Nutritional Status of the Cancer Patients Receiving Chemotherapy in an Oncology Centre, Nepal

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ABSTRACT

Introduction: Chemotherapy affects the nutritional status of cancer patients. Side effects of anticancer therapies can lead to inadequate nutrient intake and subsequent malnutrition. Nutrition is an important factor in treatment, affects patient's mortality and morbidity.

Objective: The study was carried to find nutrition status of cancer patients receiving chemotherapy and determinants of nutrition status.

Methods: Descriptive, cross sectional study was carried out with sample of 198 cancer patients (>18 years) receiving chemotherapy. Data was collected using face to face interview technique using modified Patient Generated Subjective Global Assessment and Karnofsky Performance Scale tool. SPSS was used for data analysis, descriptive and Inferential statistics to find determinants of malnutrition.

Results: The mean age was 52 ± 14.13 years, 21.7% were anaemic before and 24.7 were anaemic after administration of chemotherapy. Unexpected weight loss and Karnofsky performance score were determinants of nutritional status. Karnofsky Performance Score was significantly associated with nutrition status with AOR of 7.308 (CI=2.593-20.592). Similarly, Unexpected weight loss was significantly associated with nutrition status with AOR of 10.733 (CI= 1.378-83.623).

Conclusions: Large number of cancer patients receiving chemotherapy were malnourished. Unexpected weight loss and Karnofsky performance score were significant factors for nutrition status maintenance. Therefore, nutrition intervention program should be targeted to improve these factors for intervention.

Keywords: Cancer; chemotherapy; Karnofsky Performance Scale; Patient Generated Subjective Global Assessment; unexpected weight loss.

INTRODUCTION

Worldwide, an estimated 19.3 million new cancer cases and almost 10.0 million cancer deaths occurred in 2020.

The global cancer burden is expected to be 28.4 million cases by 2040.[1]People newly diagnosed with cancer per year in Nepal were 20,508 in 2020. The highest number of people suffered from lungs cancer followed by cervix. Total number of death due to cancer was 13,629 in Nepal in 2020.[2] In a study done 20% of the cancer patients die of symptoms related to malnutrition rather than cancer itself.[3]

In a study done in Philippines revealed that 47.7% of cancer patients receiving chemotherapy suffered from malnutrition. Well-nourished patients are associated with better survival outcomes whereas, the deranged

nutrition status affects the survival, lengthen the hospital stay, cost and increases morbidity and mortality.[4]

The study findings would be beneficial in revealing the prevalence and determinants of malnutrition among cancer patients receiving chemotherapy. The nurses working in the oncology setting might use the findings as reference to comprehend the burden of malnutrition in cancer patients receiving chemotherapy. It may also guide nurses to carry out the interventions for prevention and management of malnutrition in patients.

The objective of the study is to find out the nutritional status of cancer patients receiving chemotherapy and to elicit the determinants of malnutrition in them.

METHODS

Descriptive, cross sectional design was adopted to assess the nutritional status and the determinants of nutritional status of the cancer patients receiving chemotherapy. The study was conducted in chemotherapy ward and day care of Bhaktapur cancer hospital, Dudhpati, Bhaktapur, Nepal. The study population were cancer patients who had already received one cycle of chemotherapy. There were on an average 241 patients per months receiving chemotherapy. Convenience sampling technique was used and the sample size was 198. As convenience sampling was used the sample may not have been representative of larger population, sampling bias may have occurred, findings may not have been applicable to the broader population i.e. lack of generalizability as the sample was not randomly selected. As per the research done by Nunilion Vergara the prevalence of malnutrition in cancer patients receiving chemotherapy was 40%.[5] Assuming the prevalence of malnutrition in cancer patients receiving chemotherapy 40%, and using

$n = Z^2 * p * q / l^2$,

where, n= minimum sample size required, 188

Z=1.96 at 95% Confidence Interval (CI)

p=past prevalence, 0.4

q = 1-p = (1-0.4)

l = margin of error, 7%

Using 5% non-response rate i.e. 9.8 approximately equal to 10. Total sample; 188+10 = 198

The data was collected for one month. Informed written consent was taken before the interview with the patient. The consent was translated in Nepali language. Face to face interview technique was used to collect data, weight and height of the patient was taken using digital weighing machine which was calibrated every day and standard stadiometer was used for taking height. Patient haemoglobin before and after chemotherapy was taken from patient's chart.

Karnofsky Performance Scale (KPS) and Patient Generated Subjective Global Assessment (PGSGA) tools were used to make questionnaire. Karnofsky performance scale for measurement of performance status of the

patient. A study showed the scores in the scale ranges from 0 to 100. The categorization is KPS 80-100 = Normal, KPS 70-50 = Unable to work, KPS 0-40 = Unable to care for self.[6] Another tool is modified PG-SGA. According to a book entitled "Integrating nutrition in your cancer program" there are seven parameters in the questionnaire. They are weight, dietary pattern, sign and symptoms impending nutrition, performance status of the patient, Comorbidities, metabolic demand, physical examination. The tool classifies nutrition status into no/ mild malnutrition PG-SGA- A: 0-3, Moderate malnutrition PG-SGA- B: 4-8, Severe malnutrition PG-SGA- C: ≥ 9.[7]

Confidentiality was maintained by keeping information in such a way that only researcher could access them. Privacy was maintained throughout the study by interviewing in the separate room. Obtained data was used for research purpose only. Consistency was obtained by collecting data by the trained researcher only (single person). The reliability coefficient was calculated by Crohnbach alfa and it was 0.73.

The inclusion criteria were patients of age more than or equal to 18 years, patient not having infection, nutrition related problem and acutely ill, patient who had received one cycle of chemotherapy, those who participated and gave consent voluntarily. Exclusion criteria were, the patient who had brain tumour and those who could not speak.

Pretesting was done in wards among the cancer patients who received chemotherapy and the patients were excluded from the study. Study was conducted after obtaining approval from the institutional review committee of Tribhuvan University, Institute of Medicine, reference no 244 (6-11-E)2/072/073. Privacy was ensured by collecting data from each respondent separately in a separate room and confidentiality was maintained by coding the questionnaire. The questionnaire was Karnofsky Performance Scale (KPS) and Patient Generated Subjective Global Assessment (PGSGA)

The anthropometric measurement was measured by following WHO anthropometric measurement technique by trained researcher herself. Weight was measured with digital weighing scale. The weighing machine was calibrated in zero scale after weighing each cancer patients in kilograms. The patients were measured without extra clothes, shoes and socks. Height was measured on a flat surface, without shoes, socks and cap. Patient's shoulders, buttocks, heels touched the back, where cancer patients lean and marking the highest point on in centimeter at eye level. The weight machine was callibrated everyday before starting the measurement. Extensive literature search was done to read,understand use the PG SGA tool by the researcher.

Data entry and analysis was done in SPSS version 16. Descriptive statistics were used to describe the socio demographic, disease related

characteristics of cancer patients whereas inferential statistics i.e. Chi square test, binary logistic regression and multivariate analysis were used to find out the significant differences between independent variables and dependent variables. Variables that were significant at 5% level of significance in bi-variate analysis had been analysed by multivariate logistic regression. Hosmer and Lameshow test were done to test the goodness of fit. Model was found to be fit ($p = 0.911 > 0.05$). In multivariate analysis coefficient of determination ($R^2 = 0.308$) i.e. only 30.8% of the change in undernutrition is explained by the variables in the study.

RESULTS

The mean age of the cancer patients was 52 ± 14.13 years and varied from 18 to 83 years. Mostly 28.28% belonged to age group 50 to 59 years and female cancer patients were 61.6%. The cancer patients who were literate were 50.5% among those literate cancer patients 43% could only read and write. Majority of the cancer patients (80.3%) had received cancer nutrition related information. The mean haemoglobin level of the cancer patients before and after the initiation of chemotherapy was 12.14 ± 1.99 and 12.01 ± 1.48 respectively, additionally, 21.7% of the cancer patients were Anaemic before and 24.7% of the patients were Anaemic after the administration of chemotherapy.

The commonest cancer is breast cancer as 23.2% of the cancer patients have breast cancer followed by carcinoma of genitourinary tract (20.7%). More than half of the cancer patients (51.5%) had combined chemotherapy regimen, whereas, patients who underwent surgical intervention were 51%. The mean score was 74.04 ± 12.93. Majority (80.3%) of the cancer patients were receiving first line chemotherapy drugs and patients who received radiotherapy as their treatment modality were 62.6%. There were four factors which were significant in bivariate analysis. They are combination status of chemotherapy, radiotherapy receiving status, Karnofsky performance score and unexpected weight loss. Among these variables Karnofsky performance score and unexpected weight loss are significantly related to nutrition status. Karnofsky performance score is highly associated with nutrition status (p- value = 0.000, adjusted OR= 7.308, CI = 2.593-20.592). Those cancer patients who are unable to work and care for self are 7.308 times more malnourished than those who are able to work. Unexpected weight loss is also associated with nutrition status (p- value = 0.023, adjusted OR = 10.733, CI = 1.378 - 83.623). Those patients who reported unexpected weight loss are 10.733 times more malnourished than patient not reporting unexpected weight loss. Binary logistic regression was applied to get the final model. Hosmer and Lameshow test were done to test the goodness of fit. Model was found to be fit (p = 0.911 > 0.05). In multivariate analysis coefficient of determination ($R^2 = 0.308$) i.e.

only 30.8% of the change in under nutrition is explained by the variables in the study.

The mean score was 74.04± 12.93. More than half of the cancer patients (50.50%) were unable to work. (Table 1)

Table 1: Karnofsky performance score of the cancer patients receiving chemotherapy.

Karnofsky Performance Score	Number	Percentage
Mean score	74.04 ± 12.93	
Karnofsky Performance Score grading		
Able to carry normal activities	96	48.5
Unable to work	100	50.5
Unable to selfcare	2	1.0

Majority of the cancer patients were malnourished (83.8%). Among the patient who were malnourished 54.8% of the cancer patient were severely malnourished. Mean nutrition asssessment score was 8.33±4.29. (Table 2)

Table 2: Classification of malnutrition in the cancer patients receiving chemotherapy.

Category of Malnutrition	Number	Percentage
Nutrition status		
Normal	32	16.2
Malnourished	166	83.8
Malnutrition classes (n=166)		
Moderate malnourished	75	45.2
Severe malnourished	91	54.8
Mean nutrition assessment score	8.33 ± 4.29	
Score range	1-22	

Table 3 represents the association bretween Nutrition status and cancer and chemotherapy related variables. There was no significant association between nutrition status and hemoglobin level, types of cancer and awareness related to nutrition.

Table 3:Association between nutrition status and cancer chemotherapy related factors.

Cancer-Chemotherapy Related Factors	Nutrition Status		Crude OR (95%CI)	p- value
	Malnourished (n%)	Normal(n%)		
Hemoglobin before chemotherapy				
Hb≤11 mg/dl	35(81.4)	8(18.6)	0.802	0.623
			(0.332-1.938)	
Hb>11 mg/dl	131(84.5)	24(15.5)	**Ref**	
Hemoglobin after chemotherapy				
Hb≤11 mg/dl	42(85.7)	7(14.3)	1.210	0.681
			(0.488-3.000)	
Hb>11 mg/dl	124(83.2)	25(16.8)	**Ref**	
Types of cancer				
Head and neck	34(100)	0(0)	**Ref**	
Gastrointestinal	28(80)	7(20)	0.000(0.0)	0.998
Breast	37(80.4)	9(19.6)	0.900(0.247-3.274)	0.873
Lungs	17(89.5)	2(10.5)	0.832(0.876-0.256)	0.832
Genitourinary	32(78)	9(22)	0.42(0.072-2.483)	0.341
Others	18(78.3)	5(21.7)	1.013(0.294-3.486)	0.984
Awareness regarding nutrition				
No	33(84.6)	6(15.4)	1.075	0.883
			(0.409-2.825)	
Yes	133(83.6)	26(16.4)	**Ref**	

*p-value<0.05=significant, Pearson χ^2 test

Table 4 represents the association between Nutrition status and cancer and chemotherapy related variables. Combination status is statistically significant with the nutrition status. Those patient who received single chemotherapy are 2.365 times more malnourished than those receiving combined regimen (p- value =0.033, OR= 0.033, CI=1.055-5.301).

Table 4: Association between nutrition status and cancer-chemotherapy related factors.

Cancer-Chemotherapy Related Factors	Nutrition Status		Crude OR (95%CI)	p- value
	Malnourished (n%)	Normal (n%)		
Type of treatment regimen				
Single	86(89.6)	10(10.4)	2.365	**0.033***
Combined	80(71.4)	22(28.6)	(1.055-5.301) **Ref**	
Body Mass Index*				
BMI< 18.5	31(91.2)	3(8.8)	2.22	0.305
BMI ≥ 18.5	135(82.3)	29(17.7)	0.635-7.756) **Ref**	

#Fisher's Exact test, * p- value<0.05=significant, Pearson χ^2 test

Following Table represents the association between Nutrition status and cancer-chemotherapy related variables. Radiotherapy receiving status is significantly associated with malnutrition. The patient receiving radiotherapy are 3.007 times more malnourished than patient not receiving radiotherapy (p- value= 0.017, OR= 3.007, CI= 1.174-7.698). Karnofsky performance score is highly significantly associated with nutrition status. The patient who were unable to work and care for self were 7.591 times more malnourished than those who were able to work (p- value =0.000, OR=7.591, CI= 2.785-20.696). Unexpected weight loss is highly associated with nutrition status. The patient who reported unexpected weight loss were 15.360 times more malnourished than who didnot report unexpected weight loss with CI of (p- value of 0.000, OR 15.360, CI=2.043-115.489). (Table 5)

Table 5: Association between nutrition status and cancer-chemotherapy related: radiotherapy, surgery, Karnofsky Performance Score, unexpected weight loss.

Cancer-Chemotherapy Related Factors	Nutrition Status		Crude OR (95%CI)	p-value
	Malnourished (n%)	Normal (n%)		
Radiotherapy				
Yes	68(91.9)	6(8.1)	3.007	**0.017***
No	98(79)	26(21)	(1.174-7.698) **Ref**	
Surgery				

Yes	82(81.2)	19(18.8)	0.668	0.301
No	84(86.6)	13(13.4)	(0.310-1.440) **Ref**	
Karnofsky Performance Score				
Unable to work and care for self	97(95.1)	5(4.9)	7.591	**0.000***
Able to work	69(71.9)	27(28.1)	(2.785-20.696) **Ref**	
Unexpected weight loss#				
Yes	55(98.2)	1(1.8)	15.360	**0.000***
No	111(78.2)	31(21.8)	(2.043-115.489) **Ref**	

#Fisher's Exact test, *p-value<0.05=significant, Pearson χ^2 test

able 6 reveals the multi variate analysis of the variables with nutrition status. Karnofsky performance score and unexpected weight loss is significantly related to nutrition status. Karnofsky performance score is highly associated with nutrition status (p- value =

0.000, adjusted OR= 7.308, CI= 2.593-20.592). Those cancer patients who are unable to work

and care for self are 7.308 times more malnourished than those who are able to work. Unexpected weight loss is also associated with nutrition status (p- value =0.023, adjusted OR=10.733, CI = 1.378-83.623). Those patient who reported unexpected weight loss are 10.733 times more malnourished than patient not reporting unexpected weight loss.

Table 6: Determinants of malnutrition in the cancer patients receiving chemotherapy.

Determinants of Malnutrition	Nutrition Status		Adjusted odds ratio (CI)	p- value
	Malnourished (n%)	Normal (n%)		
Type of regimen				
Single	86(89.6)	10(10.4)	1.742 (0.710-4.275)	**0.226**
Combined	80(71.4)	22(28.6)	**Ref**	
Radiotherapy				
Yes	68(91.9)	6(8.1)	2.323 (0.833-6.472)	**0.107**
No	98(79)	26(21)	**Ref**	
Karnofsky Performance Score				
Unable to work and care for self	97(95.1)	5(4.9)	7.308 (2.593-20.592)	**<0.001***
Able to work	69(71.9)	27(28.1)	**Ref**	
Unexpected weight loss				
Yes	55(98.2)	1(1.8)	10.733 (1.378-83.623)	**0.023***
No	111(78.2)	31(21.8)	**Ref**	

*p- value <0.05= significant, Pearson χ^2 test

DISCUSSION

The present research showed that 46% of cancer patients were severely malnourished followed by 37.8% were moderately malnourished. While classifying the nutrition status as normal and malnutrition, majority of the cancer patients (83.83%) were malnourished. In a study done in China, among 1138 hospitalized patients, 41.3% of the patients were malnourished, 64% of the patient had experienced weight loss in last six months, 44.5% patient had experienced more than 5% body weight loss and 26.6% patient had experienced more than 10% body weight loss. [8] This was found on the basis of body mass index (BMI) and weight loss. [8] Additionally, while calculating nutrition status using nutrition risk index (NRI) it was found that the prevalence of malnutrition was 51.4%, among them 24.8% were severely malnourished, 26.6 were moderately malnourished and 7.9% were

mildly malnourished.[8] In contrast to this study, on whether nutritional status influence the quality of life of cancer patients in Brazil showed that 86.0% were well nourished and 14.0% were moderately or severely malnourished.[9] This may be due to limited access of cancer care and nutrition support in Nepal whereas Brazil has more developed healthcare system with better integrated oncology nutrition programs, improving nutritional outcomes.

The present study depicts that 23.2% of the cancer patients have breast cancer followed by 20.7% had genitourinary cancer as their diagnosis. This finding is supported by the study which showed that 58.7% had breast and gynaecological cancers.[9] The types of cancers were not statistically significant (*p*-value = 0.097) with the nutrition status.

Mean haemoglobin of the cancer patients before chemotherapy was 12.14 ± 1.99. The mean haemoglobin of cancer patients after administration of chemotherapy was 12.01 ± 1.48. A study done in Coimbatore India showed that the mean haemoglobin level of the patients before and after three weeks of chemotherapy was 10.64 ± 1.88 g/dl and 10.41 ± 1.89 g/dl.[10] The results showed decrease in haemoglobin levels after administration of chemotherapy. Similar findings are observed in this study as well. The mean body mass index (BMI) of the study was 22.61 ± 4.39. This is supported by the study in which mean is 22.90 kg/m^3. Body Mass Index was not statistically significant with nutrition status. This finding is supported by the study which states that BMI is not statistically significant with nutrition status.[4] This may be due to BMI considers only weight and height but does not distinguish between fat muscle and bone mass.

Radiotherapy was carried out by more than one third of the cancer patients (37.4%). Radiotherapy recipient status was not significant (p-value = 0.107, OR = 2.323, CI =

0.833-6.472) with nutrition status. A study in which nutritional status of the cancer patients receiving radiotherapy was assessed which showed that 60.8% were well nourished, 34.5% were moderately malnourished, 4.7% were severely malnourished. More than half of the cancer patients (51%) underwent surgery. Surgery status was not statistically significant (p-value = 0.301, OR = 0.668, 0.310-1.440) with the nutrition status.[11] It may be due to variability in surgery types as GI surgeries significantly affect nutrition absorption while other surgeries have minimal impact on nutritional status.

The Karnofsky performance score was statistically significant (p-value <0.0010, OR = 7.308, CI = 2.593-20.592) with the nutrition status. It is strong and independent predictor of malnutrition in this study. This finding is supported by a study by Montaya J E which showed that Karnofsky performance score was the independent predictor of malnutrition in cancer patient receiving chemotherapy.[4] The Karnofsky Performance Score evaluates the ability to perform activities of daily living, low Karnofsky Performance Score often correlate with reduced ability to eat or prepare food leading to insufficient nutrition intake, which can result in malnutrition. While patient with higher Karnofsky Performance Score tend to have better access to and intake of food helping to maintain healthier nutrition status.

The unexpected weight loss reported by the patient was statistically significant with nutritional status in this study (p- value 0.023, OR = 10.733, CI = 1.378-83.623). A study done among 104 cancer patients undergoing surgery and it was found 64.4% had experienced unintentional weight loss, (more than 10% weight loss in last 3 to 6 months) and those patients were associated with high risk of malnutrition. Presence of unintentional weight loss was the only significant predictor associated with risk of malnutrition.[12] In the present study, general unintentional weight loss from patients' self-reported earlier usual healthy weight is found to be the best single parameter for detecting malnutrition. This is due to unintentional weight loss occurs when calorie intake is lower than body energy needs, increased metabolic demands, or impaired nutrient absorption. In contrast to this study, a study done by Geirsdottir showed that unintended weight change is not significant with the nutritional study and the reason behind was due to the wide range of patient's weight changes.[13] This may be due to variability in definitions and measurement errors of unintended weight loss.

Small sample size might have limited the statistical power and precision of the findings.

CONCLUSIONS

From the findings the researcher concludes that majority of the cancer patients receiving

chemotherapy have problems of malnutrition during the session of chemotherapy.

Conflict of interest: None.

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