

Survival Pattern Depending on Hormone Receptor Status, Stages of Breast Cancer and Social-Economic Status- A Cohort Study

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ABSTRACT

Background & Objective: Breast cancer is the most common cancer among females globally and its toll is rapidly rising in India. Accurate knowledge about prognostic factors could assist oncologists in making correct treatment decisions and acquiring a better understanding of the survival of patients. In patients with hormone receptor-positive, early diagnosis along with socioeconomic factors like education, income, etc., are said to play a vital role. Hence, the present study aimed to analyze the survival pattern depending on hormone receptor status, stages of breast cancer, and socioeconomic status.

Materials & Methods: An Ambi directional cohort study was conducted among 300 patients with breast cancer registered and treated in a tertiary care hospital in Dakshina Kannada, India, in the last 3 years. A validated proforma was used to collect data. The post-treatment survival was analyzed depending on their income, family history, staging (clinical & histopathological), and hormone receptor status (HER-2/ER).

Results: The pattern of receptor among these patients showed 45% ER, 43% PR, and 14.3% HER2 positivity. Among the patients, 83% had undergone hormonal therapy as per the receptor status. The overall survival rate of breast cancer patients was found to be 81%. The clinical stage of disease had a statistically significant association with survival using the log-rank test. However, monthly income and hormonal status showed no significance.

Conclusion: A 3-year survival rate was 100% for stage I patients, 96.6% for stage II, 82.1% for stage III, and 40% for stage IV. Hormone receptor positivity is highly predictive for better prognosis in breast cancer patients.

Keywords: Breast cancer, Hormone receptor status, Socioeconomic status, Stage, Survival rate



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Introduction

The most common cancer among females worldwide is breast cancer. Almost 2.3 million patients have been diagnosed with breast cancer, and about 685000 deaths were reported in 2020. As of 2020, 7.8 million women diagnosed with breast cancer in the past 5 years were alive, thus making it the world's most prevalent cancer. Globally, breast cancer is the leading cause of disability-adjusted life years (DALYs) among women, more than any other kind of cancer (1).

The number of patients with breast cancer is on the rise in India too. In India, in 2018, 162,468 women were newly detected with breast cancer, and it accounts for 27.7% of all newly diagnosed cancers among

women. This means that one in four women who are newly diagnosed with cancer have breast cancer (2). Breast cancer accounts for 23.5% of all cancer-related deaths in women in India. This means that in India, one in four deaths among women with cancer is due to breast cancer (2).

Almost half of the women diagnosed with breast cancer every year are from developing countries, and it is known to have an earlier age of onset. They also present with advanced-stage of the disease. Women from developing countries have poor outcomes when compared to women from developed countries (3). After diagnosis, the five-year survival rate for patients

with breast cancer varies from more than 90% in developed countries to about 66% in India (1). Reports from various studies suggest that women with breast cancer who are progesterone receptor- (PR) and/or estrogen receptor- (ER) positive survive longer than women who have tumors which are negative for both these hormone receptors (4) Survival rates among patients after the diagnosis of cancer is one of the most important outcome indicators and an important determinant for assessing the quality of cancer care services, including both the therapeutic and the preventive measures (5).

Accurate knowledge about prognostic factors could assist oncologists in making correct treatment decisions and acquiring a better understanding of the survival of patients. Hormone receptor-positive patients, early stage of diagnosis, and socioeconomic factors like education, income, etc., are said to have a better prognosis in the survival of breast cancer patients. This study was planned to determine the survival pattern of breast cancer patients and assess the association of breast cancer survival with hormone receptor status, stages of breast cancer, and socioeconomic status.

Materials and Methods

In a performed Ambi directional cohort study, 250 patients were enlisted in the register of breast cancer patients treated in a tertiary care hospital in Dakshina Kannada, India, from November 2015 to July 2017 were part of the cohort. Additionally, 50 patients who had undergone treatment in the next 12 months were included to form a total of 300 cases for the study (250 test, 50 control). Informed consent was obtained from all participants. Ethical clearance was obtained from the institutional ethics committee. A validated

proforma was used to collect data. The post-treatment survival was analyzed depending on their income, family history, staging (clinical & histopathological), and hormone receptor status (HER-2/ER). The cohort was seen as survival of the individual and endpoint being death.

Validation of the questionnaire was assessed, and Kappas's agreement between the experts was 90%. For the survival analysis questionnaire, Cronbach's alpha was 0.86. The association of survival analysis with hormone receptor status, stages of breast cancer, and socioeconomic status were done using Chi-square and multivariate analysis. The statistical analysis was done using SPSS software.

Results

Most of the patients were in the age group 41-50 years. Many of them had a family income of less than 10,000 INR. The receptor pattern among these patients showed 45% ER, 43% PR, and 14.3% HER2 positivity. Of the patients, 83% had undergone hormonal therapy according to the receptor status. The overall survival rate of breast cancer patients was found to be 81%. The clinical stage of disease had a statistically significant association with survival using the log-rank test. Patients with stage 4 cancer had a higher risk of death (HR=5.6 (95%CI: 2. 9-10.3), and stage 1 had the least risk. However, monthly income (HR: 1.4; 95%CI 0.9-2.3) and hormonal status (HR: 1.08; 95%CI 0.4-2.7) showed no significance (Table 1). Figure 1 shows Kaplan Meier Curve for overall survival among patients with breast cancer. Figures 2, 3, and 4 show Kaplan Meier Curve for the overall survival among patients with breast cancer according to the stage, socioeconomic, and monthly income, respectively.

Table 1. Showing the association of cancer stage, income, and hormone receptor status with the three years observed survival rate

		Overall survival		Death		P-value#
		n	%	n	%	
Stage of Cancer	I	33	100	0	0	0.001*
	II	86	96.6	3	7.6	
	III	138	82.1	30	76.9	
	IV	4	40	6	15.3	
Monthly Income (in Rs)	<10,000	151	89.9	17	43.5	0.13
	10,000-20,000	94	82.5	20	51.2	
	>20,000	16	88.9	2	5.1	
Hormone receptor status	Positive	153	89	19	48.7	0.26
	Negative	89	83.2	18	46.1	
	Not available	19	90.5	2	5.1	

#Log rank test * P-value <0.05 is significant

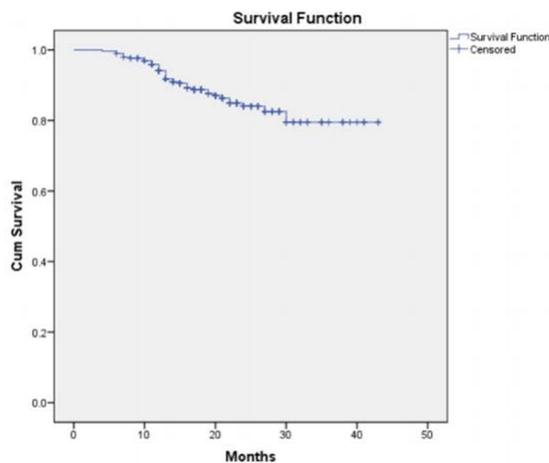


Figure 1. Kaplan Meier Curve showing the overall survival among patients with breast cancer (N=300)

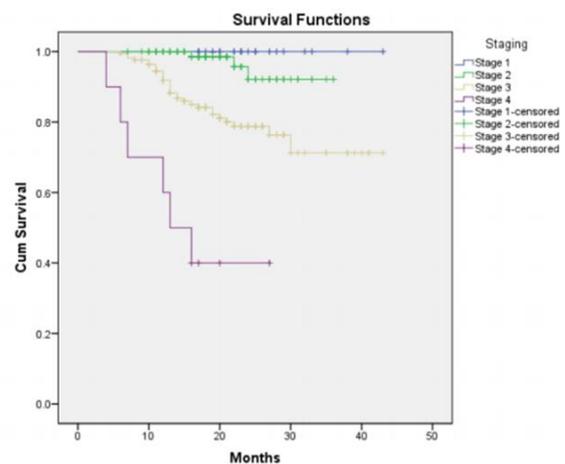


Figure 2. Kaplan Meier Curve showing the overall survival among patients with breast cancer according to the stage (N=300).

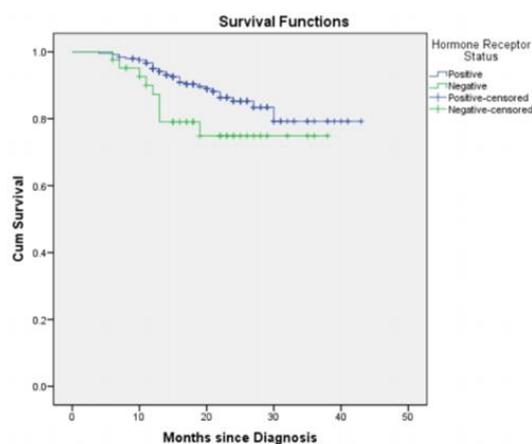


Figure 3. Kaplan Meier Curve showing the overall survival among patients with breast cancer according to hormone receptor status (N=300).

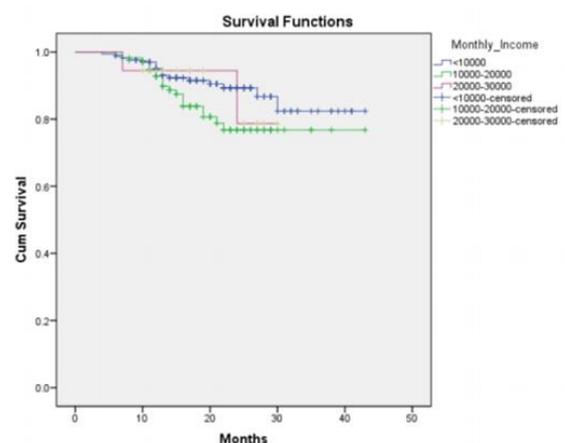


Figure 4. Kaplan Meier Curve showing the overall survival among patients with breast cancer according to monthly income (N=300).

Discussion

The current study intended to analyze survival and determinants of prognosis in the study population. Many studies using the standard cox model, such as Dunwald and Rossing Ma in 2007 and Soerjomataram *et al.* in 2008, have reported that proliferation, tumor size, hormone receptor status, and lymph node status were significant and strong prognostic factors (6, 7).

Earlier diagnosis and prompt treatment have improved the outcome in breast cancer patients. According to research findings, 80% of women who have primary breast cancer will survive for more than 10 years post-surgery. However, among women who had relapsed after the surgery, only 5% survived for more than 10 years, as per the study's findings done by Cark *et al.* (8). The current study revealed that the three-year survival rate was 100% for stage I, 96.6% for stage II, 82.1% for stage III, and 40% for stage IV, with a mean survival of 81%, and the relation was statistically significant ($P=0.0002$). Since the study was based on data from a single institution, the findings cannot be generalized to the whole Indian country. However,

these findings go hand in hand with similar studies that indicate that the relative survival in Indian Breast cancer patients was higher than in Eastern European countries. In their study, which was a part of the comprehensive Eurocare study, Ant *et al.* reported that the regional age-adjusted mean five-year and relative survival rate for breast cancer was 79% (9). Hormone receptor-positive status has been regarded as a predictor of better prognosis among breast cancer patients. The present study identified 89% survival for hormone receptor-positive tumors compared to 83.2% for hormone receptor-negative. These results are interesting as the low histological grade of tumors and hormone receptor positive status are considered indicators of good outcomes in similar studies done in western countries (10). Among sociodemographic factors, the three-year survival rate was assessed for monthly income using cox model and found it was 89.9% for those with monthly income <10,000, 82.5% for income between 10,000 to 20,000 and 88.9% for income more than 20,000 respectively. However, a statistically

significant association between income and survival was not observed ($P=0.13$). This is in agreement with breast cancer survival studies conducted in the US and Sweden (11, 12). On the contrary, a large-scale study done in Pakistan among breast cancer survivors by Aziz *et al.* revealed that survival improved with higher per capita income (13).

Conclusion

The three-year survival rate was 100% for stage I patients, 96.6% for stage II, 82.1% for stage III, and 40% for stage IV. Hormone receptor positivity is highly predictive for better prognosis among breast cancer patients.

Limitations: The duration of the study was for three years, so the five-year survival rate for cancer patients could not be calculated

To improve the understanding of the relationship between hormone receptor status, stages of breast cancer, and socioeconomic status with survival, future studies should include sufficiently large samples, longer duration, more comprehensive assessment tools, and improved measurements of covariates relevant to survival such as the presence of comorbidities, physical activity, and diet. It would be beneficial to have a more

thorough assessment of lifetime changes for these factors in the time leading up to the diagnosis. Including cancer recurrence and second cancer primaries are also crucial. In addition to assessing pre-diagnosis attributes, it would be ideal to track the changes in activity pattern, weight fluctuations, and dietary modification through treatment and post-treatment periods. It is unclear how these characteristics change over time among survivors and how any alterations throughout the cancer experience impact the survival outcome.

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Conflict of Interest

None declared.

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