



## Pharmacoeconomic evaluation on breast cancer patients in a Tertiary care hospital in south India

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### ABSTRACT

The aim of the study was to determine the economic and humanistic outcomes in the management of breast cancer patients in a tertiary care hospital of south India. Our objectives were to determine the cost of illness (economic outcome), analyse the quality of life (humanistic outcome) using EORTC C-30 and BR-23 Questionnaire, compare the cost associated with breast cancer management using different drug regimens and to estimate the occurrence of adverse drug reactions during breast cancer management. The study was conducted in the department of oncology in a tertiary care teaching hospital. The required data was collected by reviewing charts, personal interview with patients/bystanders and Mediware system of our Hospital. The treatment costs were calculated for different drug regimens and the QOL was determined using EORTC questionnaire. We have determined the economic outcome associated with breast cancer treatment as well as Quality of life of patients after therapeutic management. Economic outcomes were categorised into direct and indirect costs, and concluded that regimen I is more expensive than regimen II. Measurement of Humanistic outcomes showed no difference between the two groups and the drug related side effects were prominent in both the groups. Breast cancer is found to be the 2nd leading cause of cancer deaths among women and has become an important issue nowadays. There are less studies assessing the health care costs associated with caregiver burden so pharmacoeconomic studies will definitely help to improve patients health and overall QOL.

### INTRODUCTION

Cancer is a disease that has a significant burden of illness in terms of incidence, prevalence, mortality and morbidity. Breast cancer is an uncontrolled, abnormal growth of malignant breast tissue. It is the second leading cause of cancer-related death in women. Among Indian females with age adjusted rate as high as 25.8 per 100,000 women and mortality 12.7 per 100,000 women. About 25-40% patients develop a metastasis in the course of their illness. Since metastatic breast cancer is not curable, one of the main goals of treating them is to provide palliative support and maintaining their quality of life.[1-2]

Current treatment options for breast cancer depend upon disease characteristics-stage, grade, HER-2,ER,RP receptor

status and on patient characteristics- age and menopausal status. The total cost of breast cancer management includes direct cost-cost of investigation, therapy cost, surgical intervention, cost of radiation, consultation charges and palliative care, but also the indirect cost of the disease considering the loss of productivity and premature deaths.[3-5].Direct nonmedical costs are nonmedical expenses such as transportation and associated non medical expenses related to cancer management. Indirect costs represent opportunity costs, including income loss due to cancer-related morbidity and treatment. Although the incidence and prevalence of primary and metastatic breast cancer (MBC) are well established, there is limited information on the direct, indirect and intangible costs reported for MBC. There are no studies assessing the health care costs associated with caregiver burden.[6-7]. There has been growing recognition that *patient-*

reported outcome (PRO) measures including, measures of health-related quality of life (HRQOL) can fetch important additional material for assessing the overall burden of cancer and the effectiveness of interventions. Informal assertion from PROs matter in cancer decision making is registered whenever a provider ask patients how they feels, whether they had fatigue or pain, able to carry on with their usual activities, needs caregiver support, well enough to stick with their prescribed therapy, and so on.[8] Our study objectives were to determine the cost of illness as well as the quality of life of breast cancer patients managed with different drug regimens.

## METHODS

### Study Design :

A cross sectional study was conducted in patients diagnosed with breast cancer. The study site was 500 bedded multispecialty tertiary care teaching hospital with extensive range of services where there is an average of 40-50 outpatient visits in the oncology department on all Tuesdays, Thursdays and Saturdays. Data relevant to the study was collected during a period of six months using a specially designed patient data collection form. The various parameters taken into consideration include patient demographics, different treatments followed, adverse events, direct and indirect cost determination. In addition to this various laboratory parameters were also recorded. During the study period regular follow up of the patient was conducted.

### Inclusion criteria:

Patients undergone Immuno-histochemistry (IHC) testing and those with age > 18yrs of either gender.

### Exclusion criteria:

Patients who have unstable medical or psychiatric disorders and/or pregnant or lactating women.

### Data Collection Technique:

A total of 40 patients (undergoing chemotherapy as well as radiation therapy) were interviewed and surveyed for each outcome measures. We adopted a convenient purposive sampling technique for recruiting study participants. The cost of illness in the treatment of breast cancer was assessed by using specially designed data collection forms, the quality of life measured by using EORTC Questionnaire which is a specific quality of life assessment tool for breast cancer patients. The demographic Proforma of disease and treatment details were collected from all subjects.

Treatment related economic and humanistic outcomes were the different aspects measured from the data obtained. Data collection was done accordingly using various tools. Tool A consist of baseline information including subject identification, demographic information, socio-economic background and clinical characteristics of patients with the treatment details. Tool B, include EORTC QLQ C 30 version 3 and EORTC QLQ BR23 which is a standardized tool for measuring quality of life of cancer patients and its breast cancer specific module prepared by European Organization for Research and Treatment of cancer (EORTC) and is validated internationally, including Indian population. It covered questions on different health aspects, such as physical, emotional, cognitive, social functional scores scoring from 1-4, also the questionnaire consists of two questions on global health status, which has been scored as 1-7 scale, both ask for about overall health and overall quality of life. QLQ BR 23 measured different aspects like systemic therapy related side effects, upset by hair loss, future perspective, arm symptoms, breast symptoms, body imaging.

### Statistical Analysis:

The data was analyzed according to the objectives using descriptive and inferential statistics. The cost of illness of breast cancer patients was calculated for different regimens including different categories of cost such as cost of drugs, surgery, radiation, investigations, professional charges and total indirect costs (Travel, Food and accommodation charges). Information regarding the costs was obtained by direct-interaction with the subjects and / or caregivers regarding the costs of prescriptions and other related expenditure; also from hospital mediware applications. The humanistic outcomes were represented as functional scales and symptom scales in percentage after different treatments using EORTC QLQ C 30 and EORTC BR 23 questionnaire.

## RESULTS

Among the study population more of the subjects was in the age group of 41-64yrs and there was a female dominance, only one male subject was presented with breast cancer. The economic statuses of the subjects were evaluated and majority (57.6%) was found to be with middle income group.

Demographic details of study participants depicted in Table (1)

**Table 1 :** Demographic details of study participants

VARIABLE	FREQUENCY	PERCENTAGE
<b>AGE IN YEARS</b>		
<40YRS	1	3%
41-50YRS	16	48.5%
Above 51YRS	16	48.5%
<b>FAMILY INCOME</b>		
<10000	9	27.3%
10000-20000	19	57.6%
>20000	5	15.2%

**Table 2 :** Cost of treatment

COST	FREQUENCY	PERCENTAGE
60000-1200000	16	40 %
1200000-2400000	23	69.7%
>2400000	1	3.0%

Cost is defined as the value of the resources consumed by a program or drug therapy of interest. Consequence is defined as the effects, outputs, or outcomes of the program or drug therapy of interest. Consideration of both costs and consequences differentiates most pharmacoeconomic evaluation methods from traditional cost- containment strategies and drug- use evaluations. We evaluated the total expenditure of study subjects which includes direct as well as indirect cost.

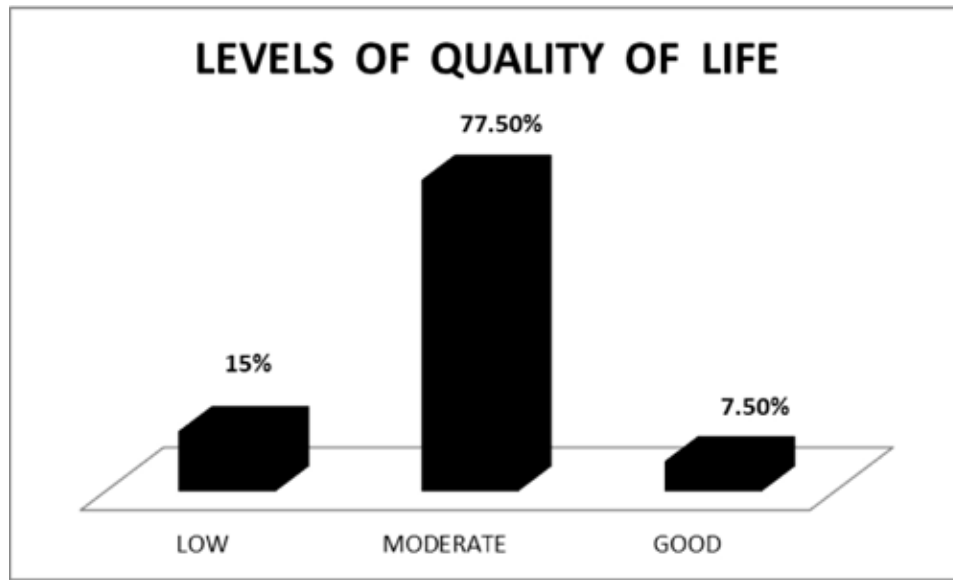
Cost associated with the treatment is depicted in Table (2)

Cost varies for each patient since individualized therapy is being given. Out of 40 participants, 3 of them had incremental cost along with total expenditure due to occurrence of rare adverse drug reactions. Total expenditure of subjects (10) taking regimen I (Trastuzumab) which showed a wide range of about INR 800000-2400000 and subjects (30) taking regimen II (Cyclophosphamide,

Doxorubicin, Docetaxel) which also showed a wide range of about 200000-1100000. From the above obtained data from study subjects, we concluded that regimen I is more expensive than regimen II.

Humanistic outcomes are the consequences of disease or treatment on patient functional status or quality of life along several dimensions (e.g. physical function, social function, general health and well-being, and life satisfaction). The patient reported humanistic outcomes of breast cancer patients were evaluated using EORTC QLQ C30 and QLQBR 23(Breast cancer specific module).The quality of life was expressed in terms of different functional scales and different symptoms or unwanted effects.

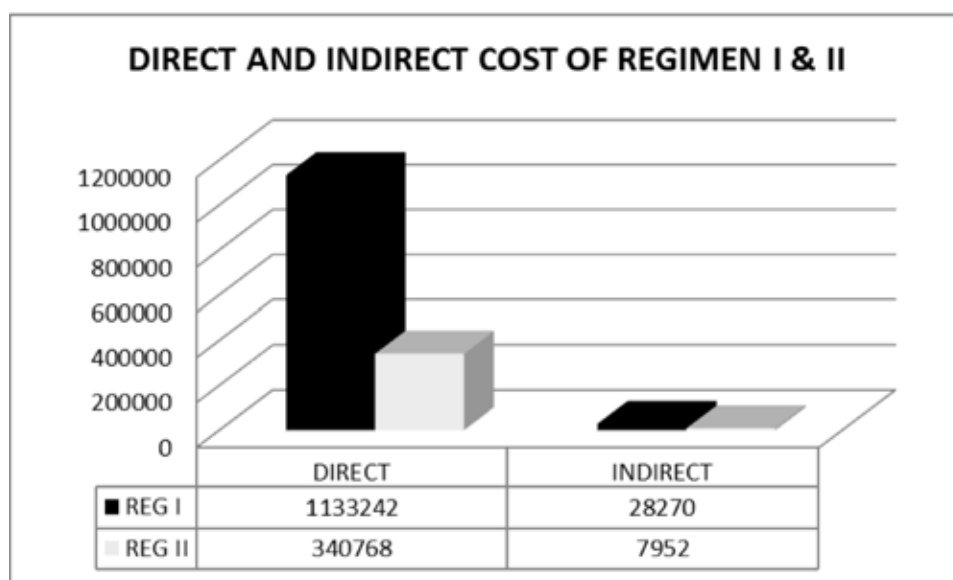
Levels of Quality of life is shown in Figure (1)



**Fig. 1 :** Levels of quality of life

**Table 3 :** Overall quality of life of Breast cancer patients after treatment

OVERALL HEALTH & QUALITY OF LIFE													
FREQUENCY							PERCENTAGE						
VERY EXCELLENT							POOR						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
0	0	2	9	15	4	3	0	0	6.1%	27.3%	45.5%	12.1%	9%



**Fig. 2 :** Direct and Indirect cost of Regimen I & II

Majority of the participants (77.5%) had moderate level of quality of life and only one participant (7.5%) reported with good quality of life. The mean of all the quality of life domains constitute the overall quality of life of breast cancer patients after treatment.

According to the domain wise analysis of data from breast cancer patients, the physical functions were about 55 %, emotional functions were about 52.5%, role functions 44.13%, cognitive functions 44.67%, social functions 38.33% and the overall functions were 69.64%.

The overall health and overall quality of life of study participants were evaluated and the result showed that almost half of the group have a moderate level of overall health. Nine percent of participants were having excellent quality of life and 6.1% were having poor quality of life.

Overall quality of life of Breast cancer patients after treatment is depicted in Table (3)

According to the domain wise analysis of quality of life data of breast cancer patients, the future perspective was 58.25%, the

systemic therapy side effects like hair loss was 50.75%, arm symptoms was 49 %, dry mouth, eye irritation, unusual taste differences, hot flushes, headache, feeling unwell altogether constitutes around 53.57 % and breast symptoms 33.94%.

The cost occurred, direct as well as indirect cost in breast cancer management by the study participants, is depicted in Figure (2).

More economic burden was associated with regimen I(Trastuzumab) rather than regimen II (Cyclophosphamide, Doxorubicin,Docetaxel) as per the analysis done.

ADRS experienced after breast cancer treatment is shown in Table (4)

While estimating the occurrence of adverse drug reactions during management of breast cancer, most commonly observed reaction in subjects were hair loss (65%) and the least one was 5% having chemotherapy induced nausea vomiting and constipation. Side effects were very less since concomitant pre-medications were given along with the targeted therapy.

**Table 4 :** ADRS experienced after breast cancer treatment

Drug Reactions	Frequency				Percentage			
	Not at all	A little	Quite a bit	Very much	Not at all	A little	Quite a bit	Very much
Hair Loss	9	3	2	26	22.5%	7.5%	5%	65%
Nausea & Vomiting	31	4	3	2	77.5%	10%	7.5%	5%
Constipation	34	4	0	2	85%	10%	0	5%
Diarrhea	30	4	0	6	75%	10%	0	15%
Loss of appetite	21	6	5	8	52.5%	15%	12.5%	20%
Insomnia	21	8	6	5	52.5%	20%	15%	12.5%
Breathing difficulty	28	6	0	6	70%	15%	0	15%
Body weakness	12	12	10	4	30%	30%	25%	10%

## DISCUSSION

In this study we evaluated the economic background as well as burden occurring to each patient diagnosed with breast cancer. Among the study group majority of the subjects were in the age group of 41-64yrs and most of them were from average middle class family with moderate income. Cost of illness was calculated by collecting treatment details from the medical records and by direct interviewing patients and/or their care takers. Direct and indirect cost comparison for two different regimens was also done.

Total expenditure of participants (7) taking regimen I (Trastuzumab) which showed a wide range of about INR800000-2400000 and total expenditure of participants (26) taking regimen II (Cyclophosphamide, Doxorubicin, Docetaxel) which showed a wide range of about 200000-1100000. While considering the economic background (direct and indirect cost) we estimated that regimen I is more expensive than regimen II, which is providing a better disease control. Daisy *et al* has conducted an Echo model study (2012) and reported that, both the quality adjusted life year saved and humanistic outcome after treatment was better if the disease was diagnosed and treated at an early stage and at a lower age. Pallis A, et al conducted a study on "Pharmacoeconomic considerations in the treatment of breast cancer" with an objective to present the available clinical and Pharmacoeconomic evidence associated with different therapies for breast cancer. Our study support this study as pharmacoeconomic analyses will help in taking better decision-making and help to optimize the use of scarce health care resources allocated to the care of breast cancer patients.[9]

Quality of life of study subjects were evaluated which showed majority of the subjects (78.8%) had moderate level of QOL, (18.2%) with low and (3.0%) reported good QOL. Perry S, Kowalski TL et al conducted a study on "Quality of life assessment in women with breast cancer: benefits, acceptability and utilization". Similar to their study we were also able to summarize the benefits, challenges, and barriers associated with the treatment by QOL measurement. [10]

Cost comparison between two different treatment regimens were conducted considering both direct as well as indirect cost, finally concluded that regimen I is more expensive than regimen II. Along with this incremental cost for management of rare ADRs associated with treatment was considered in about three patients.

Adverse drug reactions during breast cancer management was evaluated, hair loss was found to be more common among the patients. Other side effects including breathing difficulty, constipation, loss of appetite, insomnia, generalized weakness etc were reported which all leads to an increase in hospital stay or associated loss in expenditure. Michael J Hassett et al conducted a study on "Frequency and cost of chemotherapy related serious adverse effects in a population sample of women with breast cancer". Similar to their study we were able to summarize that breast cancer is more common than reported by large clinical trials and lead to more patient suffering and health care expenditures now a days than previously estimated[11].

The calculation of total expenditure for overall management of individual patients, the survival rate of participants after being managed with the therapy and finally the cost-effectiveness of the drug regimens were our limitations during the study due to short period of time.

Pharmacoeconomic studies provides healthcare decision

makers more valuable informations, allowing optimal allocation of limited resources. Pharmacoeconomics is based on long term benefits as well as considering the total expenditure, thus more validated results can be determined using appropriate models. The Pharmacoeconomic studies in cancer patients will provide a better treatment strategy, since there are no much studies stating the same early diagnosis and treatment will definitely help the patients to improve their health and overall quality of life.

## CONCLUSION

The number of patients affected by breast cancer has become an important issue today. Significant updates has been made in the management of breast cancer during the last decade. Early diagnosis and treatment will definitely help the patients to improve their health and overall quality of life. The cost of cancer chemotherapy was found to be in the range of INR 200000-2400000, there is associated financial burden for the patients as well as for their care givers. The cost difference is due to different reasons like treatment approaches adopted and the stage at which the data was taken. Among this a majority 21(63.6%) of them were having financial support through (ESI scheme) provided by the government.

Breast cancer patients are prone to have high expenditures (partly due to their younger age and higher income) it may be appropriate to offer them different supportive services that would address their added burden. Government programs to support in this regard may prove useful for those less than 65yrs of age and also to those whose private health insurance coverage is limited. Pharmacoeconomic analyses of all alternative therapy options will improve decision-making and will help decision-makers to optimize the use of scarce health care resources allocated to the treatment of cancer and the care of patients.

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## CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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