

EFFECTS OF DIETARY MODIFICATIONS AND NUTRITIONAL INTERVENTIONS ON THE HEALTH STATUS OF BREAST CANCER PATIENTS

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ABSTRACT

Objectives: To assess the effects of dietary modifications and nutritional intervention on the health status of adult breast cancer patients.

Material & Methods: The study was conducted at Institute of Radiotherapy and Nuclear Medicine (IRNUM) Peshawar from October 2013 to February 2014. Dietary intake of 131 breast cancer patients was assessed through a 7-days recall method and Food Variety (FV) was assessed through a semi-quantitative food frequency questionnaire. A variety of socio-demographic parameters were studied. Mean nutrient intakes were calculated and the most common foods consumed were identified. After initial screening the sample was divided into controlled and experimental groups based on patients' consent. Both of the groups were counseled for general guide lines of hygiene, balanced diet and were psychological support, however, the experimental group received intensive counseling in nutrition, cooking methods, stress and depression management with regular follow ups. As per patient symptoms and needs diets were modified to liquids, purees, soft, low fiber or high fiber or focused nutrient diets.

Results: Upon the termination of the study the data showed illiteracy (70%), rural background (67.5%), extended families (62.5%) and lower income level (57.5%) being the most important socio demographic contributory factors. Significant improvement in energy intake ($p=0.002$), protein ($p=0.000$), Vitamin C ($p=0.001$) iron ($p=0.051$) and calcium ($p=0.0025$) in the experimental group from the pre test and from the control group was observed dietary and nutritional interventions. The anthropometric indices for weight, BMI showed a healthy decline ($p=0.002$ and $p=0.004$ respectively) and an overall less significant but positive effects on blood indices the most obvious effect being on the hemoglobin ($p=0.004$) as compared to the control group. The 3 to 5 meals in small portions proved to be beneficial as compared to a three meals per day traditional pattern.

Conclusion: It can be concluded from the study that early assessment of nutritional status and effective nutritional care and dietary modification help improve the overall well being of the patients.

Recommendations: The area of nutritional care shall be made a permanent feature of the patients' care paradigms in Pakistan.

Key Words: Nutrients, Intervention, Dietary modification, Anthropometric indices.

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INTRODUCTION

The burden of cancer has increased to 14.1 million globally in 2012 and is estimated to be 21.4

million new cases by 2030¹. Breast cancer is the most common cancer among women accounting for 22% of all female cancer worldwide, out of which 42% cases occur in the developing countries². According to WHO Pakistan alone has the highest rate of breast cancer among the Asian population after the non-Arab Israeli women³. Approximately 90000 new cases were diagnosed every year out of which 40000 die⁴. According to Karachi tumor registry and AFIP registry; 26% of all the malignancies in Southern and Northern Pakistan are breast cancers^{5,6}. Shaukat Khanum Memorial Cancer

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Hospital alone diagnosed 40% of breast cancer of all the malignancies⁷. A number of internal and environmental risk factors have been identified⁸.

Nutrition can play an important role in the management of cancer patient across the palliative care spectrum from initial treatment and recovery phases to the long term reduction of comorbid disease risks, increase survivorship and to prevent recurrence⁹. Deterioration in nutritional status¹⁰ and dietary intake during cancer treatment and recovery phases¹¹ has increasingly been studied and has shown significant negative effects on the well being¹² as well as treatment outcomes in cancer patients¹³. Malnourished patients had higher incidence of chemotherapy-induced toxicity when compared to well-nourished patients¹⁴. Patients may also encounter catabolism as a result of disturbed metabolic conditions¹⁵. Treatments, particularly the chemotherapies impair patients' food intake due to nausea, vomiting, loss of appetite, taste sensation¹⁶ along weight loss due to infections, GIT morbidities¹⁷. Interval nutritional assessment can help in nutritional maintenance through the treatment¹⁸. Throughout the care model the primary goals of this palliative care are to relieve patients' symptoms and improve quality of life (QOL)¹⁹. Food choices and eating patterns are the modifiable factors over which patients has some control²⁰. The diagnosis of cancer in itself is a powerful motivational force for dietary modification²¹ and several studies have shown promising results²².

In this study we aimed to calculate Food Variety Score (FVS) in order to assess the quality of patients' diets and adequacy of nutrient intake. Based on such analyses nutritionally adequate and appropriate dietary regimes were planned with the objectives that such nutritional care help in maintenance of health, better drug and therapies resistance and increase chances of survival among the patients.

MATERIAL AND METHODS

A two dimensional pre test-post test experimental design was adopted. The study was conducted at Institute of Radiotherapy and Nuclear Medicine, Peshawar from October 2013 to February 2014. Upon informed written ethical approval from the hospital authority the inclusion criteria was newly diagnosed breast cancer patients after the confirmation of oncologist were selected while the exclusion criteria seriously ill end stage patients with multiple complications. Written consent from patients or their care givers were procured and a convenient random sample of 131 breast cancer patients was selected and based on patients' willingness were divided into experimental (51) and control (80) groups. Data collection was carried out through a

self-constructed questionnaire for socio-economic and demographic parameters, anthropometric measures, medical histories and biochemical indices.

A 7-day dietary recall method was followed to evaluate patients current dietary intake with the help of household portion sizes cups and spoon and nutrient intake was calculated. A modified semi-quantitative FFQ²³ Comprising of 136 food items (further divided into five food groups) was used to calculate food variation (FV). Collectively three questionnaires were completed with one month interval.

Based on patients' health status and FVS and treatment the following caloric distribution, proteins, Vitamin C, and Vitamin E were focused on.

1. Energy: *BMR Allowance = 0.9 Kcal/kg body weight/day
Activity allowance = 1.2 Kcal/kg body weight/day
Injury allowance = 1.2 Kcal/kg body weight/day
Nitrogen Balance allowance (in case of IPN)
*Harris & Benedict equation for age and gender
As per weight status of the patients a 2100-2800 Kcal/day diet was suggested with 31% from protein, 19% fats and 50% from carbohydrates.
2. Protein: 1.5 – 2.0 O₂/Kg body weight/day.
3. Vitamin C: 70 – 100 mg/d
4. Vitamin E: 5 – 10 µg/day (estimated)

Foods rich in vitamin D, sulfur amino acids, carotene, selenium, and omega -3 fatty acids were focused upon during dietary modifications and recommendations. Diets were modified to liquid soft, low residue, post chemotherapy or post surgical diets. Patients were counseled for importance of hygiene, balanced diet, taking regular meals.

Statistical analysis

Data analysis was performed on SPSS, IBM version 19. Data were calculated for mean ± SD, Analysis of Variance and correlation for significance of differences and relationship between nutrient intake and nutritional status.

RESULTS

The sample (N=131) was analyzed for socio-demographic characteristics of the patients were calculated collectively (Table 1). Of the several income categories (monthly income) 57.5% belonged to Rs. 3000-5000, 21% Rs. 5500-15000, and 22.5% from monthly income Rs. >15000. Majority (62.5%) of the patients belonged to nuclear family setups with no fam-

Table 1: Socio-Demographic data of the sample

Variables	Percentage
1. Patients' Education	
i. Elementary	6.25
ii. Matric	11.5
iii. FA	05
iv. Graduation	7.5
v. Illiterate	70
2. Patients' Husband Education	
i. Elementary	8.75
ii. Matric	2.5
iii. FA	7.5
iv. Graduation	18.75
v. Illiterate	46.25
3. Type of Family	
i. Urban	32.5
ii. Rural	67.5
iii. Nuclear unit	37.5
iv. Joint unit	62.5
4. Family history of cancers	
i. Yes	75
ii. No	25
5. No. of Children	
i. Nulliparous	13%
ii. 2-5	73.5
iii. 6-10	13.5
6. Family Income	
Rs. 5000-8000	57.5
Rs. 8000-15000	21
Rs. 15000 & above	22

ily history (75%) of breast cancer either in the patients' or husbands' family (46.25%) were the most striking assumed aetiological factors found. The patients of both the groups received their routine treatments (Fig-1). Anthropometric data (Table 2) showed mean age 44.48 ± 12.62 years, height 64.32 ± 96 inches while overweight BMI significantly declined in three months ($p = 0.002$) after nutritional modification and counseling in the experimental group. Among the control group on the other side an increase in mean weight with a rise in BMI (27.3 ± 3.17) was observed.

Dietary intake pattern of the whole sample indicated (Fig 2) a diet based on more carbohydrates (wheat as a staple, 99%) with seasonal vegetables or cereals (43% and 23%) cooked in ghee/shortening (78.7%) was the most common intake pattern. Beef intake was comparatively higher (38%) as compared to chicken (7%) and intake of fresh fruits and raw vegetables was also very low (07%). Consumption of milk tea (97.7%) was the only way of getting milk in the diet and intake of other dairy products was less common (12.5%).

Mean nutrient intake (Table 3) indicated an insignificant difference in the nutrient intake of both the groups. The intake when compared with RDA for Pakistani population fall 98.85% for control and 104.42% against the reference values for experimental group. However at the end of the study nutrient intake was significantly changed in terms of energy, protein and an overall reduction occurred in carbohydrates and fats and an improvement in vitamin C and iron. Calcium intake (mg/d) remained a bit low in the experimental group. An overall decline of nutrient intake in the control group was also observed except for a significant increase in carbohydrates and sugar intake.

Table 2: Mean Nutrient Intake of the Patients in the Pre- Test and Post-Test

Nutrients	Pre-Test		Post-Test		
	Control	Exp. Experimental	Control	Exp	*P-level
Energy (Kcal/d)	2976±21.21	2921.3±11.23	2048±34.56	1837±3.67	0.002 ^a 0.004 ^{ab}
Proteins (g/d)	43.5±23.05	42.26±8.39	37.92±9.72	63.10±7.26	0.000 ^a
Carbohydrate (g/d)	269.97±36.10	284.56±6.49	287.3±3.56	140.81±11.80	0.005 ^a
Fats (g/d)	56±10.45	51.06±2.05	49.23±16.84	32.83±5.94	0.0061
Vitamin C (mg/d)	43.11±1.52	40.8±5.60	53.38±14.11	132.15±3.20	0.001 ^{ab}
Iron (mg/d)	9.29±9.52	9.08±5.92	8.59±2.20	11.27±16.09	0.051 ^a 0.006 ^{ab}
Calcium(mg/d)	650±6.36	632.7±8.61	637±7.09	786.37±11.93	0.0025 ^a

*significance of differences at $p = >0.05$

^avalues are different significantly within the group from the pre-test

^{ab}values carrying similar alphabets are significantly different between the two groups from the pre-test

Table 3: Anthropometric indices as affected by nutritional interventions

Parameters	Experimental group				Control group				P-Level**
	Pre-Test	30 Days	60 Days	90 Days	Pre-Test	30 Days	60 Days	90 Days	
Age (years)	44.48 ± 12.62				43.89 ± 16.08				
Height (inches)	63.32 ± 17.97				64.03 ± 8.96				
Weight (kg)	65.64 ± 11.41	64.32 ± 9.02	61.9 ± 3.45	61.21 ± 6.11	66.38 ± 34.05	63.9 ± 3.89	69.54 ± 6.98	70.1 ± 11.24	0.002 ^a 0.004 ^{ab}
MUAC* (inches)	11.30 ± 1.65	11.23 ± 6.70	11.12 ± 7.64	10.63 ± 4.90	11.56 ± 7.50	11.0 ± 6.90	11.33 ± 2.89	11.72 ± 3.56	0.018 ^a
BMI	25.7 ± 367	24.99 ± 11.06	24.56 ± 11.05	24.17 ± 2.97	25.93 ± 3.96	24.96 ± 9.90	27.14 ± 5.62	27.3 ± 1.90	0.004 ^a 0.021 ^{ab}

*Mid Upper Arm Circumference

** Significance (P ≥ 0.05) of differences among the means

^avalues are different significantly within the group from the pre-test

^{ab}values carrying similar alphabets are significantly different between the two groups from the pre-test.

Table 4: Effect of Dietary Modification and Nutrition Intervention on the Blood Iron Indices of the sample

Parameters	Groups	Pre-test	30 Days	60 Days	90 Days	*P-Level
Hemoglobin (g/dL)	Experimental	9.26 ± 0.97	9.01 ± 7.25	9.24 ± 23.54	9.31 ± 8.37	0.004 ^a
	Control	9.88 ± 0.76	9.02 ± 2.69	83.42 ± 5.82	8.04 ± 0.921	0.170
RBC (R 10 ⁶ /mm ³)	Experimental	5.5 ± 1.27	4.2 ± 12.72	3.98 ± 18.56	4.01 ± 1.76	0.006
	Control	4.8 ± 2.71	3.43 ± 6.21	3.30 ± 4.61	3.02 ± 2.90	0.923
WBC (R10 ³ /mm ³)	Experimental	4.96 ± 1.36	3.92 ± 39.99	3.53 ± 96.33	4.5 ± 9.51	0.052 ^a
	Control	4.8 ± 2.47	3.2 ± 11.89	3.2 ± 22.89	3.19 ± 10.93	0.064

*values are significantly different (p = > 0.05) at the terminal from the pre-test values

^avalues carrying similar alphabets are different significantly within the group from the pre-test.

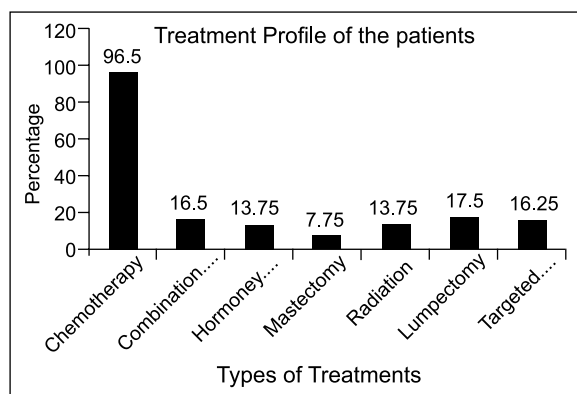


Figure 1: Treatment History of patients

The effect of nutrient modification presented a promising picture of future intervention. Correlation of nutrient intake with anthropometric measurement (Table 4) showed positive relationship between energy, fat, carbohydrate and protein intake and it was insignificant with vitamin C, iron and calcium.

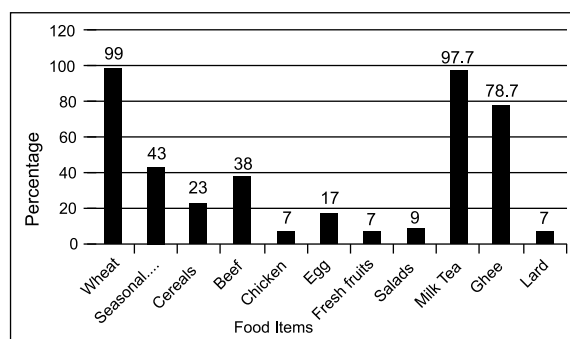


Figure 2: Dietary intake Patterns or the Most Common Foods

Due to chemotherapies along with surgical and radiation procedures in some patient the effect nutrient dense diet (Table 4) was very modest and a general decline in hemoglobin RBC count and WBC count occurred in the first two months. However the effects of consistent dietary interventions and modifications were

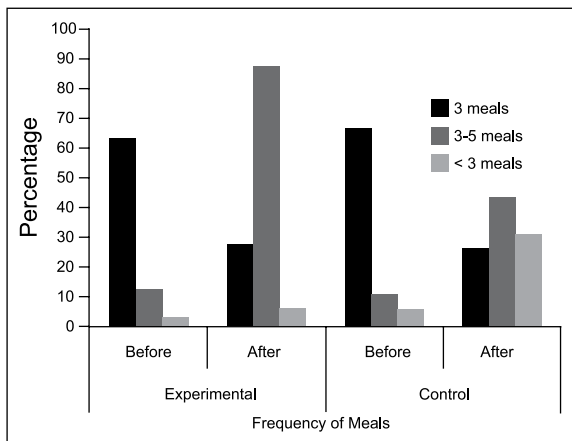


Figure 3: Meal Frequency Pattern of Sample Before and After Intervention

more obvious for the blood parameters by the end of study. Significant changes were noted for hemoglobin g/dl ($P=0.004$) and WBC $R\ 103/mm^3$ ($P=0.052$) and modest significance for RBC $R\ 106/mm^3$ ($p=0.006$). The difference in the three blood parameters of the control group was non-significant throughout the study period and rather a decline was noted in these parameters.

DISCUSSION

The current study assessed the effects of nutritional counseling and dietary modifications on the nutritional status of breast cancer patients. A variety of epidemiological factors were identified in our work. The most common being gross illiteracy, large family sizes, lower income levels and complex family structures. Dietary patterns showed an overall poor dietary intake. This might be due to the overall poverty situation, low income and gross illiteracy among the studied sample. The data for anthropometry showed a depressive younger age 44.48 years which is quite below the mean age of 48 ± 2 year reported in earlier studies from Pakistan²⁴. The data was in confirmation of earlier reports²⁵ that many patients are over weight at the time of diagnosis however the improvement in the overall prognosis and weight was managed through healthful dietary patterns as found in our study and that of the findings of Kwan et al²⁶, Yalların et al²⁷ and Demark-Wahnefried²⁸. Dietary counseling and nutritional interventions for the crucial nutrients brought positive and promising results and were in accordance with the studies done on weight management in chemotherapy treated malnourished patients²⁹. Our results showed to be of help in warding off the effects of treatment as proposed by Slaviero et al³⁰ and improvement of general dietary deficiencies as suggested by the work done on Iranian leukemia patients³¹. In the current study raising the number of meals (3 → 4 → 5) helped tolerate food intakes (Fig 3)

and stress along with hygienic practices at domestic level showed promising adaptation of the patients to treatments as per previous studies^{18,31}.

The current study also found weight loss or gain and alterations in blood indices are important indicators for the identification of malnutrition among cancer patients as described by Capuano et al³³ which can affect treatment outcomes³⁴. In our study weight loss and reduction in hemoglobin, RBC count and WBC was most obvious in the first month of treatment mainly due to chemotherapy however the modest gradual healthy weight decline in experimental group compared to the weight gain in the control group over a span of three months along with a significant differences in the hemoglobin (0.0041), RBC (0.007) and (0.06) WBC at the termination of the current study convey a very strong message of the immediate nutritional interventions of the patients and care givers in KPK. In our study we also found the positive correlation between anthropometry and nutrient demonstrating that if dietary quality and resulting malnutrition are not corrected and compensated failure in the treatments, side effects of therapies and related outcomes are expected as mentioned by Renshaw et al³⁴.

CONCLUSION

It is concluded that nutritional intervention and dietary modifications are the most effective tools in helping patients ensure adequate dietary intakes, minimizing treatment after effects, increase endurance and resistance to drugs and improving health and nutritional status.

RECOMMENDATIONS

There is a strong need to construct facts based palliative care models for the poor, illiterate and under privileged females of our region.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

- Ghaffar F:** Conceptualized ,designed .Statistical analysis & write up)
Javed N: Supervised work in the clinical set up.
Alam K: Data collection.

Authors agree 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.

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