Published online: 2020-04-26

NUJHS Vol. 4, No.3, September 2014, ISSN 2249-7110
Nitte University Journal of Health Science

Original Article

ASSESSMENT OF NUTRITIONAL STATUS OF PATIENTS RECEIVING CHEMOTHERAPY

Bincy R.[1] & Beena Chacko[2]
[1]Principal, Government College of Nursing, Alappey
[2]HOD, Department of Fundamentals of Nursing, PSG College of Nursing, Coimbatore, India.

Correspondence :
Beena Chacko
HOD, Department of Fundamentals of Nursing, PSG College of Nursing, Coimbatore, India.
E-mail : chacko.beena@gmail.com

Abstract:

Background: Cancer treatment itself and particularly chemotherapy seems to be an important nutritional risk factor. Early nutritional assessment can identify problems to help patients increase or maintain weight, improve their response to treatment, and reduce complications.This study aimed to determine the nutritional status of patients receiving chemotherapy.

Methods: A prospective study was conducted among 30 subjects between 30 and 70 years of age diagnosed with cancer of various sites and scheduled for first cycle of chemotherapy. Nutritional status of each subject was assessed based on nutritional parameters i.e. Anthropometric [BMI (body mass index), MAMC (mid-arm muscle circumference), TSF (triceps skinfold thickness)], MAC (mid-arm circumference) and Biochemical [(Hb and Albumin)] measurements before the initiation of chemotherapy, and follow-up assessment was performed on the third week after the first cycle of chemotherapy.

Results: In this study it has been found that 90% of subjects suffered from weight loss after the first cycle of chemotherapy (3wks post treatment). The't' test showed a significant decrease in TSF [t=5.4($p<0.01$)] and MAC [t=6.86 ($p<0.01$)] before and after 3 weeks of chemotherapy. The't' test showed a decrease in MAMC, t=5.83($p<0.01$) before and after 3 weeks of chemotherapy. The mean serum Albumin level of the patients before and after 3weeks of chemotherapy was 3.16±.50 g/dl and 3.07±.49 g/dl respectively. A significant decrease in albumin [t=4.17 at $p<0.01$ level] was observed in patients after chemotherapy. The mean haemoglobin level of the patients before and after 3weeks of chemotherapy was10.64±1.88 g/dl and10.41 ± 1.89 g/dl respectively, which showed a significant decrease [(t=13.32 at $p<0.01$ level)].

Conclusion: The nutritional status assessment must be carried out on each patient at the beginning and during the treatment. The cancer patients who are receiving chemotherapy are at risk of malnutrition.

Keywords: Cancer, chemotherapy, nutrition, nutritional status, nutritional status assessment.

Introduction :

Cancer and cancer therapy affect nutritional status through alterations on the metabolic system and reduction in food intake. All of the treatments for cancer i.e. systemic chemotherapy, radiation and surgery result in damage to normal tissues, and at the same time produce intense side effects such as diarrhea, oral mucositis, nausea, and vomiting that limit eating. Malnutrition and severe weight loss become evident as the disease progresses[1]. Chemotherapy treatment especially is associated with several side effects like nausea, vomiting, oral mucositis, xerostomia, diarrhea, constipation, and food aversion which play an important role in decreased food intake, nutrient loss, energy expenditure alterations and weight loss, particularly lean body mass.These conditions predispose patients towards malnutrition, especially when there are frequent and prolonged periods of chemotherapy treatment[2].

Access this article online
Quick Response Code

The purpose of nutritional screening is to identify those patients who are at nutritional risk and therefore at higher risk of complications. Malnutrition in hospitalized patients is a critical issue and has been associated with a significant increase in morbidity and mortality[3,4,5]. The detection of malnourished patients is possible if the importance of the issue is understood and the patient's nutritional status is

evaluated on admission to hospital. Nutritional status assessment may be directed to several nutrition features[1].

Assessment should begin while treatment is being planned and should focus on current nutritional status and anticipated nutritional problems related to treatment[6]. It has been suggested that maintaining energy balance or preventing weight loss during cancer treatment, is the most important nutritional goal especially those who are already undernourished[1].Several methods for assessing the nutritional status exist. The deficiency of one gold standard measure has led researchers to develop several nutritional indices to stratify patients at increased risk for poor outcomes[6]. The important factors to assess include physical examination, anthropometrics and laboratory parameters which may reflect nutrient deficits[6,7]. This study aimed to measure the nutritional status of patients receiving chemotherapy before the initiation and 3 weeks after the first cycle of chemotherapy.

Materials and Methods :

This study was undertaken after the approval by the Institutional Ethical Committee and obtaining consent from the study participants.The study was conducted in the Oncology wards of GKNM Hospital, Coimbatore. This was a prospective study where the subjects were studied before the initiation and 3 weeks after the first cycle of chemotherapy. A total of 30 subjects with cancer of stomach, lung, rectum, thyroid, breast, vaginal vault and oral cavity admitted for the first cycle of chemotherapy treatment who fulfilled the inclusion criteria were recruited using purposive sampling technique. Before the initiation of the data collection, informed consent was obtained from all the subjects. Data collection tools used were 1) demographic proforma to collect demographic data i.e. age, gender, marital status, education, type of cancer, chemotherapy drugs and 2) Anthropometric measurements (Height, Weight, BMI, Triceps skinfold thickness, Mid-arm circumference and Mid-arm muscle circumference) and biochemical parameters (Hemoglobin and Serum Albumin).

Data collection was done in two phases: - 1st phase- During the admission for the first cycle of chemotherapy, anthropometric measurements were assessed before the initiation of chemotherapy. Data about biochemical parameters was collected from the medical record.

2nd phase- After three weeks of first cycle of chemotherapy (during admission to the hospital for the second cycle), before the initiation of second cycle, anthropometric measurements were reassessed. Data about biomedical parameters was collected from the medical record.

Estimation of body mass index (BMI): The current height and weight of all the subjects were measured.Weight was taken to the nearest 0.l kg. Height was obtained by using stadiometer. The patients' feet were kept together against the measuring board and head was kept right. BMI was calculated using the formula: weight in kilograms (kg) divided by height in meters (m) squared.

Patients were categorized based on WHO standard range: - <18.5 kg/m2 (underweight), 18.5-24.9 kg/m2 (acceptable/normal weight), 25-29.9 kg/m2 (overweight), >30 kg/m2 (obese).

Estimation of Mid-arm muscle circumference (MAMC):Mid-arm muscle circumference was estimated by measuring triceps skinfold thickness (TSF) and mid arm circumference (MAC). Measurement of skin fold thickness at the triceps (TSF) provided an estimate of body fat, while mid arm circumference (MAC) and mid arm muscle circumference (MAMC) were used to estimate muscle mass.TSF was measured (to the nearest 0.2mm) using a calibrated skinfold caliper. Measurement of a vertical fold of the right arm was made midway between the tip of the acromion and olecranon process (at the same level as the MAC measurement), by pinching the skin fold with the thumb and index finger at the marked landmark and applying the calipers 1cm below, with the arm hanging vertically and the palm facing up. The average value of three measurements was directly compared to age-specific percentile values, with TSF below the 5th age-specific percentile considered evidence of

moderate/severe fat loss and subsequent moderate malnutrition. Mid-arm circumference (MAC) was obtained (to the nearest 0.1cm) by a measuring tape placed around the patient's upper arm in the same location where TSF measurement was made with the subject's arm hanging relaxed at their side. Mid-upper arm muscle circumference (MAMC) was calculated by using the formula: - MAC (cm) – [.314xTSF (mm)]. Average MAC and TSF values were used to calculate mid-arm muscle circumference (MAMC).

For descriptive purposes means and standard deviations (± SD) were reported. Changes in the outcome variable between baseline and the end of 3 weeks of chemotherapy were determined using paired t-test.

Results :

Demographic-socioeconomic characteristics: 36.6% (11) were male and 63.3% (19) female. The average age was 52.90 ± 13.03. 93.3% of them were married, 26.7% of the study subjects were graduates, and 36.3% of them were employed. 40% of them had less than 10,000/- monthly income.

Medical history: 16.6% of subjects were diagnosed with cancer of cervix, 10% with cancer of breast and stomach respectively, 6.6% were with cancer of ovary, thyroid, buccal mucosa, esophagus and larynx respectively. Other subjects were with Hodgkin's lymphoma, cancer of lung, rectum, vaginal vault and oral cavity.Most of the subjects (66.7%) were disease free. Majority of the subjects (64%) were anemic before and after the chemotherapy. Only 15% of the subjects complained of nausea, vomiting, taste changes during the three weeks post treatment.

Body Mass Index (BMI): BMI was calculated using the standard formula: Weight in kilograms (kg) divided by Height in meters (m) squared. The average height was 156.23±7.61. Regarding weight, 23.3% of subjects were underweight, 43.3% normal weight, 23.3% overweight and 6.6% obese. Three weeks after the treatment, all the subjects had weight loss from 1-3 kg irrespective of the type of cancer, except two subjects with cancer breast, who gained weight (1-2 kg), but remained in the same category of BMI. Before initiation of the first cycle of chemotherapy, the mean weight was 55.96±9.81 and after 3 weeks of chemotherapy mean weight was 54.36±9.96. The mean BMI before and 3weeks after chemotherapy was 23.17±5.33 kg/m^2 and 22.54±5.42kg/m^2 respectively. The t-test showed significant change i.e. decrease in weight before initiation and 3 weeks after chemotherapy [t=9.002, p<0.01]
(Table 1 and 1.1).

Mid-arm Muscle Circumference (MAMC): MAMC was calculated using the formula:

MAC (cm) – [.314xTSF (mm)] where MAC is mid-arm circumference and TSF is triceps skinfold thickness. These anthropometric measurements also showed a decrease before and after the chemotherapy. The mean triceps skinfold thickness (TSF) before and after 3 weeks of chemotherapy was 14.54±2.36 mm and 14.41±2.38 mm respectively, and the mid-arm circumference (MAC) before and after 3 weeks of chemotherapy was 27.46±1.62 cm and 27.27±1.61 cm respectively. The't' test showed a significant decrease in TSF and MAC measurements t=5.4(p<0.01) and t=6.86 (p<0.01) before and after 3 weeks of chemotherapy.

The mean mid-arm muscle circumference (22.90±1.35cm and 22.76±1.33 cm respectively) before and after 3 weeks of chemotherapy. The't' test showed a decrease in MAMC, t=5.83(p<0.01) before and after 3 weeks of chemotherapy [Table 1 and 1.1].

Biochemical Parameters: The mean serum Albumin level of the patients before and after 3weeks of chemotherapy was 3.16±.50 g/dl and 3.07±.49 g/dl respectively (Table2). The result on application of't' test showed significant decrease in the albumin levels [t=4.17, p<0.01], before and 3weeks after chemotherapy [Table 2.1].

The mean haemoglobin level of the patients before and after 3weeks of chemotherapy was10.64±1.88 g/dl and10.41 ± 1.89 g/dl respectively (Table2). Majority of the subjects (70%) were mildly anemic before and after 3 weeks of chemotherapy. The results show significant decrease in hemoglobin levels (p<0.01) before and after

Keywords : Cancer, chemotherapy, nutrition, nutritional status, nutritional status assessment. - Beena Chacko

3weeks of chemotherapy, but remained within the reference limits [Table 2.1]. Kallajavi et al. investigated the effect of chemotherapy on various laboratory tests, and found that hemoglobin decreased transiently at 5-8 weeks but remained within the reference limits.

Table 1 : Anthropometric characteristics of subjects before initiation and after three weeks of first cycle of chemotherapy n=30

Height 156.23±7.61	0 before the start of 1st cycle of chemotherapy Mean±SD	3weeks after 1st cycle of chemotherapy Mean±SD
Weight *	55.96±9.81	54.36±9.967
BMI *	23.17±5.33	22.54±5.42
TSF *	14.54±2.36	14.41±2.38
MAC *	27.46±1.62	27.27±1.61
MAMC *	22.90±1.35	22.76±1.33

* BMI (Body Mass Index) = Weight/ Height in m^2
* MAC (Mid-Arm Circumference in cm)
* TSF (Triceps SkinFold thickness in mm)
* MAMC (Mid-Arm Muscle Circumference) (cm) = MAC (cm) – [3.14 × TSF (mm)]

Table 1.1 : Paired samples't' test for Anthropometric measurements before initiation and after 3 wks of first cycle of chemotherapy n=30

Anthropometric measurements	Paired Differences			't' value	df	Sig. (2-tailed)
	Mean	SD	Std Error Mean			
BMI before and 3wks after chemotherapy	.633	.385	.07	9.002	29	.000 ?
MAMC before and after 3wks of chemotherapy	.147	.138	.025	5.83	29	.000 ?

* significant

Table 2 : Biochemical Measurements of subjects before initiation and after three weeks of first cycle of chemotherapy n=30

Laboratory test	Mean ± SD
Albumin before 1st cycle of chemotherapy	3.16±.50
Albumin after 3wks of first cycle of chemotherapy	3.07±.49
Hb before 1st cycle of chemotherapy	10.64±1.88
Hb after 3wks of first cycle of chemotherapy	10.41±1.89

* significant

Table 2.1 : Paired samples 't' test for biochemical measurements before initiation and after three weeks of first cycle of chemotherapy n=30

Laboratory test measurements	Paired Differences			't' value	df	Sig. (2-tailed)
	Mean	SD	Std Error Mean			
Albumin before and 3wks after 1st cycle	.086	.113	.020	4.176	29	.000 ?
Hb before & 3 wks after 1st cycle	.233	.095	.017	13.328	29	.000 ?

* significant

Discussion :

In the present study, about 90% of patients suffered from weight loss 3wks after the first cycle of chemotherapy, irrespective of the type of cancer, except two patients with cancer breast who had a weight gain of 1-2 kg. These changes in weight were not statistically significant. Weight changes are valuable indicators of nutritional risk. Assessment of changes in body weight over time can be a more informative indicator of nutritional decline (Davies. 2005).

In the present study BMI before chemotherapy and 3 weeks after chemotherapy was (23.17 vs 22.54; P< 0.01). Body mass index is positively associated with patients suffering from colon, kidney, esophagus, and breast cancer (Reeves et al. 2007). The triceps skinfold thickness, mid-arm circumference and mid-arm muscle circumference were also found to have a decrease before and after the chemotherapy treatment. Based on this study, both the anthropometric measurements [(BMI) and (MAMC)] were effective markers for assessing nutritional status.

Biochemical and hematological parameters are subject to homeostatic mechanisms and may be altered by underlying disease and/or treatment. The most common biochemical measurements used to assess nutritional status are blood parameters such as serum albumin and hemoglobin (Davies. 2005). In this study, all patients had a reduction in serum albumin level before and 3wks after chemotherapy, but remained within normal range (3.16±.50 g/dl and 3.07±.49 g/dl). This finding is in agreement with the finding of Usharani et al. (2004) where

Keywords : Cancer, chemotherapy, nutrition, nutritional status, nutritional status assessment. - Beena Chacko

a significant decrease in albumin before chemotherapy and 3 weeks after chemotherapy (p=0.018) was observed.

Majority (64%) of the subjects were mildly anemic before and 3wks after chemotherapy. Anemia is the most common hematological abnormality in cancer patients; unfortunately, it is often un-recognized and un-treated which can affect their nutritional status. Kallajavi et al. (2000), investigated the effect of chemotherapy on various laboratory tests, and found that hemoglobin decreased transiently at 5-8 weeks but remained within the reference limits, and albumin did not change.

The present study has found that cancer patients receiving chemotherapy experienced weight change, and decrease in biochemical parameters before and after chemotherapy. Therefore, these patients are at risk of malnutrition if they didn't have any help to prevent or to minimize the effect of chemotherapy on their nutritional status.

Conclusion :

Nutritional assessment throughout the course of chemotherapy plays an important role in the early recognition of cancer and treatment associated malnutrition. Knowledge of changes in nutritional status due to cancer or due to its therapy will not only help in better management of nutritional problems, but will also enable better clinical outcome[8]. Nutritional screening should be undertaken immediately following admission to ensure that any nutritional decline due to therapy or disease progression is identified as early as possible and can be dealt with. The implementation of both screening and assessment tools is essential for effective nutritional intervention and management of cancer patients receiving chemotherapy[9].

Based on the findings of this study, it is recommended that all cancer patients receiving chemotherapy require a baseline nutritional assessment with the start of the treatment, and should focus on current nutritional status and anticipated nutritional problems related to treatment. The health care personnel (physicians, nurse and dieticians) must make sure that during active cancer treatment patient should maintain adequate energy intake to prevent weight loss.

Acknowledgement :

We thank the management, nursing superintendent, medical oncologist and staff of the concerned hospital for their cooperation and support.

References :

1. A. Andreoli, A. Delorenzo, F. Cadeddu, L. Iacopino and M. Grande, New trends in nutritional status assessment of cancer patients, European Review for Medical and Pharmacological Sciences, 2011; 15: 469-480.
2. Mohamad Taghi Khorsandi Ashtiani, Nasrin Yazdani, Seyedeh Hasti Borghei, Hedayat Dehghani, Zahra Mokhtari and Shima Arastoo, Assessment of nutritional parameter outcome in laryngeal cancer patients undergoing laryngectomy, Iranian Journal of Otorhinolaryngology, Vol. 22, No.61, Autumn-2010:123-30
3. N. Khoshnevis, F. Ahmadizar, M Alizadeh and M E Akbari, Nutritional assessment of cancer patients in Tehran, Asian Pacific Journal of Cancer Prevention, Vol 13, 2012,1621-26.
4. Geoffrey Delmore, Assessment of nutritional status in cancer patients: widely neglected? Support Care Cancer, 1997.
5. Negar Shahmoradi, Mirnalini Kandiah and Loh Su Peng, Impact of Nutritional Status on the Quality of Life of Advanced Cancer Patients in Hospice Home Care, Asian Pacific Journal of Cancer Prevention, Vol 10, 2009
6. Giner M, Laviano A, Meguid M M and Gleason J R, A correlation between malnutrition and poor outcome in critically ill patients still exists, Nutrition, 1996.
7. Montoya J E, Domingo F Jr, Luna C A, Berroya R M, Catli C A, Ginete J K, Sanchez O S, Juat N J, Tiangco B J, Jamias J D, Nutritional status of cancer patients admitted for chemotherapy, Singapore Medical Journal, 2010; 51(11):860-864.
8. Naber T H, Schermer T and Jennifer Robinson, Prevalence of malnutrition in nonsurgical hospitalized patients and its association with disease complications, American Journal of Clinical Nutrition, 1997; 66, 1232-39.
9. Huhmann M B and Cunningham R S, Importance of nutritional screening in treatment of cancer-related weight loss, Lancet Oncol 2005, 6(5):334-343.