

Nutritional status of cancer patients admitted for chemotherapy at the National Kidney and Transplant Institute

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ABSTRACT

Introduction: Malnutrition is common among cancer patients. This study aimed to determine the overall prevalence of malnutrition among patients undergoing chemotherapy and to determine the predictors of malnutrition among cancer patients.

Methods: A cross-sectional study was conducted on 88 cancer patients admitted for chemotherapy at the National Kidney and Transplant Institute, Philippines, from October to November 2009. Subjective Global Assessment (SGA), anthropometric data and demographic variables were obtained. Descriptive statistics, ANOVA and logistic regression analysis were performed between the outcome and variables.

Results: A total of 88 cancer patients were included in the study. The mean age of the patients was 55.7 +/- 14.8 years. The mean duration of illness was 9.7 +/- 8.7 months and the mean body mass index (BMI) was 22.9 kg/m². The mean Karnofsky performance status was 79.3. 29.55 percent of the patients had breast cancer as the aetiology of their illness. 38 patients (43.2 percent) had SGA B and four (4.5 percent) had SGA C, giving a total malnutrition prevalence of 47.7 percent. The patients were statistically different with regard to their cancer stage (p is less than 0.001), weight (p is 0.01), BMI (p is 0.004), haemoglobin level (p is 0.001) and performance status by Karnofsky score (p is less than 0.001), as evaluated by ANOVA. Logistic regression analysis showed that cancer stage and Karnofsky performance score were predictors of malnutrition.

Conclusion: About 47.7 percent of cancer patients suffer from malnutrition, as classified by SGA. Only cancer stage and Karnofsky performance status scoring were predictive of malnutrition in this select group of patients.

Keywords: cancer, chemotherapy, nutritional status

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INTRODUCTION

Malnutrition is common among hospitalised patients. However, the nutritional aspect of medical management has not always been given first priority. Cancer patients suffer from protein energy malnutrition throughout the evolution of their disease,⁽¹⁾ with elevated basal energy requirements due to their inherent illness and decreased oral intake due to reduced gustatory senses. This is the first study that examined the prevalence of malnutrition among cancer patients admitted for chemotherapy at the National Kidney and Transplant Institute (NKTi), Philippines.

Most patients with malignancies are considered to be at risk for malnutrition, and therefore require further nutritional support. A study by Gupta et al showed that well-nourished (a good Subjective Global Assessment [SGA] score) cancer patients are associated with better survival outcomes. This augments the role of aggressive nutritional intervention in improving patient outcomes in cancer care.⁽²⁾ However, routine nutritional screening for cancer patients is not always performed at our institution due to the scarcity of logistics, the lack of a structural framework for nutrition and absence of a nutrition support group. The objectives of this study were to determine the overall prevalence of malnutrition among cancer patients undergoing chemotherapy at NKTi and the predictors of malnutrition/undernutrition among these patients. Determining the gravity of malnutrition among cancer patients will further bolster the creation of a nutrition support group that will oversee nutrition screening and possible intervention among this select group of patients.

METHODS

This is a cross-sectional analytical study that was conducted at the chemotherapy unit and wards of NKTi from October to November 2009. 88 consecutive cancer patients undergoing chemotherapy were included in the

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Table I. Demographic profiles of the study population.

Variable	Mean \pm SD
Age (yrs)	55.70 \pm 14.80
Cancer Stage: No.(%)	
Stage 1	1 (1.10)
Stage 2	21 (23.86)
Stage 3	18 (20.45)
Stage 4	48 (54.55)
Duration of illness (mths)	9.70 \pm 8.70
Weight (kg)	59.10 \pm 12.60
Height (cm)	160.20 \pm 8.40
BMI (kg/m ²)	22.90 \pm 4.10
BMI median (range)	22.46 (13.40 – 35.90)
Haemoglobin (g/dL)	11.90 \pm 1.60
Karnofsky score	79.30 \pm 11.70
Cancer type: No.(%)	
Haematological	13 (14.77)
Gynaecological	4 (4.55)
Colorectal	16 (18.18)
Breast	26 (29.55)
Lung	20 (22.90)
Urologic	5 (5.68)
Unknown primary	1 (1.13)
Head and neck	3 (3.41)

study. The inclusion criteria were subjects aged \geq 18 years, those who had not been hospitalised in the month prior to the study and those who did not have any signs of infection or disease activity. Informed consent was obtained from the patients. The research protocol was approved by the Research Review Board of the Department of Internal Medicine, NKT. The exclusion criteria were the presence of active illness and infection, as well as connective tissue disease. This study was based on a 95% confidence level, with a confidence interval of \pm 10. Using the 2008 census of 938 patients seen at the Oncology section, and at 50% prevalence rate, we arrive at a sample size of 88.

The nutritional status of the patients was assessed in two ways. First, each patient was graded according to the 3-point Subjective Global Assessment (SGA) scale, and assessed based on the patient's history and physical examination. History-taking focused on weight loss in the preceding six months as well as gastrointestinal symptoms such as anorexia, vomiting, diarrhoea, food intake, functional capacity and co-morbidity. Physical examination focused on the loss of fat stores and signs of muscle wasting. Scoring was as follows: A: normal or mild malnutrition; B: moderate malnutrition; and C: severe malnutrition (Appendix 1). SGA was carried out by three medical residents who were adequately trained to conduct the assessment. Anthropometric measurements were then taken. Body weight was measured using an Ohaus weighing scale, and height was measured using

Table II. Demographics and clinical profile by Subjective Global Assessment classification.

Variable	Mean value			p-value
	SGA A (n = 46)	SGA B (n = 38)	SGA C (n = 4)	
Age (yrs)	52.76	58.40	62.30	0.14
Cancer stage	2.89	3.68	4.00	< 0.001
Duration of illness (mths)	8.67	10.13	18.00	0.11
Weight (kg)	60.85	58.70	41.70	0.01
Height (cm)	160.47	160.30	155.50	0.52
BMI (kg/m ²)	23.66	22.93	17.36	0.004
Haemoglobin (g/dL)	12.24	11.70	9.38	0.001
Karnofsky score	86.10	74.74	45.00	< 0.001
Gender				0.07

Table III. Prevalence of malnutrition by Subjective Global Assessment.

Subjective Global Assessment score	No. (%)		
	Female	Male	Total
A	34 (38.64)	12 (13.64)	46 (52.30)
B	19 (21.59)	19 (21.59)	38 (43.20)
C	3 (3.41)	1 (1.14)	4 (4.50)
Total	56 (63.64)	32 (36.36)	88 (100.00)

a stadiometer. The body mass index (BMI) was also computed.

The patients' risk profiles were evaluated. Variables such as age, gender, the type, duration and stage of cancer, and the haemoglobin level were evaluated. Performance status was generated using Karnofsky scores (Appendix 2) and the BMI of the patients was calculated. Categorical variables were expressed using descriptive statistics (frequency, percentages) and continuous variables were expressed as mean \pm standard deviation. ANOVA F test was used to compare the variances among the different SGA groups. Multiple logistic regression analysis was conducted in order to determine the independent predictors of malnutrition. A p-value < 0.05 was considered statistically significant. All statistical analyses were conducted using SAS software version 9.0 (SAS Institute, Cary, NC, USA).

RESULTS

A total of 88 cancer patients were included in the study. The mean age of the patients was 55.70 \pm 14.80 years. Most of the patients were female (n = 56, 63.64%). The mean duration of illness from the time of diagnosis was 9.70 \pm 8.70 months. The mean haemoglobin level of the patients was 11.90 \pm 1.60 g/dL, and the mean BMI was 22.90 kg/m². The patients had a mean performance

Table IV. Distribution of malnutrition according to the type of cancer.

Cancer type	SGA score			Total
	A	B	C	
Breast	17	7	2	26
Colon and rectal	7	8	1	16
Unknown primary	1	0	0	1
Gynaecological	3	1	0	4
Head and neck	2	1	0	3
Haematological	5	7	1	13
Lung	9	11	0	20
Urologic	2	3	0	5
Total	46	38	4	88

Table V. Predictors of malnutrition.

Predictor	Estimate	p-value
Gender	1.08	0.10
Age	0.003	0.86
Cancer stage	0.6331	0.02
Duration	-0.006	0.82
Weight	0.326	0.08
Height	-0.274	0.08
BMI	-0.914	0.05
Haemoglobin	-0.061	0.73
Karnofsky score	-0.158	< 0.001

status of 79.30 based on the Karnofsky scoring. 48 out of the 88 cancer patients were in stage IV of their illness. 29.55% of them had breast cancer as the aetiology of their malignancy, followed by lung cancer at 22.90% and colon cancer at 18.18% (Table I). Using ANOVA to determine the differences across the groups by SGA, it was shown that the patients were statistically different with regard to their cancer stage ($p < 0.001$), weight ($p = 0.01$), BMI ($p = 0.004$), haemoglobin level ($p = 0.001$) and performance status, as observed by the Karnofsky score ($p < 0.001$) (Table II).

Table III shows that 38 (43.20%) patients were assessed with SGA B, and four (4.50%) patients with SGA C; this accounted for an overall prevalence of malnutrition of 47.7%, which suggests that nearly half of the patients were malnourished, and at a further risk of undernutrition. Table IV shows that among the different cancer types, colorectal, haematological and lung cancer patients were more malnourished (SGA B and C). Nine out of the 16 patients with colorectal cancer were malnourished. Out of 13 patients with haematological cancer, eight had SGA B and C, while among the 20 patients with lung cancer, 11 had SGA B. Patients who were classified as SGA B and C were considered to be malnourished. Multiple logistic regression analysis was conducted to determine

Table VI. Analysis of maximum likelihood estimate.

Parameter	Estimate	p-value
Intercept	9.2674	0.0002
Stage	0.7876	0.001
Karnofsky score	- 0.1478	< 0.0001

the predictors of undernutrition. After adjusting for gender, age, duration of illness, weight, height, BMI and haemoglobin level, it was found that only cancer stage ($p = 0.02$) and performance status by Karnofsky score ($p < 0.001$) were independent predictors of undernutrition (Table V).

Running the logistic regression model again using only the significant predictors, cancer stage and Karnofsky score (Table VI), the regression equation was as follows: $\text{Logit}(P) = 9.2674 + 0.7876(\text{stage}) - 0.1478(\text{Karnofsky score})$. The equation in terms of probability was as follows:

$$P = \frac{1}{1 + e^{-(9.2674 + 0.7876(\text{stage}) - 0.1478(\text{Karnofsky score}))}}$$

Using the equation above, given the cancer stage and the Karnofsky score of a patient, the probability of undernourishment was identified.

DISCUSSION

Malnutrition is a prevalent problem in hospitals, but it is most often unnoticed and neglected. It is important to implement appropriate nutritional screening tools to identify patients who are at risk.⁽³⁾ Cancer patients are especially at risk for malnutrition since they have elevated metabolic requirements due to tumour burden, poor or insufficient oral intake due to chemotherapy-induced emesis and inherently altered taste and smell.^(4,5) Malnutrition is prevalent among cancer patients, with foreign literature showing a prevalence rate of 40%–80%.^(2,6) A local study by Tolentino and Quizon reported that among 599 cancer patients, BMI class change (from normal to underweight) was greater for gastrointestinal than non-gastrointestinal malignancies, although weight loss was fairly common for both groups.⁽⁷⁾ Nutrition risk evaluation conducted by the Spanish Nutrition and Cancer Group showed that 64% of their cancer patients were suffering from malnutrition, which increased up to 81% among patients undergoing palliative treatment.⁽⁸⁾ Due to the high prevalence of malnutrition among cancer patients, it is important for every physician to assess the nutritional status of these patients.

The nutritional status of cancer patients can be assessed through multiple indices. The easiest to use would be the SGA. SGA was originally created by Detsky

et al to identify nutritionally at-risk groups prior to gastrointestinal surgery.⁽⁹⁾ However, it is now considered the standard of assessment of nutritional status, and is used among varied groups of patients, from patients with renal failure (accepted by the Kidney Disease Outcomes Quality Initiative guidelines) to cancer patients. It is a simple and reliable predictor of nutritional status,⁽¹¹⁾ which is reproducible and non-invasive.⁽¹²⁾ The SGA is also an accepted and validated tool for the assessment of nutritional status among Filipino patients, and is currently used by different local nutrition support groups as a nutritional screening tool. Among cancer patients, numerous studies have been conducted using SGA, and it has proven to be a reliable assessment tool for screening malnutrition, and at the same time, acts as a predictor for survival among cancer patients.⁽¹⁰⁾ Anthropometric parameters are also used to assess nutritional status. BMI, weight, height, triceps skinfold (TSF), mid-arm circumference (MAC) and mid-arm muscle circumference (computed as $MAC - 3.1215 \times TSF$) have all been used in the assessment of nutritional status. The advantages of using these parameters would include ease of obtaining data as well as fast and rapid assessment of the nutritional status.

Our study was carried out using the SGA to determine the nutrition of different cancer patients. SGA established that approximately half (47.6%) of the patients admitted for chemotherapy at our institution were malnourished or at a high risk for further deterioration of nutritional status. Of the different SGA components, a weight loss of more than 10% for the past six months had been the most prevalent trend among the cancer patients. In addition, their food intake was affected, probably due to chemotherapy-induced loss of appetite or chemotherapy-induced mucosal injury of the gastrointestinal tract. However, the concurrent use of nutritional supplements and anti-emetics was not taken into consideration in the current study.

The Karnofsky performance scale has been used as a performance scale among oncology patients since 1948, and is considered to be the gold standard in measuring performance status among cancer patients.^(13,14) Our patients were mostly ambulatory, and had relatively good functional capacity and performance status, as evaluated by the Karnofsky score. Moreover, the majority of them had a normal or near normal BMI. Also, most of them were presumed to have good nutrition. This was probably the reason for not conducting nutritional screening among them. To our knowledge, this was the first study that examined the nutritional status of cancer patients. Given this data, nutritional screening and possibly, intervention, can be done to further improve patient outcomes. Our

study emphasises the need for routine and serial nutritional screening, especially among high-risk patients, even if they seem to have a good performance status, weight and BMI.

In conclusion, the prevalence of malnutrition among cancer patients in our study was 47.7%, as classified by SGA, and is consistent with the results obtained in previous published studies. Only cancer stage and performance status by Karnofsky scoring were independent predictors of malnutrition in this select group of patients.

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APPENDIX 1. Subjective Global Assessment

Name:
 Room:
 Age:
 Weight:
 Height:
 BMI:
 Ideal body weight:
 Diagnosis:

Criteria	Normal/mild	Moderate	Severe
Weight loss	None	< 10% of usual weight	> 10% of usual weight
Food intake (1–2 months)	No change	Suboptimal	Starvation
Gastrointestinal symptoms > 2 weeks	None	Nausea, vomiting	Severe anorexia and diarrhoea
Functional capacity	No change	Dysfunction < 3 weeks, suboptimal work, bedridden < 2 weeks	Bedridden > 2 weeks
Disease and relation to nutritional requirements	No or low stress	Moderate stress	Severe stress
Physical examination	Zero subcutaneous fat and/or muscle loss	+1 to +2 subcutaneous fat and/or muscle loss	+3 subcutaneous fat and/or muscle loss
Oedema/ascites	None	None	+1 or +2
SGA grade	A	B	C

APPENDIX 2. Karnofsky Scoring Table

Able to carry on normal activity and work; no special care needed.

- 100 Normal; no complaints; no evidence of disease
- 90 Able to carry on normal activity; minor signs or symptoms of disease
- 80 Able to carry on normal activity with effort; some signs or symptoms of disease

Unable to work; able to stay at home and cater to most personal needs; varying amount of assistance required.

- 70 Cares for self; unable to carry on normal activity or do active work
- 60 Requires occasional assistance, but able to care for most of personal needs
- 50 Requires considerable assistance and frequent medical care

Unable to care for self; requires equivalent of institutional or hospital care; disease may be progressing rapidly.

- 40 Disabled; requires special care and assistance
- 30 Severely disabled; hospital admission is indicated although death is not imminent
- 20 Very sick; hospital admission necessary; active supportive treatment necessary
- 10 Moribund; fatal processes progressing rapidly
- 0 Died