 6: Factors affecting QLQ BR45 mean Symptom domain scores in breast survivors

Characteristics		Systemic therapy side effects	Upset by hair loss	Arm symptoms	Breast symptoms	Endocrine therapy symptoms	Skin mucositis symptoms	Endocrine sexual symptoms
Age	<50 yrs	20.96	2.5	22.75	21.54	19.39	20.93	23.96
	>50 yrs	20.25	3.13	19.29	19.94	21.1	20.27	18.63
	p-value	0.852	1	0.359	0.667	0.66	0.82	0.13
Obesity	BMI <25	14.32	0	15.73	15.27	16.64	18.73	19.45
	BMI ≥ 25	22.84	3	22.31	22.48	21.97	21.17	20.9
	p-value	0.028		0.099	0.07	0.196	0.489	0.742
Laterality	NS	NS						
Addictions	No	20.21	3	20.58	20.01	19.68	19.95	20.3
	Yes	26	0	19	29.75	36	31	24.25
	p values	0.45		0.891	0.354	0.026	0.117	0.705
Comorbidities	NS	NS						
Menstrual status	Pre	20.69	2.5	22.06	19.92	22.22	20.5	19.06
	Post	20.34	3.33	19.23	20.98	19.09	20.5	21.68
	p-value	0.926	1	0.436	0.778	0.399	1	0.45
Received NACT?	Yes	19.24	5	19.48	16.62	20.69	19.02	22.17
	No	21.89	2.5	21.63	24.79	20.29	22.13	18.66
	p-value	0.454	0.2	0.553	0.018	0.918	0.327	0.311
Type of surgery	BCS	21.44	0	15.89	20.11	26.17	29.61	21.11
	MRM	20.23	3	21.84	20.61	18.85	17.85	20.32
	p-value	0.78		0.172	0.907	0.097	0.001	0.884
Node Positivity	Positive	21.37	2.5	19.7	22.66	22.18	25.08	19.34
	Negative	19.71	3.75	21.4	18.55	18.98	16.36	21.55
	p-value	0.643	0.4	0.598	0.251	0.386	0.005	0.539

The bold values show significant p value. A two-sided p-value <0.05 was considered statistically significant. NACT: Neoadjuvant chemotherapy

DISCUSSION

This study aimed to investigate the long-term impact of breast cancer diagnosis and treatment on patients. Specifically, it focused on assessing the QoL among breast cancer survivors. According to the American Cancer Society (ACS), a long-term cancer survivor is defined as someone who has survived the disease for five years or more.^[7] The mortality rate from breast cancer has dropped as a result of the adoption and utilization of better detection and treatment programs. However, the QoL of survivors has been significantly influenced by the persistent unknown side effects and toxicity of this novel long-term therapy.

Surgery for breast cancer is linked to long-term side effects such as pain, exhaustion, and emotional distress. With little attention paid to the long-term effects of medicines, treatments are adopting more aggressive, multimodal regimens. Systemic therapy has long-term side effects, including fatigue, weight gain, lymphedema, pain, and menopausal symptoms. While

women on aromatase inhibitors are more likely to experience bone loss and fractures, anthracycline usage, and adjuvant trastuzumab have been related to an increased risk of heart issues occurring even after the course of treatment has ended. Radiation therapy may increase the risk of secondary sarcomas.^[8,9]

The European Organization for Research and Treatment of Cancer QoL Questionnaire-Core 30 (EORTC QLQ-C30) is a widely used questionnaire that assesses the QoL of cancer patients. It consists of 30 items that assess five functional domains (physical, role, emotional, cognitive, and social), three symptom domains (fatigue, pain, and nausea/vomiting), and six single items (dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties).^[10]

The EORTC QoL Group has developed two questionnaires specifically for use in breast cancer patients: EORTC QLQ-BR23 and EORTC QLQ-BR45. The EORTC QLQ-C30 is a core questionnaire that assesses the QoL of cancer patients.

The EORTC QLQ-BR45 is a breast cancer-specific module that is used in combination with the EORTC QLQ-C30 core questionnaire as an updated version with more dimensions compared to the QLQ BR23 questionnaire.^[6]

Studies on the QoL of cancer patients and survivors are of utmost importance in these current times since we are constantly focused on the search for a better drug, but only in terms of its efficacy in improving survival outcomes. Interestingly, a systematic review by Shrestha *et al* showed that QoL was preferred over length of life in patients with older age and poorer physical status.^[11] This further underscores the value of baseline and periodic QoL assessments, which might even help us decide the treatment plan for patients instead of empiric treatment for all.

The patients in our study showed high physical, role, and cognitive function scores with modest Global QoL mean scores (58.33 ± 15.38), similar to those observed in another study from India. However, compared to the study by Singh *et al.*, the social (36.63 ± 22.82) and emotional functioning (52.49 ± 25.69) scores were comparatively lower in our study, which can be attributed to the sociodemographic and cultural differences in the populations chosen for the two studies.^[12]

The QLQ-C30 symptom score analysis also reveals that the mean scores achieved in our study are comparable to those reported in similar Indian studies.^[12] The scores revealed the predominant symptoms in breast cancer survivors to be fatigue (MS-48.88) and pain (MS-56.67). Biering *et al.*, in their study of the long-term course of fatigue in breast cancer patients, demonstrated that fatigue was a significant problem affecting approximately 35% of patients, with it peaking in the first six months post-intensive treatment and then gradually decreasing over time, but never returning to pretreatment levels.^[13]

Pain is another significant determinant of QoL, with another study by Kaur *et al.*^[14] showing that post-mastectomy chronic pain (defined as pain lasting for more than three months) was prevalent in around 41.4% of breast cancer patients, with the most common type of pain being that of pins and needles sensation. The most common site is the mastectomy scar.^[14]

Notably, our study showed lower scores for nausea, vomiting, and dyspnea. Strangely, the mean financial toxicity (FT) score (33.33 ± 21.59) was seemingly higher despite being treated at a government setup where most of the treatment was provided for free. This may be due to other out-of-pocket expenses, such as travel, accommodation, and supplementary medications, as well as the long-term and multidisciplinary nature of follow-up care. A systematic review and meta-analysis on the same revealed that rates of FT in breast cancer patients were around 35% and 78% in high-income and Low-middle-income countries, respectively, which suggests

that expansion of health care coverage, transportation, and accommodation facilities may be the way to cut down these costs.^[15]

The overall mean scores in the Body image, Future perspectives, and Sexual functioning domains were high (93.5, 86.7, and 90.42, respectively), with more than 90% of the participants achieving scores of 66.7 or higher (high score). However, the overall mean scores in the Sexual Enjoyment and Breast Satisfaction domains were low (60.6 and 63.33, respectively), with only 62% of participants achieving high scores. The mean scores in the Symptom Scale domains were generally low, except for the domain of Upset about hair loss (MS-40). Overall mean symptom scores are lower compared to those reported in the study by Singh *et al.*^[12]

Our findings are similar to those reported in Global QoL systematic reviews, with the highest Functional domain scores in the QLQ-C30 and breast-specific modules (BR23 and BR45) observed in the Cognitive Functioning and Breast image domains, respectively. Diarrhea had one of the lowest Symptom domain scores in our study, similar to the review.^[16] This indicates that, although the general Global QoL in our study is low, the overall trend of the individual domain scores aligns with the pattern observed in similar studies worldwide.

Limited studies are available assessing QoL in breast cancer survivors in India using the EORTC QLQ BR45 scale. Most existing data are on patients during or after treatment and focus on the general QoL QLQ-C30 domains. Hence, we sought to study and shed light on the factors affecting breast cancer-specific domains, which were assessed using the EORTC QLQ BR45 questionnaire. Kim *et al.*, in their study of breast cancer patients up to 3 years post-treatment, showed that the presence of comorbidities, fatigue, anxiety, and depression was a significant determinant of poor QoL.^[17] Similarly, other Indian studies have also shown that age, general condition, level of education, and disease stage at presentation were determinants of QoL in breast cancer patients.

In our study, we found that older patients (ages greater than 50 years) had significantly better sexual functioning scores compared to their younger counterparts. Morales *et al.* had shown that endocrine symptoms such as loss of sexual interest, dyspareunia, hot flashes, dry vagina, etc, are more prevalent in younger patients and thereby negatively impact female sexual health.^[18] This can also be seen in the nonsignificant trend of higher endocrine sexual symptoms scores in younger patients in our study. Obesity (BMI \geq 25) is another major determinant of QoL in breast cancer survivors, with it resulting in both significantly low Body Image perception as well as higher Systemic therapy side effect scores. This has been observed in previous studies, although its effects have been mixed. Ram *et al.* showed

that Obese patients required more frequent dose reductions than their non-obese counterparts.^[19] We also saw a non-significant trend towards higher arm and Breast symptom scores in obese patients.

Pre-menstrual status was associated with higher breast satisfaction in our study, which contrasts with the results of some other studies.^[12] This can be attributed partly to the changes in perception with age, as well as due to the emotional distress, anxiety, depression, etc, induced after menopause due to hormonal changes.

Patients with addictions (Tobacco chewing, smoking, etc) had higher endocrine therapy side effects. There have been studies that have shown that tobacco use is associated with increased estrogen receptor activity.^[20] Patients who had received NACT had lower breast symptom domain scores, which might be due to the tumor bulk decreasing, resulting in better surgical outcomes. This is also evidenced by a non-significant trend toward a better Body Image domain score in patients who received NACT in our study. A higher disease stage at presentation was associated with significantly higher Arm symptom domain scores due to the need for nodal irradiation in these patients.

Lastly, Skin Mucositis symptom scores were higher in those who underwent MRM, had node positivity, or presented at a higher stage. This can be due to treatment intensification in the form of extended radiation fields or Adjuvant chemotherapy in these subsets of patients.

A limitation of our study is its small sample size, which makes it challenging to perform further subset-specific analysis to estimate the contribution of each treatment modality to the QoL changes.

Consideration of the impact of a treatment modality on the QoL of cancer survivors should be incorporated into the decision-making process. If explained to the patient, the factors affecting the QoL would help the patient decide the most suitable treatment for him, considering his financial, physical, cultural, familial, and social situation. This can also help us navigate the “grey” areas in medicine, primarily when no conclusive evidence supports one modality over another.

CONCLUSION

Breast cancer is the most common cancer in women worldwide. While pushing the limits of optimizing the therapeutic efficacy of treatment modalities such as systemic therapy and radiation, we should not lose track of these modalities' impact on patients' QoL. Sociodemographic factors such as age, obesity, menstrual status, and presence of addictions, as well as clinicopathological factors such as stage of disease, nodal involvement, type of surgery, and receipt of

NACT, are determinants of QoL in breast cancer survivors.

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Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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