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Effectiveness of Nutritional Counseling in Improving the Nutritional Status of Cancer Patients

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Abstract

Nutritional counselling identifies each patient's particular needs. The provision of nutritional support by individualized nutritional assessment and care plan developed by a professional nutrition physician and implemented by a dietitian is crucial for improving cancer patients' nutritional status. This study aimed to evaluate the effect of nutrition counselling either directly or by video in cancer patients. One hundred and one cancer patients were screened randomly and divided into two groups. Both groups had individualized nutritional Counseling given by a dietitian according to the nutrition care plan developed by a clinical nutritionist. Group 1: had direct nutritional counselling before starting the treatment, every follow-up visit, and daily by mobile phone for six months during therapy. Group 2: had predesigned weekly scheduled nutrition educational videos before starting treatment and weekly during treatment. Each group was subdivided into group (A) obese and group (B) non-obese. We found that direct daily nutrition counselling had significantly good results than weekly video counselling. Direct nutrition interventions positively impacted anthropometrics (body weight and BMI mid-arm circumference and triceps skinfold), nutrition status, protein, energy intake, and biochemical measurements used to assess nutritional statuses such as serum albumin and hemoglobin. These results highlight the importance of early incorporation of nutrition interventions as a component of cancer therapy for the oncology patient population.

Keywords: Cancer, Malnutrition, Nutrition assessment, Nutritional Counseling

Introduction

Cancer is the second leading cause of death of non-communicable diseases worldwide. Its prevalence increased by 25.4% between 2007 and 2017 [1]. Due to the effects of both, the disease and its intensive treatment, patients with cancer have an increased risk of

malnutrition. Various cancer-related mechanisms, such as systemic inflammation and hypoxic stress affect the patients' nutritional status. Patients might already present lower dietary intake before anticancer treatment and in addition, side effects of anticancer therapy, e. g. loss of appetite, dry mouth, or nausea that are associated with a lower energy intake [2]. Early detection and treatment of malnutrition are recommended for the prevention of cancer-related adverse outcomes [3]. For patients with cancer, the use of Mini Nutritional Assessment-Short Form (MNA-SF) is recommended by medical oncology societies as well as by practicing oncologists [4]. According to a study done by Farrell et al., 2013, nearly half of patients with cancer had not received any nutritional counseling from health care professionals [5].

Therefore, the present study aims to evaluate and elucidate the impact of different nutritional counseling either direct or by video for patients with cancer during chemo or radiotherapy.

Methods

This interventional study was carried out at therapeutic nutrition for cancer patients, complementary medicine outpatient clinic, Centre of Excellency, National Research Centre between October 1, 2019, and September 30, 2021. The study duration was over 6 months.

One hundred and one cancer patient were screened randomly and divided into two groups. Both groups had individualized nutritional counseling given by a dietitian according to the nutrition care plan developed by a clinical nutritionist. Group 1: had direct nutritional counseling before starting the treatment, and every follow-up visit, and daily by mobile phone for six months during chemo or radiotherapy. Group 2: had predesigned weekly scheduled nutrition educational videos before starting treatment and weekly during treatment. Each group was subdivided into group (A) obese, and group (B) non-obese cancer patients.

Informed consent was obtained from the patients after full explanation of the aim and benefits of the study.

Study tools: -

1- **Questionnaire** Including dietary intake assessment (24 hours recall – food frequency questionnaire-food diary).

2- **Nutritional counseling:** Daily individualized nutritional counseling and appropriate diet plan with -supplements when needed. One hundred and one cancer patient were screened randomly and divided into two groups. Both groups had individualized nutritional counseling given by a dietitian according to the nutrition care plan developed by a clinical nutritionist. Group 1: had direct nutritional counseling before starting the treatment, and every follow-up visit, and daily by mobile phone for six months during

therapy. Group 2: had predesigned weekly scheduled nutrition educational videos before starting treatment and weekly during treatment.

To compare proportions in the 2 studied groups intervention and comparison group we used for the sample size n:

$$n = (Z_{\alpha/2} + Z_{\beta})^2 * (p_1(1-p_1) + p_2(1-p_2)) / (p_1 - p_2)^2,$$

where $Z_{\alpha/2}$ is the critical value of the Normal distribution at $\alpha/2$ (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96), Z_{β} is the critical value of the Normal distribution at β (e.g. for a power of 80%, β is 0.2 and the critical value is 0.84) and p_1 and p_2 are the expected sample proportions of the two groups.

3- Laboratory analysis: Blood samples collected from all patients were complete blood count (CBC), including hemoglobin with normal range (13-17 g/dL) [6], liver function tests, including aspartate aminotransferase (AST) with normal range (10-40 U/L) and alanine aminotransferase (ALT) with normal range (7-56 U/L) [7], serum albumin (3.3-5 g/dL), calcium (8.5-10.3mg/dL), phosphorus (2.5-4.9 mg/dL), and kidney function tests, including urea (15-45mg/dL) and creatinine (0.7-1.3mg/dL)[8]. All laboratory tests were performed according to the standard operating procedures in our Biochemistry Laboratory.

4- Anthropometric measures measured weekly including body weight (Kg) using Hospital medical body weight and height scale, height in cm, body mass index (BMI) will be calculated (kg/m²), triceps skinfold (TSF) using skinfold caliber and mid-arm muscle-circumference (MAMC) using a measuring tape.[9]

Statistical analysis

Data analysis was performed using Statistical Program for Social Science version 17 (SPSS Inc., Chicago, IL, USA). Quantitative variables were described in the form of mean and standard deviation (SD), or median and range. To compare quantitative parametric variables between two groups the Student's t-test was applied. Comparison of nonparametric variables Mann–Whitney test was used for comparison between two groups. Wilcoxon signed-rank test is used to conduct a paired difference test of repeated measurements on a single sample Correlation studies were carried out using Spearman's rank correlation coefficient. A P value < 0.05 was considered significant in all analyses.

Results

In this current work, we compare nutritional counseling for cancer patients (n= 101 cases) randomly taken to maintain normal body weight and best clinical outcome by either direct daily intervention with a trained dietitian or by weekly video counseling.

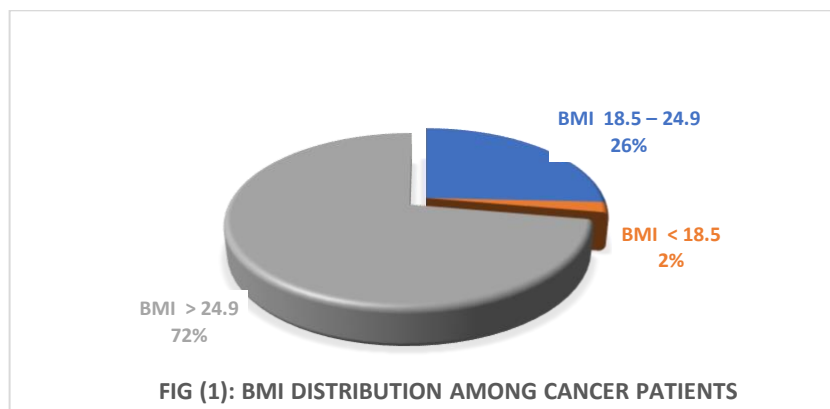


Table 1: Characteristics of anthropometric measurements of obese cancer patients before and after nutritional intervention in both groups.

Markers	Characteristics	Group1A Nutritional daily Intervention (n = 23)	p - value	Group 2A Nutritional video Intervention (n = 15)	p- value
Anthropometric measurements	Age, mean(SD) Year	50.00±8.84		53.87±8.17	
	Sex, n (%)Female	23(100%)		15(100%)	
	Weight before intervention (Kg) mean ± SD	92.46±22.40	0.458	79.4±15.37	0.690
	Basic weight after intervention (Kg) mean ± SD	89.24±20.42		80.03±13.566	
	BMI before intervention (Kg/m2) mean ± SD	36.23±9.28	0.433	33.33±5.07	0.718
	Basic BMI after intervention (Kg/m2) mean ± SD	35.73±6.45		33.56±4.30	
	Skinfold before intervention (mm) mean ± SD	35.39±6.01	0.179	32.51±4.87	0.803
	Skinfold after intervention, mean(SD) mm	34.70±5.38		32.60±4.73	
	Mid arm circumference before intervention (cm) mean ± SD	36.09±4.79	0.670	33.13±3.96	0.554
	Mid arm circumference after intervention (cm) mean ± SD	35.78±4.52		33.47±3.33	

*The p-value for t-test comparing between-group 1A and group 2A obese cancer patients
There were no significant differences at p > 0.05*

Table 2: Characteristics of anthropometric measurements of non-obese cancer patients before and after nutritional intervention in both groups.

Markers	Characteristics	Group1B	Group 2B	p - value	
		Nutritional daily Intervention (n = 26)	Nutritional video Intervention (n = 37)		
Anthropometric measurements	Age/years	49.92±9.90	51.46±8.54		
	Female	11(42%)	18(48%)		
	Male	15(58%)	19(52%)		
	Weight before intervention (Kg) mean ± SD	74.60±10.44	73.78±11.12	0.05*	0.001**
	Weight after intervention (Kg) mean ± SD	67.98±13.14	62.51±17.00		
	BMI before intervention (Kg/m2) mean ± SD	26.60±3.11	26.35±4.39	0.05*	0.001**
	Basic BMI after intervention (Kg/m2) mean ± SD	24.04±3.32	23.81±3.03		
	Skinfold before intervention (mm) mean ± SD	27.42±2.48	26.98±3.46	0.05*	0.001**
	Skinfold after intervention (mm) mean ± SD	26.38±5.91	24.56±5.86		
	Mid arm circumference before intervention (cm) mean ± SD	31.54±4.27	30.47±4.14	0.05*	0.001**
	Mid arm circumference after intervention (cm) mean ± SD	28.69±4.22	28.06±4.03		

The p-value for t-test comparing between group 1B and group 2B non-obese cancer patients.

*Statistically significant at $p \leq 0.05$

** Statistically highly significant at $p \leq 0.001$

Table 3: Descriptive baseline characteristics of patient's intake of diet as regard total calorie and macronutrients in both groups of cancer patients:

Markers	Characteristics	Group 1(A+B) N=49 (median-range)	Group 2(A+B) N=52 (median-range)	p -value
Total Calories and Macronutrients	K.cal	1560 (368 -3160)	1300 (490-2500)	0.01*
	CHO	218 (21.56 - 481)	197.32 (59.68-474)	0.123
	Protein	64 (31.25 – 120)	51.65 (22-97.5)	0.001**
	Fat	43 (11.51 – 101.2)	32.64 (11.05-65.9)	0.001**
	Fiber	6 (1.08 – 44.5)	6.54 (0.43-17.24)	0.619

The p-value for the Mann-Whitney test comparing between each two groups.

*Statistically significant at $p \leq 0.01$.

** Statistically highly significant at $p \leq 0.001$

Table 4: Characteristics of Laboratory blood tests of obese cancer patients before and after nutritional intervention in both groups.

Characteristics	Group1A	P - value	Group 2A	p -value
	Nutritional daily Intervention (n =23)		Nutritional video Intervention (n =15)	
Laboratory tests	Hb before intervention (g/dL) mean ± SD	0.468	11.71±1.22	0.001**
	Hb after intervention (g/dL) mean ± SD		10.35± 1.43	
	Alb before intervention (g/dl) mean ± SD	0.747	4.01±0.43	0.0001**
	Alb after intervention (g/dL) mean ± SD		3.48 ±0.73	

The p-value for paired t-test comparing between-group 1A and group 2A obese cancer patients. *Statistically significant at $p \leq 0.001$.

** Statistically highly significant at $p \leq 0.0001$

Table 5: Characteristics of laboratory blood tests of non-obese cancer patients before and after nutritional intervention in both groups.

Markers	Characteristics	Group1B	P - value	Group 2B	P - value
		Nutritional daily Intervention (n = 26)		Nutritional video Intervention (n = 37)	
Laboratory tests	Hb before intervention(g/dL) mean ± SD	12.08±1.72	0.0001**	11.55±1.35	0.0001*
	Hb after intervention (g/dL) mean ± SD			9.12±1.57	
	Alb before intervention (g/dL) mean ± SD	3.35±0.63	0.01*	3.41±0.55	0.0001*
	Alb after intervention (g/dL) mean ± SD			2.73±1.00	

The p-value for paired student t-test comparing between each group 1B and group 2B obese cancer patients before and after intervention

*Statistically significant at $p \leq 0.01$

** Statistically highly significant at $p \leq 0.0001$

Discussion:

Cancer itself and cancer treatment particularly chemotherapy seem to be important nutritional risk factors. Early nutritional assessment can identify problems to help patients increase or maintain weight, improve their response to treatment, and reduce complications [10].

In this current work, we compare nutritional counseling for two groups of cancer patients (n= 101 cases) randomly taken to maintain normal body weight, improve their clinical outcome by either direct daily intervention with a trained dietitian or by weekly video counseling.

In our study, we found that BMI for about 26% of cases was ranged (18.5 -24.9), 2% their BMI less than 18.5 and 72% of cancer patients their BMI was more than 24.9. So that the majority of our randomized cases were overweight, these findings agree with work done by Kitahara [11], who found in their work that peoples who are overweight or obese are at greater risk for many diseases, including cancer

Also, we found that there were a decrease in weight, BMI, Skinfold, and mid-arm circumference in both group 1 obese with direct counseling and group 2 obese with video counseling after 6 months of therapy but these decrease were not significant.

This agree with Bincy and Beena Chacko [10] who reported that both the anthropometric measurements [(BMI) and (MAMC)] were effective markers for assessing nutritional status. Shaikh [12] reported that several interventions have been adopted into clinical practice for cancer survivors who are obese, to reduce body weight and maintain it within a healthy weight range (BMI of 18.5 to 24.9 kg/m²).

In our study we found that there was a decrease in weight, BMI, Skinfold and mid-arm circumference in both group 1 with daily nutritional intervention counseling and group 2 with video weekly intervention) non-obese cancer patients, but this decrease were not significant This agrees with Ashtiani [13] who reported that Chemotherapy treatment plays an important role in decreased food intake, nutrient loss, energy expenditure and weight loss, particularly lean body mass. These conditions predispose patients towards malnutrition; Assessment of changes in body weight over time can be a more informative indicator of nutritional decline [10].

In this study, we found in the description of the patient's diet in both groups, as regards total calories of macronutrient, the caloric intake from Carbohydrate was the highest one. Our finding was supported with work done by Seidelmann [14] who found, a significantly increased risk of mortality associated with cancer both very high carbohydrate and very low fiber intake, suggesting that not only the type but also the amount of carbohydrates consumed is important for health. In another work done by Julia Tulipan and Barbara Kofler [15], they found that low carbohydrate diet improved self-reported quality of life in more than the majority of study participants.

In the current study, we found that the fiber content of the patient's diet was low in both groups. this agree with a study done by Farvid [16], who reported that high fiber foods help reduce overall calorie intake and help for maintaining a healthy weight, which is vital for reducing cancer risk. Recently, Autumn G Hullings [17] concluded that the

intake of fiber from whole grains was inversely associated with colorectal cancer, particularly rectal cancer.

Chemical Parameters: Biochemical and hematological parameters are subject to homeostatic mechanisms and may be altered by the underlying disease and/or treatment. The most common biochemical measurements used to assess nutritional status are blood parameters such as serum albumin and hemoglobin [10].

In our work there was a non-significant decrease in serum albumin level of the patients after 6 months of therapy in-group 1 obese with the daily intervention (Table 4), but there was a significant decrease in non-obese patients with daily intervention, (Table 5).

As regards video intervention group (group 2) there were highly significant decrease in serum albumin in both obese (table 4) and non-obese patients (table 5). This finding is in agreement with Negrichi and Taleb, 2020 who found a significant decrease in serum albumin in cancer patient after chemotherapy [18]. Serum albumin is a commonly utilized biochemical index of nutritional assessment despite being affected by infection, inflammation, fever, fluid shifts, liver or renal dysfunction, and the use of drugs such as asparaginase as well as steroids [19].

Sala [20] found that there was considerable value to the addition of serum albumin to arm anthropometry, especially in the proportion classified as severely depleted.

In the European Cancer Anemia Survey, 67% of patients had anemia during chemotherapy, this result is very close to anemia prevalence in our study (69%) [21]. In our study, we found a non-significant decrease in the mean hemoglobin level in group 1 obese cancer patients with daily nutritional intervention after 6 months of chemotherapy (Table 4), but there was a highly significant decrease in non-obese cancer patients, (Table 5).

As regards group 2 patients with video weekly intervention, there were highly significant decrease in both obese (Table 4) and non-obese (Table 5) cancer patient. This agrees with Bincy and Beena Chacko, [10] who investigated the effect of chemotherapy on various laboratory tests and found that hemoglobin decreased transiently at 5-8 weeks. Madeddu [22] reported that cancer-related anemia (CRA) is a common comorbidity in cancer patients at diagnosis. It does not appear to be a consequence of concurrent antineoplastic therapy; rather it is primarily caused by the low-grade chronic inflammation associated with cancer. In addition, malnutrition, lack of specific components such as iron, vitamins, and folic acid fundamental for erythropoiesis, eating disorders, inactivity, and other lifestyle factors may contribute to the multifactorial pathogenesis of anemia [22]. Natalucci [23] reported that to better understand the prognosis and to properly manage anemic cancer patients it is therefore crucial to correctly identify the existing low chronic inflammatory and oxidative state and to take into consideration the diagnosis of anemia before initiating antineoplastic treatment.

Conclusion The present study has found that cancer patients receiving chemotherapy or radiotherapy experienced weight change and a decrease in biochemical parameters. Nutrition interventions had a positive impact on anthropometrics, body weight, BMI, mid-arm circumference, and triceps skinfold, as well as on some biochemical measurements used to assess nutritional statuses such as serum albumin and hemoglobin. Direct daily intervention counseling had significantly good results than weekly video counseling. Therefore, nutritional counseling and interventions should be started immediately after cancer diagnosis and continued every visit during the treatment period and subsequently.

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فاعلية الاستشارات التغذوية في تحسين الحالة التغذوية لمرضى السرطان

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الملخص العربي

الاستشارات التغذوية هي تحديد الاحتياجات الخاصة وتوفير الدعم الغذائي وفقاً للتقييم التغذوي الفردي وخطة التغذية لكل مريض التي وضعها طبيب التغذية وينفذها اختصاصي التغذية أمراً بالغ الأهمية لتحسين الحالة التغذوية لمرضى السرطان. أجريت هذه الدراسة لمعرفة تأثير الاستشارات التغذوية التي تتم بشكل مباشر أو عن طريق الفيديو على مرضى السرطان. تم فحص مائة وواحد مريض من مرضى السرطان بشكل عشوائي وتم تقسيمهم إلى مجموعتين. كان لكل من المجموعتين استشارات تغذوية فردية تقدم لكل مريض بواسطة اختصاصي التغذية وفقاً للخطة التي وضعها طبيب التغذية. المجموعة الأولى: تلقوا استشارات تغذوية وتثقيفاً غذائياً بشكل فردي قبل بدء العلاج مع متابعة يومية عبر الهاتف المحمول لمدة ستة أشهر أثناء العلاج الكيميائي أو الإشعاعي. المجموعة الثانية: تم عرض مقاطع فيديو تعليمية أسبوعية عن التغذية الصحية قبل بدء العلاج الكيميائي أو الإشعاعي وأسبوعياً أثناء العلاج. تم تقسيم كل مجموعة إلى مجموعة أ (1 : 2) تشمل مرضى السرطان يعانون من السمنة ومجموعة ب (1 : 2) تشمل مرضى السرطان الذين لا يعانون من زيادة الوزن. وقد وجد ان الاستشارات التغذوية المباشرة ادت الى نتائج أفضل من التي تمت من خلال الاستشارات الاسبوعية عن طريق الفيديو. وجد ان التدخلات التغذوية المباشرة اليومية كان لها تأثير إيجابي على قياسات الجسم (الوزن ومحيط منتصف الذراع ومؤشر كتلة الجسم سمك طية الجلد في منطقة العضلة العضدية الثلاثية الرؤوس) والحالة التغذوية، وتناول السعرات اللازمة والبروتين وكذلك على بعض القياسات الكيميائية الحيوية المستخدمة لتقييم الحالة التغذوية مثل الألبومين والهيموجلوبين. تسلط هذه النتائج الضوء على أهمية الدمج المبكر للتدخلات التغذوية كأحد العناصر الهامة في علاج السرطان لمرضى الأورام.

الكلمات المفتاحية: السرطان، سوء التغذية، التقييم الغذائي، الاستشارات التغذوية.