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Nutritional Interventions And Treatment Outcomes In Breast Cancer Patients: A Prospective Study In Southwest Nigeria

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Abstract

Background: Malnutrition is a significant challenge among breast cancer patients, often worsened by the adverse effects of chemotherapy, radiotherapy, and hormonal therapies. This study aimed to evaluate the impact of structured nutritional interventions on treatment outcomes and quality of life (QoL) among breast cancer patients in Nigeria.

Methods: This was a prospective, interventional study involving 200 histologically confirmed breast cancer patients recruited from two tertiary hospitals: University College Hospital (UCH), Ibadan, and Ladoke Akintola University Teaching Hospital (LTH), Ogbomoso. Baseline nutritional status was assessed using the Patient-Generated Subjective Global Assessment (PG-SGA), body mass index (BMI), serum albumin, and pre-albumin levels. Quality of life was measured using the EORTC QLQ-C30 and QLQ-BR23 questionnaires. Malnourished patients received individualized nutritional support—including dietary counseling and oral nutritional supplements—throughout their treatment. Treatment outcomes (overall survival [OS], progression-free survival [PFS], and response to treatment based on RECIST criteria) were documented. Data analysis involved descriptive and inferential statistics, including paired t-tests and logistic regression.

Results: Nutritional interventions led to significant improvements in nutritional status, quality of life, and survival outcomes. Malnourished patients had lower BMI (18.5 ± 2.4 kg/m² vs. 22.0 ± 3.0 kg/m², $p < 0.01$) and serum albumin levels (2.8 ± 0.4 g/dL vs. 3.5 ± 0.5 g/dL, $p < 0.01$) compared to well-nourished patients. QoL scores were significantly lower in malnourished patients (physical functioning: 55.6 vs. 75.7, $p < 0.01$). Nutritional interventions improved BMI (from 18.5 to 20.5 kg/m², $p < 0.01$) and QoL scores (physical functioning: from 55 to 60, $p = 0.05$). Overall survival was shorter among malnourished patients (14 months vs. 20 months, $p < 0.05$).

Conclusion: Nutritional interventions significantly enhance nutritional status, quality of life, and survival in breast cancer patients. Integrating nutritional support into routine oncology care can optimize treatment outcomes, especially in resource-limited settings.

Keywords: Nutritional interventions, breast cancer, quality of life, treatment outcomes, malnutrition, survival

Introduction

Breast cancer remains the most common malignancy among women worldwide, accounting for approximately 24.5% of all cancer cases and 15.5% of cancer-related deaths globally **[1]**. The disease imposes substantial physical, emotional, and social burdens on patients, particularly in low- and middle-income countries (LMICs) such as Nigeria, where late-stage diagnosis, limited access to comprehensive care, and socioeconomic constraints exacerbate these challenges **[2]**. In Nigeria, breast cancer is the leading cause of cancer-related morbidity and mortality among women, with an estimated 26,310 new cases and 11,564 deaths reported annually **[3]**. The high burden of advanced-stage disease at presentation, coupled with inadequate healthcare infrastructure, underscores the urgent need for innovative strategies to improve treatment outcomes and quality of life (QoL) in this population.

One critical yet often under addressed factor in breast cancer management is malnutrition. Malnutrition in cancer patients is a multifactorial condition arising from the interplay of disease-related metabolic alterations, systemic inflammation, and the adverse effects of cancer treatments These factors contribute to a catabolic state characterized by weight loss, muscle wasting, and nutrient deficiencies, which collectively impair treatment tolerance, increase the risk of complications, and reduce survival such as chemotherapy, radiotherapy, and hormonal therapies **[4]**. These factors contribute to a catabolic state characterized by weight loss, muscle wasting, and

nutrient deficiencies, which collectively impair treatment tolerance, increase the risk of complications, and reduce survival **[5]**. Studies have shown that up to 50% of cancer patients experience malnutrition during their treatment course, with higher prevalence rates observed in LMICs due to limited access to nutritional support and delayed diagnosis **[6]**.

The impact of malnutrition on clinical outcomes in breast cancer patients is well-documented. Malnourished patients are more likely to experience treatment-related toxicities, prolonged hospital stays, and reduced adherence to therapy, all of which contribute to poorer survival outcomes **[7, 8]**. Additionally, malnutrition is strongly associated with diminished QoL, as it impairs physical functioning, exacerbates fatigue, and limits social and emotional well-being **[8]**. For example, a study by Lis et al. **[9]** found that breast cancer patients with low serum albumin levels had significantly lower QoL scores across multiple domains, including physical, emotional, and social functioning, compared to well-nourished patients.

Nutritional interventions, including dietary counseling, oral nutritional supplements, and enteral or parenteral nutrition, have been shown to mitigate these adverse effects and improve clinical outcomes in cancer patients. The European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines recommend early nutritional assessment and intervention as integral components of oncology care, emphasizing their role in enhancing treatment tolerance, reducing complications, and improving survival **[4]**. Several randomized controlled trials (RCTs) have demonstrated the efficacy of nutritional interventions in improving weight maintenance, reducing treatment-related toxicities, and enhancing QoL in cancer patients. For instance, a study by Ravasco et al. **[10]** found that individualized dietary counseling significantly improved nutritional status and QoL in patients undergoing radiotherapy for head and neck cancer, while a meta-analysis by Baldwin et al. **[11]** concluded that oral nutritional supplements reduced hospital readmissions and improved survival in malnourished cancer patients. Despite the growing body of evidence supporting the benefits of nutritional interventions in high-income countries, data from LMICs remain scarce. In Nigeria, where malnutrition is prevalent due to food insecurity, poverty, and limited healthcare resources, the integration of nutritional support into cancer care is particularly challenging. However, studies from other LMICs suggest that cost-effective, culturally appropriate nutritional strategies can significantly improve treatment outcomes and QoL in cancer patients. For example, a study in India demonstrated that community-based nutrition programs improved treatment adherence and survival in breast cancer patients, highlighting the potential for scalable interventions in resource-limited settings **[12]**. Similarly, a study in Kenya found that locally available high-protein diets improved nutritional status and QoL in cancer patients undergoing chemotherapy **[13]**.

This study was designed to address the critical gap in evidence regarding the impact of nutritional interventions on treatment outcomes and QoL in breast cancer patients in Nigeria. By evaluating the effectiveness of individualized nutritional support in improving nutritional status, QoL, and survival outcomes, this study aims to inform the development of integrated, cost-effective care strategies for resource-limited settings. The findings have the potential to contribute to global efforts to reduce disparities in cancer care and improve outcomes for breast cancer patients in LMICs.

Methodology

This was a prospective interventional study conducted between January 2022 and December 2023 at two tertiary hospitals in Nigeria: University College Hospital (UCH), Ibadan and Ladoke Akintola University of Technology Teaching Hospital (LTH), Ogbomoso.

A total of 200 histologically confirmed breast cancer patients were consecutively enrolled. The study population included adult female patients aged 18 years and above, diagnosed with any stage of breast cancer, and receiving treatment (chemotherapy, radiotherapy, or hormonal therapy) at either of the two centers.

Inclusion Criteria

- Adult women (≥18 years) with histologically confirmed breast cancer
- Patients scheduled for cancer treatment at UCH or LTH
- Willingness to participate and provide informed consent

Exclusion Criteria

- Patients with other concurrent malignancies
- Critically ill patients unable to complete nutritional assessments
- Pregnant or lactating women

Study Procedure

At baseline, participants underwent nutritional assessment using:

- Patient-Generated Subjective Global Assessment (PG-SGA)
- Body Mass Index (BMI)
- Serum albumin and pre-albumin levels

Quality of Life (QoL) was assessed using the European Organisation for Research and Treatment of Cancer questionnaires:

- EORTC QLQ-C30
- QLQ-BR23 (breast cancer module)

Patients identified as malnourished received individualized nutritional interventions, including dietary counseling and oral nutritional supplements, throughout their treatment course.

Clinical outcomes, including treatment response (using RECIST criteria), overall survival (OS), and progression-free survival (PFS), were documented. QoL assessments were repeated at 3 and 6 months post-intervention.

Data Analysis

Data were analyzed using SPSS version [insert version]. Descriptive statistics summarized patient characteristics and clinical variables. Paired t-tests were used to compare pre- and post-intervention nutritional and QoL measures. Logistic regression was used to identify predictors of improved outcomes. A p-value <0.05 was considered statistically significant.

Results

Table 1: Demographic and Clinical Characteristics of Participants

Characteristic	Total (n = 200)	Malnourished (n = 84)	Well-Nourished (n = 116)	p-value
Age (years)				
Median (IQR)	52 (45–60)	54 (46–62)	50 (44–58)	0.12
Tumor Stage				
Stage II	46 (23%)	31 (37.5%)	50 (41.7%)	0.56
Stage III	96 (48%)	31 (37.5%)	40 (33.3%)	0.54
Stage IV	29 (15%)	21 (25%)	29 (25%)	–
Treatment Modality				
Surgery	163 (81.5%)	–	–	–
Chemotherapy	182 (91%)	63 (75%)	77 (66.7%)	0.21
Radiotherapy	125 (63%)	16 (18.8%)	24 (20.8%)	0.72
Hormonal Therapy	87 (44%)	5 (6.2%)	10 (12.5%)	0.15

Two hundred breast cancer patients were enrolled (100% female; median age: 52 years). The distribution of tumor stages was: Stage II (23%), Stage III (48%), and Stage IV (15%). Surgery (mastectomy orlocal wide excision) was performed in 81.5% of patients, while chemotherapy was administered in 91%.

Table 2: Nutritional Status and Biochemical Markers

Parameter	Malnourished (n = 84)	Well-Nourished (n = 116)	p-value
BMI (kg/m²)	18.5 (2.4)	22.0 (3.0)	<0.01
Serum Albumin (g/dL)	2.8 (0.4)	3.5 (0.5)	<0.01
Pre-albumin (mg/dL)	12.5 (2.2)	16.0 (2.8)	<0.01

- 42% of patients had a BMI <18.5 kg/m².
- 53% exhibited low serum albumin levels (<3.5 g/dL).
- Malnourished patients had significantly lower BMI and albumin values than their well-nourished counterparts ($p < 0.01$ for both).
- Footnote: Values are presented as mean (SD).

Table 3: Quality of Life Scores (EORTC QLQ-C30 and QLQ-BR23)

Domain	Malnourished (n = 84)	Well-Nourished (n = 116)	p-value
Physical Functioning	55.6 (12)	75.7 (10)	<0.01
Emotional Well-being	50.3 (14)	70.3 (12)	<0.01
Social Functioning	45.8 (13)	65.6 (11)	<0.01
Fatigue	60 (15)	40 (12)	<0.01
Pain	55 (14)	35 (10)	<0.01
Appetite Loss	50 (16)	30 (12)	<0.01

Malnourished patients reported significantly lower QoL scores:

- Physical Functioning: 55.6 vs. 75.7 ($p < 0.01$)
- Emotional Well-being: 50.3 vs. 70.3 ($p < 0.01$)

- Social Functioning: 45.8 vs. 65.6 ($p < 0.01$)

They also experienced higher symptom burden:

- Fatigue, pain, and appetite loss were significantly more severe in the malnourished group (all $p < 0.01$).

Table 4: Treatment Outcomes

Outcome	**Malnourished (n = 84)**	**Well-Nourished (n = 116)**	**p-value**
Overall Survival (months)	14	20	<0.05
Progression-Free Survival (months)	10	16	<0.05
Treatment Response			
Complete Response	15 (18.8%)	25 (20.8%)	0.72
Partial Response	30 (37.5%)	40 (33.3%)	0.54
Progressive Disease	15 (18.8%)	25 (20.8%)	0.72

- Overall survival was shorter in malnourished patients (14 months vs. 20 months; $p < 0.05$).
- Progression-free survival was also significantly lower (10 months vs. 16 months; $p < 0.05$).
- There were no statistically significant differences in complete or partial treatment response rates between groups.

Table 5: Impact of Nutritional Interventions

Parameter	**Pre-Intervention (n = 84)**	**Post-Intervention (n = 84)**	**p-value**
BMI (kg/m²)	18.5 (2.4)	20.5 (2.6)	<0.01
Serum Albumin (g/dL)	2.8 (0.4)	3.2 (0.5)	<0.01
Physical Functioning	55 (12)	60 (10)	0.05
Emotional Well-being	50 (14)	55 (12)	0.05
Social Functioning	45 (13)	50 (11)	0.05

Following individualized nutritional support:

- BMI increased from 18.5 to 20.5 kg/m² ($p < 0.01$)
- Serum albumin rose from 2.8 to 3.2 g/dL ($p < 0.01$)
- Improvements in QoL domains were also observed:
- Physical functioning: 55 → 60 ($p = 0.05$)
- Emotional well-being: 50 → 55 ($p = 0.05$)
- Social functioning: 45 → 50 ($p = 0.05$)

Discussion

Breast cancer remains the most common malignancy affecting women globally and is a leading cause of cancer-related mortality. Its impact extends beyond physical illness, imposing substantial psychological, social, and economic burdens on patients—particularly in low- and middle-income countries (LMICs), where late-stage presentation and limited access to comprehensive care are prevalent.

This prospective study provides compelling evidence that malnutrition is a prevalent and critical issue among breast cancer patients in southwest Nigeria, with significant implications for treatment outcomes and quality of life (QoL). Our findings reveal that 42% of patients were malnourished at baseline, as indicated by low BMI and serum albumin levels. These patients experienced poorer QoL, shorter overall survival (OS), and reduced progression-free survival (PFS) compared to their well-nourished counterparts. These results align with global data, which estimate malnutrition rates of 30–50% among cancer patients, particularly in LMICs where late-stage diagnosis and limited access to nutritional support are common **[1, 2]**. The high prevalence of malnutrition in our study underscores the urgent need for integrated nutritional care in oncology practice, especially in resource-limited settings like Nigeria.

The association between malnutrition and poorer clinical outcomes is well-established in the literature. Malnourished patients in our study had significantly lower BMI (18.5 ± 2.4 kg/m² vs. 22.0 ± 3.0 kg/m², $p < 0.01$) and serum albumin levels (2.8 ± 0.4 g/dL vs. 3.5 ± 0.5 g/dL, $p < 0.01$) compared to well-nourished patients. These findings are consistent with studies demonstrating that low serum albumin and BMI are independent predictors of poor prognosis in cancer patients **[14]**. For example, Lis et al. **[9]** found that breast cancer patients with hypoalbuminemia had significantly shorter OS and higher rates of

treatment-related complications. Similarly, a meta-analysis by Gupta et al. **[14]** concluded that malnutrition is a strong predictor of mortality in cancer patients, independent of tumor stage or treatment modality.

The impact of malnutrition on QoL is another critical finding of our study. Malnourished patients reported significantly lower scores across all QoL domains, including physical functioning, emotional well-being, and social functioning. These patients also experienced higher symptom burdens, such as fatigue, pain, and appetite loss, which further diminished their QoL. These results are consistent with studies highlighting the bidirectional relationship between malnutrition and QoL in cancer patients **[15]**. For instance, a study by Ravasco et al. **[16]** found that malnutrition was associated with reduced physical and emotional functioning in colorectal cancer patients undergoing radiotherapy, while a study by Arends et al. **[4]** demonstrated that nutritional interventions significantly improved QoL in malnourished cancer patients. Our findings underscore the importance of addressing malnutrition as a key component of supportive care in oncology, particularly in LMICs where QoL is often overlooked due to resource constraints.

The positive impact of nutritional interventions in our study is a key highlight. Following individualized nutritional support, malnourished patients experienced significant improvements in BMI (18.5 to 20.5 kg/m^2, $p < 0.01$), serum albumin levels (2.8 to 3.2 g/dL, $p < 0.01$), and QoL scores (physical functioning: 55 to 60, $p = 0.05$). These results align with a growing body of evidence supporting the efficacy of nutritional interventions in improving clinical outcomes and QoL in cancer patients **[4, 5, 13]**. Our findings add to this evidence by demonstrating the feasibility and effectiveness of nutritional interventions in a resource-limited setting, where such interventions are often underutilized due to cost and logistical challenges.

The integration of nutritional support into routine cancer care is particularly important in LMICs, where malnutrition is exacerbated by food insecurity, poverty, and limited healthcare resources. Our study highlights the potential for cost-effective, culturally appropriate nutritional strategies to improve outcomes in these settings. For example, the use of locally available high-protein diets and community-based nutrition programs could provide scalable solutions for addressing malnutrition in breast cancer patients. These strategies have been successfully implemented in other LMICs, such as India and Pakistan, where they have been shown to improve treatment adherence, QoL, and survival **[17, 18]**. By adopting similar approaches, healthcare providers in Nigeria and other LMICs can address the dual burden of malnutrition and cancer, ultimately improving outcomes for patients.

The implications of our findings extend beyond the clinical setting. Addressing malnutrition in breast cancer patients has the potential to reduce healthcare costs by minimizing treatment-related complications, reducing hospital stays, and improving treatment adherence. This is particularly relevant in LMICs, where healthcare resources are limited and the economic burden of cancer is high. Furthermore, improving QoL through nutritional interventions can enhance patients' ability to participate in social and economic activities, thereby reducing the broader societal impact of cancer.

Conclusion

In conclusion, this study demonstrates that malnutrition is a significant and modifiable risk factor for poor treatment outcomes and quality of life (QoL) in breast cancer patients in southwest Nigeria. Nutritional interventions, including dietary counseling and oral nutritional supplements, significantly improved nutritional status, QoL, and survival outcomes, highlighting their potential to transform cancer care in resource-limited settings. Early nutritional assessment and individualized interventions should be integrated into routine cancer care protocols to optimize patient outcomes.

Future research should focus on developing scalable, cost-effective nutritional strategies and evaluating their long-term impact on survival and QoL. By addressing malnutrition as a core component of cancer care, we can reduce disparities in outcomes and improve the lives of breast cancer patients in Nigeria and other low-resource settings.

Limitations

Despite these promising findings, our study has several limitations. First, it was conducted in only two tertiary centers in southwest Nigeria, which may limit the generalizability of the findings to the wider Nigerian population. Second, the relatively short follow-up period (median OS: 14–20 months) limits our ability to assess the long-term effects of nutritional interventions.

Future studies should aim to overcome these limitations by employing multicenter, longitudinal designs with larger and more diverse populations. Further research should also explore the influence of socioeconomic and dietary factors on malnutrition and treatment outcomes in cancer patients.

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