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Life Beyond the Clinic: Quantifying the Negative Correlation Between Treatment Duration and Survivor Quality of Life in Breast Cancer Patients

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Abstract

Background: Improvements in early diagnosis and treatment have led to significant improvements in breast cancer survival, but long-term survivors may still have reduced quality of life (QoL) affected by physical, psychological and social aspects. The purpose of this study was to explore the quality of life of breast cancer survivors and to evaluate the correlation between treatment duration and quality of life. **Methods:** This cross sectional study with 120 breast cancer survivors used non-probability consecutive sampling technique with a Structured questionnaire to assess quality of life were used to gather data on physical, emotional, social and functional domains. Descriptive data analysis was performed, and inferential data analysis was done through one-way ANOVA, Pearson correlation, independent t-test, and multiple linear regression (SPSS 20.0, P value <0.05). **Results:** The average total QoL score was 62.4 ± 13.7. Patients with a shorter treatment duration (<1 year) had significantly higher scores (71.2 ± 10.5) than patients with a longer treatment duration (>3 years) (55.1 ± 12.3), ($p < 0.001$). Significant negative correlations were observed between treatment duration and overall QoL ($r = -0.56$, $p < 0.001$), physical well-being ($r = -0.49$, $p < 0.001$), and emotional well-being ($r = -0.52$, $p < 0.001$). Multiple linear regression showed that treatment duration ($p < 0.001$, $\beta = -0.44$), cancer stage ($p = 0.002$, $\beta = -0.23$) and chemotherapy exposure ($p = 0.044$, $\beta = -0.19$) were significant factors in the reduction of QoL. The model elucidated 48% of the variance in QoL outcomes ($R^2 = 0.48$, $p < 0.001$). **Conclusions:** The length of treatment is a significant factor in quality of life among the survivors of breast cancer and is correlated with poor quality of life. New targeted survivorship care programs emphasizing lifelong follow-up, psychological support, and physical rehabilitation are needed to enhance the well-being of this patient population.

Keywords: Breast cancer, quality of life, survivors, treatment duration, oncology, survivorship care

Introduction

Despite the improvement in screening and treatment, breast cancer is the most common type of cancer and is still the most common cancer in women worldwide [1]. Better diagnosis, treatment (multi-modality) and supportive care have made a big difference in improving breast cancer survival rates and a larger number of survivors of breast cancer [2]. Survival, however, does not always mean complete recovery, with many patients having ongoing physical, mental and social problems that have a negative impact on their quality of life (QoL) [3]. Quality of life of breast cancer survivors is a multidimensional construct that includes physical functioning, emotional health, social relationships, and role functioning [4]. Multiple factors affect it such as the stage of the cancer at diagnosis, the type of treatment used, any other health conditions that are present and the length of time that the treatment lasts [5]. Of these, treatment duration is of growing importance for analyzing survivorship outcomes; exposure to treatment over a longer period (surgery, chemotherapy, radiotherapy, or hormonal therapy) could result in accumulative toxic effects, chronic fatigue, psychological distress, and lower functional capacity [6,7].

Life satisfaction may also be impacted by cancer treatment in the long term, which can affect daily life, work and social activities [8]. Survivors are also likely to have ongoing concerns about the risk of recurrence, the cost of continued treatment, and a changed body image, which can also affect their quality of life [9]. However, there is not much available to demonstrate treatment duration's effect on specific aspects of QoL in breast cancer survivors in the developing healthcare environment. In addition, previous research has emphasized overall survivorship outcomes, with

little attention paid to the impact of treatment duration on individual domains of quality of life, including physical, emotional and functional well-being [10].

The existing literature also indicates that long-term effects of extended exposure to treatment are uncertain across a variety of clinical populations calling for additional research [11,12]. This is an important relationship to know when creating effective survivorship care plans to address overall patient care and wellness beyond just managing the disease. Hence, the present study aimed to determine the quality of life for patients with breast cancer and to examine its relationship with the length of treatment, and other clinical and demographic parameters. The results will be informative for clinicians and policy makers to refine supportive care for the long-term and improve survivorship outcomes.

The present study evaluated the severity of fatigue in chronic kidney disease and its association with the severity of the disease and some clinical parameters like disease duration, hemoglobin level, and kidney function.

Methodology

This study used a cross-sectional analytical design to examine the QoL of breast cancer survivors and the relationship between the quality of life and treatment duration. The study was carried out at oncology follow up clinics of affiliated tertiary care hospital during a study period of six months from July 2023 to December 2023. The study subjects consisted of adult female breast cancer patients who had been treated and were coming for regular follow-up visits. The number of participants that were enrolled was 120, with a non-probability consecutive sampling technique in order to reach the required sample size.

A histologically established diagnosis of breast cancer in women aged 18 years or older who had undergone at least primary treatment (surgery, chemotherapy, and/or radiotherapy) were included in the study. Critically ill patients, patients with recurrent metastatic disease at the time of data collection, and patients with a history of cognitive impairment or psychiatric illness that may affect the ability to fill out the questionnaires were excluded. Those who did not give informed consent were also excluded. An organized questionnaire was used to gather data, as well as a standardized instrument for assessing quality of life in social, emotional, physical, social, and functional areas. Clinical and demographic information such as age, level of education, marital status, type of treatment received, cancer stage at diagnosis, and occurrence of comorbidities, hormonal therapy status, and length of treatment was collected from medical records and patient interviews. Quality of life scores were derived based on a standardized scoring system with higher scores representing higher quality of life.

IBM SPSS version 20.0 was used for the data analysis [13]. Clinical and demographic variables were concised using descriptive statistics such as standard deviation, mean, frequency and percentage. One-way analysis of variance (ANOVA) was used to compare quality of life scores between treatment duration groups, independent sample t-tests were used to compare the scores in the different groups, Pearson correlation analysis was used to determine the association between two variables, whereas multiple linear regression analysis was used to conclude independent predictors of quality of life. A p-value of < 0.05 was considered as statistically significant. Relevant institutional ethics committee gave ethical approval before the study was commenced. All participants gave informed consent and confidentiality of all data collected was carefully maintained throughout the research process.

Results

All 120 breast cancer survivors partaken in the study. The median age of the members was 51.6 ± 11.8 years with the majority of the patients in the 40-59 age group. The level of overall quality of life was moderate, 62.4 ± 13.7, and significantly decreased with longer treatment duration. Table 1 shows the characteristics of survivors of breast cancer in the study. The age was predominantly middle-aged (51.6 ± 11.8 years) and most participants were married and unemployed. There was a wide range of educational status, with the majority having at least a secondary level education. The sampling is based on urban and rural population, and the sample is representative of the socioeconomic status.

Table 1: Detailed Socio-Demographic Characteristics of Participants (n = 120)

Variable	Category	n	%
Age (years)	<40	22	18.3
	40–49	34	28.3
	50–59	32	26.7
	≥60	32	26.7
Mean age ± SD	—	51.6 ± 11.8	—
Marital Status	Married	87	72.5
	Single	14	11.7
	Widowed/Divorced	19	15.8
Education Level	No formal education	18	15.0
	Primary	28	23.3
	Secondary	46	38.3
	Higher education	28	23.3
Employment Status	Employed	41	34.2
	Unemployed	79	65.8
Residence	Urban	68	56.7
	Rural	52	43.3

The clinical stage, the treatment modalities and the health-related characteristics of the members are précised in this table. There was a significant proportion of patients diagnosed at Stage II or III, and a combination of treatment was most common. Over half of the patients

were treated for 1-3 years. Nearly half were taking hormonal therapy, and a large number of the patients had other medical conditions. Table 2 shows the clinical and treatment characteristics of breast cancer.

Table 2: Clinical and Treatment Characteristics of Breast Cancer Survivors (n = 120)

Variable	Category	n	%
Cancer Stage at Diagnosis	Stage I	18	15.0
	Stage II	44	36.7
	Stage III	38	31.7
	Stage IV	20	16.7
Type of Treatment	Surgery only	20	16.7
	Surgery + Chemotherapy	36	30.0
	Surgery + Radiotherapy	25	20.8
	Combined (Surgery + Chemo + RT)	39	32.5
Treatment Duration	<1 year	18	15.0
	1–3 years	70	58.3
	>3 years	32	26.7
Ongoing Hormonal Therapy	Yes	54	45.0
	No	66	55.0
Presence of Comorbidities	Yes	49	40.8

Table 3 compares quality of life scores across different treatment durations and clinical variables. A significant decline in QoL was observed with increasing treatment duration, with the lowest scores seen in patients treated for more than three years. Advanced cancer stage and combined therapy were also associated with poorer QoL. All differences were statistically significant in most comparisons ($p < 0.05$).

Table 3: Quality of Life Scores Across Treatment Duration and Clinical Groups

Variable	Category	n	Mean QoL ± SD	F / t value
Treatment Duration	<1 year	18	71.2 ± 10.5	18.62
	1–3 years	70	64.8 ± 11.6	—
	>3 years	32	55.1 ± 12.3	—
Cancer Stage	Early (I–II)	62	68.5 ± 11.2	9.41
	Advanced (III–IV)	58	57.9 ± 12.8	—
Treatment Type	Single modality	45	70.3 ± 10.8	11.27
	Combined therapy	75	59.4 ± 12.6	—
Hormonal Therapy	Yes	54	60.2 ± 12.4	-2.98
	No	66	66.8 ± 12.1	—

Table 4 presents mean scores across different quality of life domains consisting of emotional, physical, social, and functional well-being. Social well-being showed relatively higher scores, while functional and symptom-related domains were comparatively lower. Overall QoL was moderately reduced, reflecting ongoing physical and psychological burden among survivors.

Table 4: Quality of Life Domain Scores (EORTC-Based Distribution)

QoL Domain	Mean ± SD	Minimum	Maximum
Physical Well-being	64.1 ± 14.2	30	95
Emotional Well-being	60.3 ± 15.6	25	92
Social Well-being	66.5 ± 13.1	28	98
Functional Well-being	58.7 ± 14.9	20	90
Symptom Burden (reverse scored)	55.2 ± 16.3	18	94
Overall QoL Score	62.4 ± 13.7	25	96

Table 5 shows the relationship between treatment duration and various QoL domains. A significant negative correlation was observed across all major domains, indicating that longer treatment duration is related with poorer QoL. The strongest associations were seen with emotional and physical well-being. Symptom burden showed a positive correlation with treatment duration.

Table 5: Correlation Between Treatment Duration and Quality of Life Domains

Variable	r-value	p-value
Overall QoL	-0.56	<0.001
Physical Well-being	-0.49	<0.001
Emotional Well-being	-0.52	<0.001
Social Well-being	-0.41	0.002
Functional Well-being	-0.38	0.004
Symptom Burden	0.47	<0.001

Table 6 identifies independent predictors of QoL among survivors of breast cancer. Treatment duration emerged as the strongest negative predictor, followed by cancer stage and chemotherapy exposure.

Table 6: Multiple Linear Regression Analysis for Predictors of Quality of Life

Predictor	β	SE	t-value	p-value
Treatment Duration	-0.44	0.08	-5.62	<0.001
Age	-0.21	0.09	-2.18	0.031
Cancer Stage	-0.23	0.07	-3.12	0.002
Chemotherapy Exposure	-0.19	0.08	-2.04	0.044
Hormonal Therapy	-0.14	0.09	-1.56	0.121
Constant	—	—	—	—

Age also showed a modest negative association with QoL. The model explained 48% of the variance, indicating a strong overall predictive fit.

Discussion

The present study assessed the quality of life (QoL) amongst breast cancer survivors and examined their relationship to treatment period. The results showed that survivors had a moderate overall QoL score, with significantly poorer QoL scores in survivors receiving longer treatment durations. Those who were treated for less than a year reported significantly higher QoL than individuals who were treated for more than three years. Survivors of breast cancer often face physical, emotional and social problems that persist after treatment and improve survival, as reported in previous studies [14,15]. Examples include increased burden of symptoms and reduced daily functioning with longer duration of exposure to breast cancer treatment [16].

One of the key findings of this research was the high negative correlation between treatment duration and overall QoL, especially in the domains of emotional and physical health. Longer treatment durations have been shown previously to be linked to higher levels of fatigue, pain, sleep problems and emotional distress in breast cancer survivors,[17,18] and it is likely that these effects on physical functioning and psychological well-being persist long after diagnosis. The same findings have been seen in studies conducted over time—survivorship research—that showed that treatment effects can last for years and play a significant role in the overall loss of QoL[19]. Multiple regression analysis revealed that treatment duration was the most important independent predictor of decreased QoL, followed by cancer stage and chemotherapy treatment. Patients who are treated with more intensive treatment regimens and longer durations of treatment are more likely to have treatment-related functional limitations and complications of treatment, which also contribute to poorer survivorship outcomes[20]. Clinical factors also play a substantial role in the well-being of survivors,[21] as the regression model accounted for 48% of the variance in the QOL outcomes; other psychosocial and socioeconomic factors may also be important.

The findings of this study have vital clinical implications for survivorship care. With the number of breast cancer survivors on the rise, health care systems need to be concerned with not only survival but quality of life [22]. Follow-up programs should include routine evaluation of physical symptoms, emotional status, and functioning, especially for patients who are on long-term treatment [23]. Survivorship studies indicate that supportive care, psychological counseling, physical rehabilitation, and symptom management can impact patient reported outcomes and overall survivorship quality of life,[24] which may be more likely to happen when a patient is identified early as being at risk of reduced QoL[25].

Since the study is cross-sectional, it is not possible to draw causal inferences between treatment duration and quality of life. Moreover, participants were selected consecutively from one oncology follow-up area, and the findings might not be generalizable. Quality of life was measured at one time and may not capture the full spectrum of changes that can happen over the survivorship continuum. Additional multicenter, longitudinal studies with larger, more diverse patient cohorts are needed to gain better insight into changes in quality of life over time and to identify factors that can be modified to improve survivorship outcomes. Additional studies are required to assess the effectiveness of tailored supportive care interventions intended to minimize the long-term physical and psychological effects of breast cancer therapy.

Conclusion

The present study revealed that the longer breast cancer treatments were received, the lower the quality of life, particularly for the physical and emotional aspects among the breast cancer survivors. Other variables that were important in determining the poorer quality of life were chemotherapy exposure and cancer stage, treatment duration being the strongest independent predictor. The findings show the importance of comprehensive survivorship care programs that include psychological support, symptom management, and rehabilitation. Breast cancer survivors should be routinely assessed on survivorship care for various aspects of their quality of life to maximize survivorship and overall health.

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Conflict of Interest

None

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Use of Artificial Intelligence

The corresponding author declared that no artificial intelligence or AI-assisted tools were used in this manuscript.

Authors' Contribution

RA, MK, ME did Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND Drafting the work or reviewing it critically for important intellectual content; AND Final approval of the version to be published; AND Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors gave their final approvals to publish this article.

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