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ORIGINAL ARTICLE

A Cross Sectional Study to Assess the Nutritional Status of Cancer Patients in A Tertiary Care Facility in Meghalaya, Northeast India

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Abstract

Patients with cancer often have poor nutritional status, which further deteriorates as the disease progresses. Systematic assessment of the nutritional status is essential to determine the nature of intervention required for each individual. This cross-sectional study was conducted at a tertiary care centre in Meghalaya, North East, India with the primary objective of assessing the nutritional status of cancer patients. The secondary objectives were to assess the diet pattern of cancer patients and the nutritional intervention, which was provided as per the nutritional status. A total of 100 patients who consented to participate were selected consecutively for this study and were interviewed by the first author. Patient Generated Subjective Global Assessment (PGSGA) parameters and other parameters like anthropometry, biochemical values and dietary pattern to assess the nutritional status were used. Majority of them (60%) had Gastrointestinal cancer. The nutritional status of the participants, using the PG-SGA Global Assessment Categories, indicated that 84% of the participants were suffering from moderate to severe malnutrition. An analysis of the weight loss showed that 38% of the participants had a weight loss of 20% or greater in the previous 6 months. The diet pattern of the participants clearly indicated a decrease in the frequency of consumption of dietary fibre derived from whole-grains, whole grams and fruits. The study findings also revealed that 75% of the participants had an altered food intake pattern. As per the PGSGA parameter of symptoms which have an impact on nutritional intake, 40% of the participants were not feeling up to most things, but in bed or chair less than half a day. Based on these data regarding the food intake, nutritional related symp-

toms and the rate of activity, it clearly indicates that most of the participants were malnourished. Nutritional intervention should be provided to all cancer patients once they are diagnosed in order to prevent the severity of malnutrition.

Keywords: Nutritional Status in Cancer; Patient Generated Subjective Global Assessment; Diet pattern; Northeast India; Malnutrition in cancer

1 Introduction

There were almost 10 million deaths globally from cancer in 2020[1].The cancer incidence in India was 1.15 million in 2018 and is expected to double by the year 2040[2]. According to a desk review study it was found that most cancer risk in Northeast India is tobacco related[3]. In Meghalaya, 70.4% in men and 46.5% in women suffer from cancer associated with the use of tobacco[4]. Studies of the past 40 years have shown that among hospital patients, cancer patients were mostly affected by malnutrition[5]. Malnutrition has always been a characteristic of most cancer patients due to poor food intake and reduced nutrient absorption. This has a significant influence on their treatment and its outcome; on decreasing treatment tolerance or increasing the harmful effects of treatment, thus having a negative impact on the quality of life which ultimately affects their survival[6]. The progression and survival of most cancer patients is affected by their nutritional status[7].Nutrition is one of the main foundation of cancer treatment, diagnosis and evolution of cancer patient[8]. Good nutrition can maintain or improve skeletal muscle mass and physical performance, seeking to reduce metabolic disturbance thus preventing the patient from missing treatment[9–11].

The World Health Organization (WHO) defined "nutritional status" as the condition of the body resulting from intake, absorption and utilization of nutrient and the influence of particular physiological and pathological status[12]. A tool for assessing the nutritional status of cancer patients known as the Patient Generated Subjective Global Assessment (PGSGA) was specifically developed by Dr Faith Ottery and it has been recognised by the Oncology Nutrition Dietetic Practice Group of the American Dietetic Association[13]. PGSGA is very useful and it helps the patient and health care provider to systematically assess and monitor the risk of malnutrition to evaluate the effect of intervention. One of the primary front lines in the fight and a contributing component in the treatment of cancer patients is professional nutritional advice[14].

Although there are several studies done on the Nutritional status of cancer patients in India, there are few studies done in Northeast India, therefore this study was taken up with the primary objective to assess the nutritional status of cancer patients at a tertiary care facility in Northeast India. The secondary objectives were to assess the diet pattern of cancer patients and the nutritional intervention, which was provided as per the nutritional status.

2 Methodology

This prospective cross-sectional study was conducted in the outpatient and inpatient departments of Surgical Oncology and Radiotherapy at a tertiary care centre in Meghalaya. The study participants were patients diagnosed with any type of cancer who were 18 years and above. Those who were seriously ill and unable to provide personal information verbally due to the disease or due to a language barrier were excluded from the study. Ethical approval for the study was obtained from the Institute Ethics Committee and written informed consent was obtained from all participants.

Consecutive patients who fulfilled the inclusion criteria and consented to participate were interviewed by the first author who is a Dietician and administered a

questionnaire which included socio-demographic details, parameters adapted from the Patient Generated Subjective Global Assessment (PGSGA) and other parameters like anthropometry, biochemical values and dietary pattern to assess the nutritional status. PGSGA is a validated and reliable tool (available in public domain) which is widely used in cancer patients[15]. When it comes to predicting subjected global assessment classification, the PGSGA score exhibited an 82% specificity and a 98% sensitivity. Thus, the PGSGA is a simple to use nutrition assessment tool which enables prompt identification and prioritising of malnutrition in cancer patients[16]. The questionnaire was validated for content by experts. Since the PGSGA is not available in the local lanuage, we had to use this adapted questionnaire, which was administered by the dietician.

The SGA section of the questionnaire consists of seven sections- weight loss, food intake, nutritional related symptoms which interfere with the food intake pattern, activities and function, disease and its relation to nutritional requirement, metabolic demand and physical examination related to nutrition, each of these sections is given a score of 0-3 or 4. The total of each score obtained from each section provides an information regarding the degree of nutrition intervention required by each cancer patient.

The additive score of the SGA was used for triaging of specific nutritional intervention. Other parameters were also used like the anthropometric measurement i.e., height and weight were recorded and the Body Mass Index (BMI) was classified according to World Health Organisation (WHO) Asian-Body Mass Index Classification[17]. Biochemical values like albumin and haemoglobin were also noted down to know about the clinical status. The dietary pattern of the participants was also assessed and several tools and guidelines were being used. Broca's index for deriving the ideal body weight was utilized. European Society for Parenteral and Enteral Nutrition (ESPEN) and National Institute of Nutrition Hyderabad (NIN) guidelines for obtaining energy requirement were used. "My Plate for the Day" guidelines regarding percentage of macronutrients were applied to assess the nutritional requirement of the participants. Food frequency questionnaire (FFQ) to collect information about the frequency of consumption of cereals, pulses, vegetables, fruits, nonvegetarian foods, milk and milk products, nuts, oil and sugar was put to use. A 24-hours recall was also taken to assess the nutrient consumption of the participants. Based on the nutritional status, each participant was given a Nutritional intervention comprising of a personalised diet chart and counselled on how to follow the diet plan by a dietitian.

The sample size for the study was calculated using data on prevalence of malnutrition among cancer patients from previous studies in Asian countries[18]. Assuming a prevalence of 53.1, a sample size of 88 was obtained. Taking into consideration non-response rate of about 15%, a final sample size of 100 was arrived at.

Data was analysed by using SPSS version 20. Descriptive statistics like frequency, percentage, mean and standard deviation were computed for data presentation.

3 Results

Among the 100 participants of the study, half (51%) of them were in the age group of 41-59 years (age range 18 to 77 years); 51% were male; 20% completed graduation and higher educational qualification and 19% were illiterate and a majority of them (83%) were from the State of Meghalaya. A majority of the participants (60%) had Gastrointestinal cancer, followed by lung cancer (12%). Most of the participants (31%) were treated with surgery, 24% had undergone chemotherapy and others (19%) had combination of various therapies like radiation, surgery and chemotherapy and 19% were on palliative treatment.

While assessing the nutritional status of patients, according to the WHO South Asia-BMI classification, (Table 1) 36% of the participants had normal BMI, 34% were underweight, 12% were overweight and 16% were under the category of class I obesity and only 2% were of class II obesity. According to the percentage of weight loss parameter of the Patient Generated Subjective Global Assessment (PGSGA), a majority (85%) of the participants experienced no change in their weight in a period of two weeks to 1 month and an analysis of the weight loss for the previous 6 months shows that 38% of the participants had a weight loss of 20% or greater and 34% had a weight loss of 10-20%.

Table 1. BMI classification of participants (n=100)

Classification of BMI	Number of participants	%
Underweight (<18.5)	34	34
Normal (18.5-22.9)	36	36
Overweight (23-24.9)	12	12
Obesity Class I (25-29.9)	16	16
Obesity Class II (>30)	2	2

On analysis of the SGA parameters, regarding the food intake pattern of the participants, it was observed that 45% of them can take food of normal consistency but less than usual, 10% can take a little solid food, 4% liquid food only, 10% a little of anything either solid or liquid, 6% tube feeding only and 25% of the participants had unchanged food intake. The study findings also revealed that 75% of the participants had an altered food intake pattern.

As per the SGA parameter of symptoms which have an impact on nutritional intake, 29% reported to have a loss of appetite and 17% have nausea and 35% have other symptoms like constipation, pain, dysphagia, fatigue, diarrhoea, dry mouth etc. Most of the participants reported

having less than normal physical activity (Table 2). A physical examination conducted on the muscle, fat and fluid status of the participants showed that 36% have a mild deficit of muscle status, 34% have a moderate deficit and 12% have severe deficit in muscle status (Table 2).

The additive score of the SGA helps in triaging and to define specific nutrition intervention for patients. According to the Nutritional triage Recommendation, 72% of the participants required a critical need for improved symptoms management and/or nutrition intervention options (Table 3).

An evaluation of the nutritional status of the participants using the SGA Global Assessment Categories (Figure 1) indicates that 62% participants suffered from moderate malnutrition and 22% participants were severely malnourished and 16% were well nourished, therefore according to these findings, 84% of the participants were suffering from moderate to severe malnutrition.

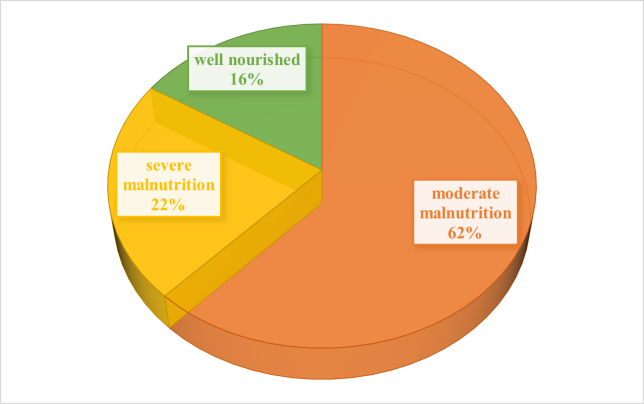

Fig 1. Stages of nutritional status as per the SGA categorization (n=100)

In this study, it was also observed that 63% of the participants had anaemia and 47% had low albumin level.

The diet pattern of the participants was assessed using the food frequency questionnaire and the 24 hours recall (Table 4). The diet pattern of the participants clearly indicated a decrease in the frequency of consumption of dietary fibre derived from wholegrains, whole grams and fruits.

The data shows that consumption of cereals such as rice and refined wheat was on a daily basis by most participants (96% and 67% respectively), whereas intake of whole grains was comparatively very low with just 25% participants who consumed daily. Consumption of protein sources was mostly from non-vegetarian food items which was consumed on alternate days in the form of poultry 55%, fish 39%, meat 22% and egg 43%, whereas intake pattern of other sources of protein from pulses and legumes was relatively low, with only 2% participants consuming whole grams on a daily basis. Only 33% consumed dal on a daily basis.

Table 2. SGA parameters (n=100)

Nutritional Characteristics	Number of participants
Food intake	
Unchanged	25
Less than usual	45
Little solid food	10
Liquid only	4
Very little of anything	10
Tube feeds	6
Symptoms/Problems impacting nutrition	
No appetite	29
Nausea and feeling of fullness	17
Dry mouth/No taste/ Dysphagia/Constipation/ Diarrhoea/Pain	35
No symptoms	19
Weight loss over the past two weeks to one month	
Weight decreased	15
Weight unchanged	85
Weight loss over the past 6 months	
0-1.9%	16
2-5.9%	9
6-9.9%	3
10-19.9%	34
20% or greater	38
Physical Activity	
Normal	28%
Mostly tired	26%
Not feeling up to most things, but in bed or chair less than half a day	40%
Bedridden	6%
Loss of muscle mass	
Severe muscle deficit	12%
Moderate muscle deficit	34%
Mild muscle deficit	36%
No abnormality in muscle status	18%

Table 3. SGA classification based on Nutritional Triage (n=100)

SGA classification	Nutritional triage score	Number of participants
Requires no intervention	0-1	16
Requires patient and family education	2-3	4
Requires nutritional intervention by dietitian in conjunction with nurse and physician	4-8	8
Requires critical symptoms management and/or nutritional interventions	>/=9	72

The frequency of intake of different types of vegetables varied for all participants. Almost everyone (97%) consumed roots & tubers, mainly potato daily, while only one third (33%) of them consumed green leafy vegetables daily. However, the daily intake of other vegetables like squash, pumpkin, different types of gourds and others was reported by a majority (86%) of the participants. Only 24% participants consumed fruits on a daily basis.

Milk and dairy products were consumed by 45% of the participants on a daily basis and 21% never included dairy products in their daily diet patterns. Several (93%) participants consumed tea daily. Most of the participants (53%) consumed nuts occasionally. Maximum (71%) participants used mustard oil as a cooking medium. The amount of oil consumed by the participants varied from 5-40 ml per day with 4% among the participants having an exceptionally high consumption of oil (45-50 ml) per day. Sugar intake of the participants varied from 5-55 gm per day with 23% taking 10-14 gm per day, 26% taking 15-19 gm and 14% taking 20-24 gm. Ten percent of the participants took 30-34 gm per day.

Another aspect of this study was to find the energy and protein intake of the participants, which was derived after calculating their ideal body weight using the Broca's index (height in cm-100). Figure 3 depicts the energy and protein intake pre and post diagnosis of cancer among participants. This figure clearly illustrates that 59% participants had an excess energy intake before the diagnosis of cancer and only 18% had a deficit energy intake. In contrast, after the diagnosis of cancer most of the participants (65%) had a deficit intake of energy and only 19% had an excess intake of energy. Similarly, excess protein intake of the participants reduced from 61% before the diagnosis of cancer to 48% after the diagnosis of cancer. However, the optimum intake of protein improved after the diagnosis of cancer from 36% to 47%.

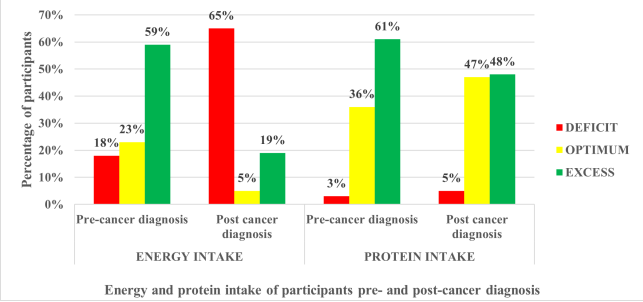

Fig 2. Energy and protein intake before and after the diagnosis of cancer(n=100)

4 Discussion

The disease profile of the participants revealed that a majority of them (60%) have Gastrointestinal cancer, which is similar to a study done by Sharma et al[19], where it was also found that 65% of the participants also had Gastrointestinal cancer. While assessing the nutritional status of patients, according to the World Health Organisation (WHO) South Asian-BMI classification, majority of the participants (36%) had a normal BMI and 34% had a low BMI (Table 1). According to the percentage of weight loss parameter of the Patient Generated Subjective Global Assessment (PGSGA), a majority (85%) of the participants experienced no change in their weight in a period of two weeks to 1 month and an analysis of the weight loss for the previous 6 months shows that 38% of the participants had a weight loss of 20% or greater and 34% had a weight loss of 10-20%. A similar study done by Khoshnevis et al (2012) also indicated that 44.4 % of the participants had a decreased weight in a period of 1 month to 6 months[18].

One of the parameters of the SGA is food intake (Table 2). The findings of this study revealed that 75% of the participants had an altered food intake pattern which is similar to a study done by Sharma et al showing 80.70% of patients with less than usual food intake[19].

As per the PGSGA parameter of physical activity, 40% of the participants were not feeling up to most things, but in bed or chair less than half a day, 28% have a normal rate of activity, and 26% of them were mostly tired in carrying out their normal activity (Table 2). In the study done by Sharma et al, it was found that 36.84% of the participants also experienced the same activity status.

Based on these data regarding the food intake, nutritional related symptoms and the rate of activity and physical examination, it clearly indicates that most of the participants were malnourished. These findings are similar to a study conducted by Santarpia et al.,[20] where malnutrition was shown to affect the quality of life.

An evaluation of the nutritional status of the participants using the SGA Global Assessment Categories (Figure 1) indicates that 62% of participants suffered from moderate mal-

Table 4. Diet pattern of the participants of the study as per food frequency (n=100)

Food items	Number of participants consuming food items as per frequency						
	Daily	Alternate day	Once a week	Fortnightly	Once a month	Occasionally	Never
Whole grains	25	24	16	5	8	15	7
Refined wheat flour	67	6	10	3	2	6	6
Rice	96	3	Nil	Nil	Nil	Nil	nil
Dal	33	38	15	2	5	3	4
Whole gram	2	14	8	15	24	17	20
Green leafy vegetables	33	40	21	Nil	1	4	1
Other vegetables	86	8	2	Nil	1	Nil	3
Root vegetables	97	2	Nil	Nil	1	Nil	nil
Fruits	24	18	18	7	5	19	9
Milk and milk products	45	6	8	2	4	14	21
Egg	14	43	18	8	5	5	7
Meat fresh	13	22	24	3	5	10	23
Meat smoked	2	11	10	5	11	14	47
Processed meat	Nil	1	Nil	Nil	2	9	88
Poultry	10	55	14	8	4	4	5
Fresh fish	12	39	21	7	2	1	18
Dried fish	10	10	2	3	8	63	4
Fermented fish	6	6	1	2	3	77	5
Nuts	3	5	3	2	8	53	26

nutrition and 22% of participants were severely malnourished and 16% were well nourished, therefore according to these findings, 84% of the participants were suffering from moderate to severe malnutrition. This finding corroborates with the findings of a study[19] done at Silchar, Northeast India, to assess the nutritional status of cancer patients using PGSGA which reports that 84.2 % were malnourished during treatment.In comparison to the nutritional assessment based on Asian-BMI alone (Table 2) which shows that only 34% of participants were underweight, the findings of the SGA clearly shows that BMI alone is insufficient to determine the degree of malnutrition of the participants of the study. A similar study[19] also reported the same findings regarding BMI in analysing the degree of malnutrition in cancer patients. In Table 5, 63% of the participants were anaemic. Similar study[21] also showed that 68% of cancer patients had some form of anaemia.

The diet pattern of the participants was assessed using the food frequency questionnaire and the 24 hours recall (Table 4). The diet pattern of the participants clearly indicated a decrease in the frequency of consumption of dietary fibre derived from wholegrains, whole grams and fruits.

The data shows that consumption of cereals such as rice and refined wheat was on a daily basis (96% and 67%) respectively, whereas intake of whole grains was comparatively very low with just 25% who consumed daily among the participants. According to a study[22] it was found that wholegrains can lower the risk of colorectal cancer specific mortality, furthermore in this study, it was stated that intake of fibre specifically from cereals had a protective effect and improved survival rate against colorectal cancer. Consumption of protein sources was mostly from non-vegetarian food items which was consumed on alternate days in the form of poultry 55%, fish 39%, meat 22% and egg 43%, whereas intake pattern of other sources of protein from pulses and legumes was relatively very less, with only 2% participants consuming whole gram on a daily basis. Only 33% consumed dal on a daily basis. From this data it is clear that non-vegetarian food items were consumed on a daily basis by all the participants. A study by Gayathry et al.,[23] done on assessment of pre-cancerous dietary patients of cancer patients, reports that only 14% of participants take whole grams and 45% of participants take dal daily.

The frequency of intake of different types of vegetables varied for all participants. Almost everyone (97%) consumed roots & tubers, mainly potatoes daily, while only one third (33%) of them consumed green leafy vegetables daily. However, the daily intake of other vegetables like squash, pumpkin, different types of gourds and others was reported by a majority (86%) of the participants. Only 24% of participants consumed fruits on a daily basis. A similar observation was found in a study done by Gayathry et al.,[23] where 71% of the patients took other vegetables daily and fruit consumption was also not substantial. Similar studies done in Japan also revealed that frequency of intake of green leafy vegetables and fruits was also less and meat consumption was more among colorectal cancer patients[24]. A diet rich in fruits, vegetables and whole grains may have advantageous outcomes which arise from the balanced ratio of fatty acids, the high fibre content and the essential amount of antioxidants which hampers multiple cancer related biological pathways, including carcinogen bioactivation, cell signalling, cell cycle regulation, angiogenesis and inflammation[25].

Milk and dairy products were consumed by 45% of the participants on a daily basis and 21% never included dairy products in their daily diet patterns. Several (93%) participants consumed tea daily. Most of the participants (53%) consumed nuts occasionally. Maximum (71%) participants used mustard oil as a cooking medium. The amount of oil consumed by the participants varied from 5-40 ml per day with 4% among the participants having an exceptionally high consumption of oil (45-50 ml) per day. Sugar intake of the participants varied from 5-55 gm per day with 23% taking 10-14gm per day, 26% taking 15-19 gm and 14% taking 20-24 gm. Ten percent of the participants took 30-34 gm per day which is an excess amount compared to the recommended amount of 25 gm as stated by National Institute of Nutrition[26].

Another aspect of this study was to find the energy requirement of the participants, which was derived after calculating their ideal body weight using Broca's index (height in cm-100). In clinical practice, the Broca's index continues to have the same accuracy and utility in comparison to other formulae[27]. As per the guidelines of ESPEN[28] the energy requirement is calculated as per the ideal body weight is as follows ,

If ideal weight:

Recommended calorie allowance: 30 kcal per kg weight per day

If underweight:

Recommended calorie allowance: 40 kcal per kg weight per day

If overweight:

Recommended calorie allowance: 20 kcal per kg weight per day

Based on the "My Plate for the Day"[29] A balanced diet should provide 50-60% total calories from carbohydrates, preferably from complex carbohydrates, 20-30% from fats and 15-20% from protein. Each participant's ideal body weight was derived before and also after the diagnosis of cancer and their energy requirement was obtained based on the NIN calculation. Each participant was then categorised as taking either excess or deficit or optimum energy based on their nutritional requirement prior and post diagnosis of cancer.Figure 2 depicts the energy intake pre and post diagnosis of cancer among participants, clearly illustrating that 59% of participants had an excess caloric intake before the diagnosis of cancer and only 18% had a deficit of energy intake. In contrast, after the diagnosis of cancer most of the participants (65%) had a deficit intake of energy and only 19% had an excess intake of energy. In a similar study[30] about variation in nutrients intake, it was also found that 70% of the participants had a poor intake after the diagnosis of cancer.

This study is limited by the fact that it was performed in all cancer patients. More studies need to be carried out in homogenous groups of cancer patients in Northeast India to assess the nutritional status and the dietary pattern.

5 Conclusion

Moderate to severe malnutrition was found in most of the cancer patients seeking treatment at a tertiary centre in Northeast India. The Nutritional status of cancer patients may be assessed by the SGA-based tools as BMI alone cannot give a clear indication of the degree of malnutrition. Diet pattern of the participants clearly indicates less consumption of dietary fibre. After the diagnosis of cancer most patients had a deficit of energy intake.

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