Effect of Socio-Phycological Factors on Quality of Life (QoL) of Breast Cancer Patients: Structural Equation Modelling Approach

Sanjiv Srivastava[1], Dr. Alpana Srivastava[2], Dr. Sandeep Tiwari[3]

*[1]Research Scholar, Amity Business School, Lucknow, UP, India[1] M.Sc. Orchid code – 0000-0001-7500-6755, Tel. No. - 09336530358, Email-sanjivbanlaxmi@gmail.com
[2]Professor, Department of Amity Business School, Amity University, Lucknow[2], Tel. No.-09415303802, Email-alpana94@gmail.com,
[3]Professor & Head, Department of Trauma Surgery, King George Medical University, Lucknow3
Tel. No. - 09415510733, Email-sandeep_neelu@yahoo.co.in
***Corresponding Author: -** Sanjiv Srivastava

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Abstract

Objective
To study the effect of socio-phycological factors on Quality of Life (QoL) of breast cancer patients.
Methods
A cross-sectional cum longitudinal study was conducted at a tertiary care hospital of Lucknow. Data was collected in two phases. In the first phase, demography, disease and treatment details and other relevant information was collected whereas in the second phase, a validated scale, developed by Ferrel, was used for evaluating QoL of breast cancer patients. Over 150 patients who were diagnosed with breast cancer at tertiary care hospital of Lucknow were sampled. Structural Equation Model (SEM) was developed as a structural and measurement model (Rizzo et al., 2008). Path analysis, developed by Wright (1993), has been used for establishing direct and indirect cause-and-effect relationships between observed variables and latent variables.
Results
A total of 150 patients were interviewed and their average QoL index was built by using index number approach. Confirmatory Factor Analysis (CFA) was done at the first stage for all constructs and selected relevant exogenous variables. In second stage SEM was run through AMOS software to test the model fit in the next stage. We can see that QoL is not only hampered by medication and physical deterioration but also by psychological wellbeing and it should be taken care of.
Conclusion
Study revealed that the patients who received counselling during and after treatment, they tend to have better social and psychological well-being with a significantly less fear factor. Fear psychosis, therefore, can be reduced with the help of a proper guidance system and a supportive social circle that includes the patient's family and friends. As the diagnosis and treatment of cancer can have a major impact on a patient's quality of life, healthcare

facilities should concentrate on psychological well-being. Diverting resources towards maintaining better psychological well-being and prescribing counselling as an additional stage of treatment and recovery can greatly improve a patient's QoL.

Keywords: Breast cancer, socio-psychological factors, Quality of Life (QoL), Structural Equation Modelling (SEM), QoL Model.

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Introduction

Breast cancer is the most common type of cancer which affects women worldwide (World Health Organization, 2012) "[1]". The standard treatment for breast cancer is surgery, followed by different combinations of treatments like chemotherapy, radiotherapy and hormone therapy (NBCG, 2012; Norwegian Directorate of Health, 2007) "[2], [3]". Although the rate of survival among breast cancer patients has increased in recent past due to rapid advancements in treatment and mammography screening (Holleczek, Arndt, Stegmaier & Brenner, 2011) "[4]" the surviving women pass through various medical, physical, and psychosocial challenges (Dizon, 2009) "[5]".

Studies on breast cancer survivorship sought to examine a broad area of topics related to cancer diagnosis and treatment-related outcomes like medical status, late effects of treatment, second cancers and quality of life (QoL) (Aziz, 2002; Lemieux et al, 2007) "[6],[7]". The importance of QoL has been illustrated by studies that evaluated QoL during treatment and found that it could be used to improve the treatment, serve as a prognostic medical factor, and predict survival (Montazeri, 2008; Ganz, 2001; Coates et al, 1997) "[8],[9],[10]". Lack of research into QoL among cancer survivors has been proclaimed as a challenge area within academia (Aziz, 2002) "[6]".

Review of Literature

Diagnosis of breast cancer and its long- term treatment has been shown to have positive and negative effects in recovery and QoL as different interventions have different effects. QoL expresses an overall sense of well-being, happiness, and satisfaction with life. It includes Subjective evaluations of both positive and negative aspects of life (CDC, 2000) "[8]". According to the World Health Organization, QoL is "An individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (World Health Organization, 1997). Hence, focus on quality-of-life issues and measurement of quality of life among breast cancer patients is a very important area for research (Montazeri et al, 2008) "[9]".

The physical domain includes disease or treatment related body concerns like fatigue and pain, while the functional domain measures the ability to work as affected by the illness. The psychological domain assesses the positive and negative emotional effects including stress, depression and anxiety. The ability to participate in the usual social activities are measured in the social domain, while the spiritual domain examines the existential dimension of the patient's experience. Lastly, the sexual domain assesses the impact of the illness on the intimate life of the patient. Hence, Health-Related Quality of Life (HRQoL) seems to cover aspects of overall QoL that can be shown to affect both physical and mental health (CDC, 2000) "[8]".

The socio-ecological context assesses socio-economic status (income, education and employment), burden of life (living situation, neighborhood characters and resources, day-to-day strain) and social support (emotional, instrumental, social networking). The cultural context includes ethnicity (region of ancestral origin), ethnic identity (level to which ethnicity and cultural heritage defines oneself), acculturation (language, choice of media, social networking skills and cultural practices), interconnectivity (quality and pressure of family life and social relationships), worldview (attitudes and beliefs) and spirituality (faith-based beliefs and practices). The demographic context includes age, while the healthcare system context includes access to healthcare (cost, insurance, availability of treatment centers), quality of healthcare (state of the art, satisfaction with care) and quality of physician–survivor relationship (compassion, communication,

involvement). The individual level is measured under general health [disease status and co-morbid illness(es)], cancer-specific medical factors (stage, age at which diagnosed, surgery, chemotherapy and radiation) health efficacy (motivation and know-how about health practices, utilization, perceived health efficacy, medical adherence) and psychological well-being (levels of functioning as affected by depression, anxiety, stress, self-esteem).

Existing research on QoL of breast cancer survivors has looked into measurement of QoL from a diverse range of focus areas like surgical treatment, systemic therapies, psychological distress, supportive care and common symptoms (Montazeri, 2008) "[9]". Further, research papers have looked into QoL by examining defined subgroups under ethnicity, age, treatment (surgical procedure, adjuvant therapy, breast reconstruction) and time elapsed since diagnosis (Lemieux et al, 2007) "[7]". While few studies have focused on the physical, functional and psychological effects, therefore, more research is required in order to examine the economic effects of cancer on the quality-of-life outcomes (Aziz, 2002) "[6]". As argued by author (Ashing-giwa,2005)"[12]" under the contextual model of HRQoL, in order to shed more light on the topic, diverse variables like care-giving and medical care settings need to be taken into consideration (Rowland et al, 2002) "[14]". Furthermore, it was suggested that factors like socio-economic status, education level etc. should be considered for QoL assessment in the countries like India where a large %age of women are from rural background with low literacy and lack of healthcare facilities. (Sharma and Purkayastha, 2019)"[15]". (It seems an incomplete sentence) QOL assessment should include an instrument which assesses physical health, social health, psychological health, and spiritual health "[16]". Geographical area, socioeconomic status, education, and type of treatment, especially non-adjuvant and adjuvant therapy, significantly affect QoL among breast cancer patients "[17]". Strength of the relationship was found between clinical and socio-demographical factors and QoL of breast cancer patients and strength of the relationship between education and physical well-being, education with social well-being and education with spiritual well-being "[18]". Measurement of quality-of-life index assessment can assist decision making and in providing data for clinical trials and identifying patients who needs psychosocial interventions and thus can pave way for better life for cancer patients."[19]". Physical well-being not only directly affects QoL at the beginning of the disease, but also post-treatment. While physical well-being remains the same and can even get degraded in certain critical cases during the different stages of the disease, it is a factor that is not in our control" [20]".

Patients and Methods

1. Data Collection

The prime objective of this cross-sectional cum longitudinal study was to measure QoL in breast cancer patients and the factors that affect it. This study also aimed to reveal the relationship between QoL and the factors affecting it during the treatment. A sample size of 150 breast cancer patients was collected from a tertiary care hospital of Lucknow, Uttar Pradesh. The reason for choosing a tertiary hospital was the wide variety of referral patients that come here for treatment. As we aimed vital analysis of factors affecting QoL aimed to study the effect, we required varied data, including patients from different income groups and social backgrounds, the type we selected, was found at a government hospital. We used a structured questionnaire with two parts for data collection. The first part included demography, disease and treatment related information, while the second part comprised a validated questionnaire related to the quality of life of breast cancer patients.

2. Sample Size and Sampling Technique

It was found that around 5000 cancer patients visited annually in this tertiary care hospital in which about 2000 breast cancer patients visited this hospital for treatment as per the records. Non profitability purposive sampling was done. The sample of about 151 patients from the specialty departments were collected based on the sample size assessment as follows:

$$N=Z2p(1-p) / e2$$

Where
N is the total sample size required

Z value is taken as 95% confidence interval (1.96)
P is the 60% prevalence as per record 2012 of ICMR
E is the 1% of the probable error
(1.96)2(0.60(0.4)/ (0.1)2
= 92.19 – 100

Hence, we collected samples of more than 150 patients with the help of doctors available in OPD and IPD. We tried to select the patients during their first visit and followed-up who have been diagnosed with breast cancer and irrespective of the stage (of cancer) they have started the treatment, this was the first assessment of the patients. The same patients were followed after six months as second assessment and after 12 months same patients were followed up and third assessment was made. We applied exploratory research design to analyse the QoL of breast cancer patients. A non-probability purposive and convenience sampling was done to cater to patients.

3. Inclusion and Exclusion Criteria

All the patients (age > 18 years) coming to specialty department like Endocrine Surgery, Radiotherapy OPD and Indoor (Surgery, Chemotherapy, or Radiotherapy) were included in the study who agreed to participate and gave written consent. Patients who were gravely ill and unable to give written consent were excluded from the study.

4. QoL Instrument

Quality of life of breast cancer patients were measured using a validated questionnaire i.e. Ferrell's QOL questionnaire (Ferrell et al., 1995). Ferrell summarised the definitions of the four QoL domains like Physical well-being, psychological well-being, social well-being and spiritual well-being. The Quality-of-Life questionnaire has 46 items where patients evaluate their QoL on a 10 point Likert scale, with 0 being worst and 10 being best QoL. The scale analyses the general quality of life, psychological well-being, stress owing to illness and treatment, fearfulness, social concerns, and spiritual well-being. QoL was measured by summing all the scores of 46 items and the index was built by the following formula:

$$\text{QoL} = \frac{\text{Actual Score}}{\text{Maximum Theoretical Score}}$$

Here highest score is 460 as there are 46 items rates on the scale 0 to 10.

5. Tools and Techniques Used

Quality of life was measured using Ferrel's QOL questionnaire. Ferrel summarized the definitions of four QoL domains:

- Physical well-being is the control of relief of symptoms and the maintenance of function and independence
- Psychological well-being is the attempt to maintain a sense of control in the face of life-threatening illness characterized by emotional distress, altered life priorities and fear for unknown as well as positive life changes.
- Social well-being is the effort to deal with the impact of breast cancer on individuals their roles and responsibilities
- Spiritual well-being is the ability to maintain hope and derive meaning from the cancer experience which is characterized by uncertainty.

6. Reliability and validity of Data

The data obtained gives a Cronbach's alpha value of 0.692, which is reliable enough for further study.

7. Ethical Approval

The Institutional ethics committee of this tertiary care hospital provided ethical clearance for the survey and study.

Statistical Tools

Structural Equation Modelling (SEM)

Structural equation model or SEM was developed as a structural and measurement model (Rizzo et al., 2008). Path analysis, developed by Wright (1993), establishes direct and indirect cause-and-effect relationships between observed variables and later variables. It was elaborated by Boolean (1989). The SEM allows the addition of latent variables into the analysis. It also allows the study to measure any combination of relationships existing by exploring a series of dependent relationships concurrently and considering errors of measurement between all variables at the same time. SEM has the ability of testing models

overall rather than coefficients individually. The measurement model for exogenous (x) and endogenous (y) latent variables can be written as:

$$x = +\lambda\xi\ \delta \quad (1)$$
$$y = +\gamma\eta \int \quad (2)$$

Where: x → observed exogenous variables
ξ → exogenous latent variables
δ → measurement error
λ →factor loadings relating x to ξ
Y → observed endogenous variables
η → endogenous latent variables

a vital analysis of factors affecting QoL

ε → measurement error for the observed endogenous variables
γ → factor loadings relating y to η.

Relationships among latent construct variables and structural model are given by;

$$\eta = +\Gamma + \beta\eta\ \xi\ \zeta \quad (3)$$

Where:
β → path coefficient describing the relationships among endogenous latent variables
Γ → path coefficients describing the linear effects of exogenous variables on endogenous variables
ζ → errors of endogenous variables.

We used the maximum likelihood estimation method to evaluate SEM computer programs and structural equation models. SPSS and Amos 21 were used for the analysis

Data Analysis

General Profile of Respondents

In this study, 54.7% of the patients were in the age group 41-60 years old and 34% were < 40 years old. In terms of geographical location, 76.7% were from rural areas and 23.2% were from urban areas. 61.3% of the patients had Weight/BMI category (i.e., in between 18.4-24.9 kg/m2) while 28.7 were overweight. Among these women, 47.3% were illiterate, 22.7% had primary and upper primary level education, 18.7% had studied till high school level, 9.3% were graduates and 2% were postgraduates. Regarding marital status, 96% were married and 2.7% were unmarried. Regarding socioeconomic status, 74% had low-income status and 25.3% had middle income status.

Diagnosis and Treatment

Cancer staging of patients showed that 64.7% of patients had stage IV, 19.3% had stage II, 14% had stage III and 2% had stage I cancer. Nodal Involvement N1 was reported by 74.7% , N2 in 16%. Metastasis was reported by 78.3% . Regarding treatment, 62.7% received Neoadjuvant chemotherapy, 8% received Adjuvant chemotherapy, 26% patients received a combination of two or more therapies.

Variables Used in Analysis (According to Instruments)

Physical Wellbeing

The physical well-being (F1) construct is measured by 8 items are Fatigue (G1), Appetite change (G2), Aches/Pain (G3), Sleep Changes (G4), Weight gain (G5), Vaginal dryness/menopausal symptoms (G6), Menstrual changes or fertility (G7), Overall physical health (G8).

Psychological Wellbeing

The psychological well-being (F2) construct is measured by 10 items which are difficulty in coping with disease (PS9), difficulty for coping with treatment (PS10), quality of life (PS11), happiness (PS12), in control of situation (PS13), satisfaction in life (PS14), concentrate or to remember things (PS15), usefulness (PS16), changes in appearance after treatment (PS17), self-concept (PS18).

Distress

The distress (F3) is measured by 7 items which are how distressing initial diagnosis (D19), cancer chemotherapy (D20), cancer radiation (D21), cancer surgery (D22), completion of treatment (D23), level of anxiety (D24), level of depression (D25).

Fearfulness

The fearfulness (F4) is measured by 5 items which are fearful about future tests (F26), a second cancer (F27), recurrence of cancer (F28), spreading of cancer (F29), back to normal life (F30).

Social Concerns

The social concern (F5) is measured by 9 items which are how distressing this illness for family

(SO31), amount of support (SO32), personal relationship (SO33), impact of illness on sexual life (SO34), effect of treatment on employment (SO35), activities at home (SO36), how much isolation you feel (SO37), concern about your daughter (SO38), financial burden (SO39).

Spiritual Wellbeing

The spiritual well-being (F6) is measured by 7 items which are importance of religious activities (SP40), how important is spiritual activities (SP41), spiritual life changed (SP42), uncertainty do you feel (SP43), positive changes in your life (SP44), purpose/mission of your life (SP45), how hopeful you feel (SP46).

Result and Findings

Confirmatory Factor Analysis (CFA) was done at the first stage for all constructs and selected relevant exogenous variables. In second stage SEM was run through AMOS software to test the model fit in the next stage. Figure 1 and Table 1 displayed results. Modification Indices (MI) table examined unnecessary items in the initial fit model and the model was respecified with the relevant variables. Correlated pairs of items greater than 15 were set as a free parameter estimate and some items was deleted, respectively. Table 1 Model fit summary Chi-sq 2735.493 DF 1030 Chi-sq/ df 2.65 GFI 0.573 AGFI 0.533 CFI 0.749 RMSE 0.105. The model is specified until uni-dimensionality for the model is achieved through a fitness check. Variables Ps12 was deleted from construct F2 and So31, So32, So33, and So34 were deleted from construct F5. SP46 was deleted from construct F5. After deleting the above exogenous variables, the fitness indices for the model is achieved. Below is given model fit summary as table-2 and Path diagram of achieved models figure-2.

Table-1: Model Fit Summary

Model fit summary	
Chi sq	2735.493
DF	1030
Chi sq/DF	2.65
GFI	.573
AGFI	.533
CFI	.749
RMSE	.105

Figure-1: QoL Model

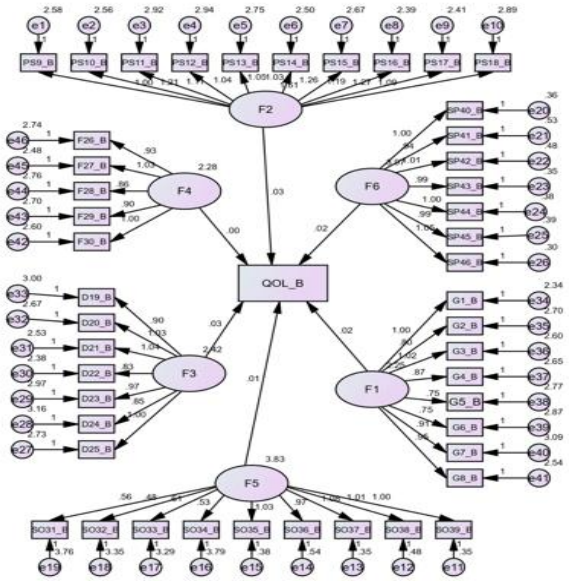
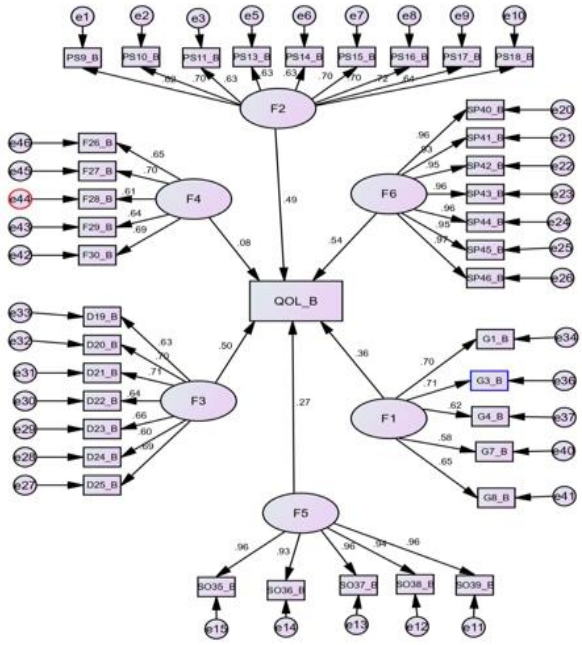


Table-2: Model Fit Summary (QoL) [Updated]

Model fit summary	
Chi sq	2163.919
DF	698
Chi sq/DF	3.10
GFI	.568
AGFI	.537
CFI	.763
RMSE	.119

Figure-2: QoL Model (Updated)



The finding of SEM good correlation (direct and indirect) between QoL indicators and various socio-economic domains. Physical well-being shows 0.36 correlation with QoL as breast cancer at initial stage does not deteriorate physical condition much as compared to other cancers. Psychological and distress parameters are of concern as they are contributing

relatively high with .49 and .50. The major items of concern are happiness, concentration and change in appearance which are playing adverse role. High distress level is mainly attributed to chemotherapy, radiation, and anxiety. Fear factor is indirectly playing role as most affected items are second cancer and cancer spread. Spiritual construct is high with 0.54 whereas social construct contributing 0.27. Thus, from the above analyse we can see that QoL is also hampered not only by medication and physical deterioration but also by phycological wellbeing and it should be taken care of.

Conclusions

The assessment of the QoL index can facilitate decision-making, provide data in clinical trials, and identify patients who need psychosocial interventions. The collected data shows that most tertiary care government hospitals cater to patients from a low-income group. These people are more vulnerable to low QoL and financial vulnerability that cancer adds. Physical well-being not only directly affects QoL at the beginning of the disease, but also post-treatment. While physical well-being remains the same and can even degrade in certain critical cases during the different stages of the disease. It is a factor that is not in our control what changes, though, it is the psychological well-being from the beginning to the end of the treatment process. Patients who receive counselling during and after treatment tend to have better social and psychological well-being with a significantly less fear factor. Fear psychosis, therefore, can be reduced with the help of a proper guidance system and a supportive social circle that includes the patient's family and friends. As the diagnosis and treatment of cancer can have a major impact on a patient's quality of life, healthcare facilities should concentrate on psychological well-being. Diverting resources towards maintaining better psychological well-being and prescribing counselling as an additional stage of treatment and recovery can greatly improve a patient's QoL.

Limitations

This study has several limitations such as 'recall bias' as some patients may not remember the answers of some questions. This was minimized by ensuring proper definition of the research question and improving the quality-of-life questionnaire. The significance of the study is that it highlights the effect of the disease and associated factors on the quality of life (QoL) of breast cancer patients. Similar studies on all types of cancers across the hospitals may be done in future.

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