Prevalence and factors associated with malnutrition on patients with cancer in Bangladesh: a cross-sectional study

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ABSTRACT

Introduction Malnutrition is related to the development of chronic diseases, including cancer and is a major cause of mortality in patients with cancer. The study aimed to understand the prevalence and factors associated with malnutrition among patients with cancer.

Methods This cross-sectional study investigated the prevalence of malnutrition among patients with cancer and its relationship with sociodemographic status and treatments. Patients' nutritional diagnosis was performed using the Patient-Generated Subjective Global Assessment (PG-SGA) tool. The performance status (PS) was obtained from the scale developed by the Eastern Cooperative Oncology Group (ECOG). Data were collected from two hospitals from January to March 2023. A χ^2 test and multinominal regression analysis were performed by SPSS V.25.

Results Out of 275 patients, 164 (60%) were male, with the mean age of 49.54 years (SD 15.61). Of these, 184 patients (67%) were malnourished of whom 149 patients (54%) had moderate and 35 patients (13%) had severe malnutrition. Patients' age, sex, PS, cancer site, treatment modalities, duration and hospitalisation were significantly associated with nutritional status (p<0.05). Patients between the ages of 40 and 60 were 2.96 times more likely to be malnourished compared with those younger than 40 (adjusted odd ratio (AOR) 2.96; 95% CI 1.40 to 6.24). Female patients had 7.74 times higher risk of malnutrition compared with male patients (AOR 7.74; 95% CI 2.03 to 19.80). Malnutrition was 2.6 times higher for surgical patients compared with nonsurgical ones (AOR 2.60; 95% CI 1.29 to 5.26). The risk of malnutrition was 4.06 times greater in patients treated longer than 12 months compared with those treated less than 6 months (AOR 4.06; 95% CI 1.82 to 9.08).

Conclusion There is a high prevalence of malnutrition among patients with cancer, and it is essential to include regular nutritional assessment in the treatment process for better outcomes.

INTRODUCTION

Cancer is a global public health concern and causes significant morbidity and mortality. According to Global Cancer Statistics 2020, there were 19.3 million newly diagnosed cancer cases and almost 10 million people

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Patients with cancer are frequently malnourished, which is one of the significant causes of mortality and morbidity. Data on cancer patients' nutritional status are lacking, and the association with their sociodemographic and clinical characteristics are not sufficiently investigated in Bangladesh.

⇒ In our study, we aimed to understand the prevalence of malnutrition among patients with cancer and evaluate the association between their nutritional status, sociodemographic and clinical characteristics.

WHAT THIS STUDY ADDS

⇒ It has been found that more than half of the patients with cancer suffer from malnutrition.

⇒ Similar to international study findings, our data found that older and female patients, cancer site, treatment duration, treatment procedures, length of hospitalisation and performance status were significantly associated with nutritional status.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The results of this study will likely influence health providers to perform nutritional assessments as a part of the treatment process for patients with cancer and to consider malnutrition predictors during treatment procedures for more successful outcomes.

died from cancer worldwide.[1] [2] These increasing trends in mortality from cancer accompany the demographic and epidemiological transitions around the globe, particularly in low-income and middle-income countries[3] such as Bangladesh where cancer is the second-leading cause of death.[4]

According to the World Health Organization, 'nutritional status' can be defined as the condition of the body resulting from the intake, absorption and utilisation of various types of nutrients that influence a person's physiological and psychological status.[5] People's socioeconomic and demographic characteristics are highly correlated with their health and nutritional status.[6] Fundamental

demographic factors such as age, gender and ethnicity can contribute in one form or another to nutritional status.[7] Body mass index (BMI) is a widely used indicator of the nutritional status of a population. However, the Subjective Global Assessment, comprising an observational history focusing on gastrointestinal symptoms, weight loss and physical examination, is a reliable and widely used tool for nutritional screening.[8]

It is documented that nutrition is an important factor related to the prevention and/or development of chronic diseases and functional limitations in the general population.[9] Disease-related malnutrition occurs frequently among patients with cancer, which is a major cause of mortality and morbidity among them.[10 11] Malnutrition refers to deficiencies or excesses in nutrient intake, imbalance of essential nutrients or impaired nutrient utilisation.[5] Cancer cachexia is a specific form of cancer-associated malnutrition, often occurring in patients with advanced disease.[12] Malnutrition among patients with cancer increases the cost of healthcare and also increases the risk of infection.[13] It also decreases the patient's quality of life, affecting their treatment process and overall survival.[14 15] There have been studies where the nutritional status of patients with cancer and their clinical outcomes have been assessed, such as deterioration of nutritional status and surgical outcome.[16 17] Moreover, there are studies contributing to the association and correlation between nutritional status and sociodemographic status among the general population or any specific niche of population.[18 19]

In Bangladesh, there is a scarcity of research focusing on patients with cancer, though cancer is the second-leading cause of death.[4] To our best knowledge, there is a lack of published study in Bangladesh that has empirically evaluated the association between the nutritional status of patients with cancer and their sociodemographic status and treatment measures. This study is, therefore, justifiably designed and aimed to identify the extent of malnutrition among patients with cancer and investigate its relationship with demographic status and clinical characteristics.

METHODS AND MATERIALS
Study design and settings
This cross-sectional study was conducted in two hospitals from January to March 2023 in Dhaka, Bangladesh. Dhaka is the capital city of Bangladesh where people come from across the country due to availability and potential access to better cancer treatment options.

Sample size
We estimated the sample size based on the formula used for cross-sectional studies, a single population proportion formula.[20] A similar study found that 71% of patients with cancer had malnutrition.[19] Considering it as a reference, the sample size was 316 when the allowable error was 5%.

However, we were able to collect 275 complete responses from respondents, with a response rate of 84%.

Data collection
We used convenient sampling techniques to perform this study. Patients at two tertiary care cancer hospitals in Dhaka, Bangladesh, who were receiving treatment at the inpatient and outpatient departments were included in our study. Patients younger than 18 years and those who had severe illness or mental health illness were unable to understand or comprehend a research questionnaire and refused to give consent were excluded. Relevant queries from patients and their caregivers were answered to help them understand the study objectives and goals. Recruiting was conducted daily among eligible patients. The data collection process was maintained by experienced health professionals and physicians. A pilot study was conducted among 14 patients, after which the questionnaire was revised and finalised on feedback. It was made clear to the respondents that participation in the study was entirely voluntary, and the face-to-face interview took place one person at a time to ensure privacy. The selected information regarding demographic, cancer and treatment-related variables was collected by a Bengali version of the questionnaire from the respondents (online supplemental file 1).

Finally, a total of 275 data were selected for the analytical exploration. The confidentiality of patient data and anonymity was secured by using codes instead of personally identifiable information. Data selection, identification and inclusion flow diagram process are presented in figure 1.

Measurements/variables
Dependent variables
Nutritional status
Patients' nutritional status was the main outcome variable. Nutritional diagnosis was performed by the Patient-Generated Subjective Global Assessment (PG-SGA) tool.[21] It primarily relies on patients' weight history, changes in diet, physical examination and gastrointestinal symptoms. The PG-SGA tool classified nutritional status into three categories: (1) A=well nourished: maintain weight or gain weight, or lose weight <5% within 6 months, without oedema; (2) B=suspected or moderate malnutrition: weight loss of at least 5% within 2 weeks or reduced dietary intake, signs of less subcutaneous fat loss or mild muscle atrophy and (3) C=severe malnutrition: weight loss is more than 10% within 6 months, and there is poor appetite (eating viscous or liquid food) lasting 2 weeks, or there are obvious signs of loss of subcutaneous fat layer, muscle atrophy severe or accompanied by oedema, and oedema of the lumbar spine. The tool has the ability to determine nutritional status in both cancer and non-cancer cases and has been identified as an ideal instrument for nutritional status worldwide. Several studies have shown an association between the
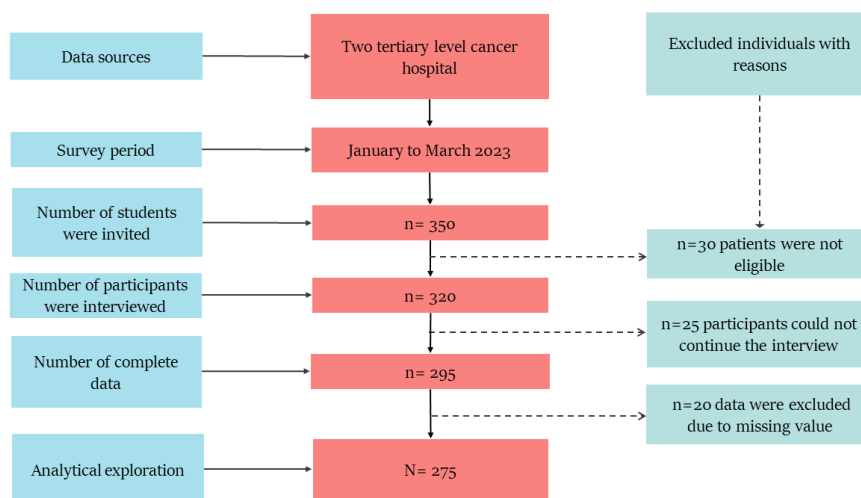
Figure 1 Distribution of study participants.

PG-SGA scores and specific nutritional parameters, including weight loss, BMI, skinfold measurements and hand grip strength.[22 23] The tool has been used elsewhere to assess cancer patients' nutritional status but has not yet been widely introduced in Bangladesh. The BMI was measured and classified according to the US Centers for Disease Control and Prevention.[24]

Performance status

The performance status (PS) is another indicator that is important for patients with cancer and was obtained from the scale developed by the Eastern Cooperative Oncology Group (ECOG).[25] The cut-off point was '2', which denotes limited functional ability and is categorised as (a) PS<2 (good performance) and (b) PS≥2 (poor performance).

Independent variables

Patients' sociodemographic characteristics (age, gender, occupation, education, marital status, family size, monthly household income and smoking history) were considered. In addition, patients' detailed cancer history (cancer site, stage and metastasis) and treatment-related information (treatment duration, consultation with a dietician, chemotherapy, receiving surgery, PS and hospitalisation) were considered clinical characteristics.

Statistical analysis

The collected data were first checked for completeness and then entered in Microsoft Excel and checked for consistency. We analysed data from 275 patients with cancer, where assessment of nutritional status and other descriptive analyses were performed using frequency and percentage. A χ^2 statistic was performed to see the association between dependent and independent variables. A multinomial logistic regression was performed to determine the strength of association and predictors of severe malnutrition. All statistical analyses were done using IBM SPSS Statistics V.25.

RESULTS

A total of 275 patients with cancer were included in the study. The mean age of the study participants was 49.54±15.613 (SD) years with minimum 19 and maximum 74 years old. The average height of patients was 159.98±8.11 (SD) cm and highest weight was 92 kg with mean 56.59±10.37 (SD) kg. We also measured the BMI of patients where mean value was 22.12±3.67 (SD) with maximum 35.49 kg/m^2 (online supplemental file 2).

The majority of participants were more than 60 years of old (n=75, 27%). More than half of the participants were males (n=164, 60%), had extended families (n=147, 54%) and were unemployed (n=147, 54%). Approximately 19% (n=52) of patients were underweight, while 66% (n=180) were normal weight. The majority of participants (n=84, 31%) had secondary level or more education. Approximately 67% of participants were married (n=183) and had monthly household income ranged from BDT40 000 to BDT80 000 (n=182) (online supplemental file 3).

Across cancer sites, approximately 29% (n=78) had lung cancer, 23% (n=63) had upper gastrointestinal tract cancer, 16% (n=44) had breast cancer and 16% (n=42) had cancer in reproductive system. Among participants, 20% (n=53) had metastasis. Approximately 32% (n=87) of patients were taking anticancer treatments for more than 12 months and half of patients (n=138, 50%) were following the instructions of a dietician. Nearly half (n=123, 45%) of patients were under chemotherapy, and 41% (n=112) had surgical treatment. Most participants were from inpatient departments (n=203, 78%), where 23% (n=62) were hospitalised for more than 15 days. Nearly half of (n=121, 44%) patients had poor PS (score: ≥2) (online supplemental file 4).

Nutritional status was classified into three categories (A=well nourished, B=suspected or moderate malnutrition and C=severe malnutrition). The overall prevalence of malnutrition was 67% (n=184); 35 (13%) patients

had severe malnutrition and 149 (54%) patients had moderate malnutrition.

A χ^2 test was conducted to determine the association between dependent and independent variables. Among the considered sociodemographic characteristics, patients' age (p<0.001), sex (p=0.042) were found significantly associated with nutritional status. However, no statistically significant association were observed for household members, patient's occupation, education, marital status, smoking and monthly household income. Among the cancer-related variables, cancer site (p=0.002), follow dietician's advice (p=0.008), duration of treatment (p=0.009), chemotherapy (p=0.001), surgical treatment (p=0.029), duration of hospitalisation (p<0.001) and PS (p=0.035) were significantly associated with nutritional status (table 1).

We further categorised moderate-severe malnutrition in the poor nutrition category and independent characteristics that showed significant association in the χ^2 test were subjected to multinomial logistic regression analysis. Patients between 40 and 60 years old were 2.96 times more likely to be malnourished (adjusted OR, AOR 2.96; 95% CI 1.40 to 6.24) compared with those under 40 years old. The regression model also showed that female patients had 7.74 times more risk of malnutrition compared with male patients (AOR 7.74; 95% CI 2.03 to 19.80). We found that patients who underwent surgical treatment (AOR 2.60; 95% CI 1.29 to 5.26) and underwent the treatment process for more than 12 months (AOR 4.06; 95% CI 1.82 to 9.08) were more likely to be malnourished (table 2).

DISCUSSION

Our study aimed at exploring the prevalence of malnutrition and its association with sociodemographic status and treatment measures among Bangladeshi patients with cancer. We used a Bengali version of the questionnaire to ensure effective communication with patients, which in turn contributed to safeguarding the accuracy of the data. We obtained several key findings in our study that are pertinent to patients with cancer.

According to our data, 54% of patients with cancer had moderate malnutrition, and 13% had severe malnutrition. While a similar study conducted in India found that 32% of patients with cancer were moderately malnourished, lower than our findings and 53% were severely malnourished which is higher than our results.[19] A study from China found that 32% of patients with cancer were malnourished using the same tool (PG-SGA tool),[26] which is lower than our findings (67%). The difference might be due to several factors, study populations, area, ethnicity and sample size. This could also be because, despite healthy and nutritious food, the nutritional well-being of a significant portion of Bangladeshi population is still neglected.[27 28] Malnutrition can negatively affect a cancer patient's prognosis and outcome, and patients with cancer must maintain a healthy nutritional status to maximise their response to anticancer therapies. As a result, nutritional evaluation of patients with cancer should be established as an essential preventative measure to prevent malnutrition.

After conducting a χ^2 test, we found the patient's age and gender to be significantly associated with nutritional status. Previous studies reported that increasing age is independently associated with poor nutritional status and has a significant and independent effect on several key biochemical and anthropometric measure variables used in nutritional assessment.[29 30] A study carried out among the Indian population found a significant association with age group and nutritional status.[31] Although the aforementioned studies were carried out on healthy adults, further investigation should be conducted to determine whether age influences nutritional status in patients with cancer like healthy adults. Interestingly, a study carried out among advanced patients with lung cancer in northern China reported both age and sex to be associated with malnutrition,[32] which is in congruence with our findings. Another study carried out in Turkey, reported that younger age was associated with inadequate nutritional status in hospitalised patients with cancer.[33]

Among cancer-related variables, we found several variables, including PS, to be significantly associated with nutritional status. A prior study concluded that malnutrition affects PS in patients with pancreatic cancer.[34] Another article reported that PS is one of the most important variables that affect the prognosis of patients with cancer.[35] The epidemiological estimates of future cancer cases suggest that older patients with cancer will continue to increase across the globe in the years to come.[36] As such, using low-cost, practical nutritional risk assessment tools for older patients with cancer will allow specialised nutritional interventions and help patients' quality of life.

In our study, multinomial logistic regression analysis yielded several predictors. The findings of this study are in agreement with those of previous studies. In the current study, we found that participants who were between 40 and 60 years old were 2.96 times more likely to be malnourished compared with those under 40 years old. A Brazilian study reported that older patients with cancer are at greater risk of being malnourished compared with younger patients with cancer.[37] Another study from Australia carried out on patients with cancer that also used the PG-SGA to evaluate nutritional status, it was also observed that older patients with cancer were at higher risk of being malnourished compared with younger patients.[38] It is evident that older adults are vulnerable to malnutrition due to age-related physiological decline, reduced access to nutritious food and comorbidities.[39] A possible explanation for this could be that, with ageing, body composition changes, resulting in a reduction in lean body mass among older adults and these changes may alter muscular strength, functionality and independence in this population. These findings can make healthcare challenging in developing regions, such as Bangladesh, where there is a shortage of adequate resources and infrastructure for geriatric medicine.

Table 1 Association between nutritional status and considered independent characteristics of patients with cancer (n=275)

Variables	Category	Nutritional status, n (%)			P value
		Moderate	Severe	Nourished	
Age, years	<40	54 (54.5)	3 (3.0)	42 (42.4)	
	40–60	61 (60.4)	12 (11.9)	28 (27.7)	
	>60	34 (45.3)	20 (26.7)	21 (28.0)	**<0.001**
Family size	Nuclear (≤6 members)	67 (52.3)	18 (14.1)	43 (33.6)	
	Extended (>6 members)	82 (55.8)	17 (11.6)	48 (32.7)	0.778
Occupation	Paid work	11 (44.0)	4 (16.0)	10 (40.0)	
	Retired/get benefit	21 (47.7)	9 (20.5)	14 (31.8)	
	Unemployed	83 (56.5)	13 (8.8)	51 (34.7)	
	Business/others	34 (57.6)	9 (15.3)	16 (27.1)	0.366
Gender	Male	79 (48.2)	22 (13.4)	63 (38.4)	
	Female	70 (63.1)	13 (11.7)	28 (25.2)	**0.042**
Education	Uneducated	36 (51.4)	14 (20.0)	20 (28.6)	
	Informal/primary	23 (60.5)	7 (18.4)	8 (21.1)	
	Secondary	48 (57.8)	5 (6.0)	30 (36.1)	
	Higher education	42 (50.0)	9 (10.7)	33 (39.3)	0.081
Marital status	Living with partner	96 (52.5)	26 (14.2)	61 (33.3)	
	Living without partner	53 (57.6)	9 (9.8)	30 (32.6)	0.535
Smoking history	Former/current smokers	76 (56.7)	19 (14.2)	39 (29.1)	
	Non-smokers	73 (51.8)	16 (11.3)	52 (36.9)	0.368
Monthly household income (BDT)	<BDT40 000	20 (39.2)	9 (17.6)	22 (43.1)	
	BDT40 000–BDT80 000	108 (59.3)	21 (11.5)	53 (29.1)	
	>BDT80 000	21 (50.0)	5 (11.9)	16 (38.1)	0.132
Cancer site	Breast	20 (45.5)	3 (6.8)	21 (47.7)	
	Lower gastrointestinal tract	16 (51.6)	10 (32.3)	5 (16.1)	
	Lung	43 (55.1)	6 (7.7)	29 (37.2)	
	Upper gastrointestinal tract	33 (52.4)	11 (17.5)	19 (30.2)	
	Reproductive system	30 (71.4)	4 (9.5)	8 (19.0)	
	Others site	7 (41.2)	1 (5.9)	9 (52.9)	**0.002**
Cancer stage	Stage 0	20 (55.6)	2 (5.6)	14 (38.9)	
	Stage I	38 (55.9)	4 (5.9)	26 (38.2)	
	Stage II	37 (59.7)	8 (12.9)	17 (27.4)	
	Stage III	26 (42.6)	12 (19.7)	23 (37.7)	
	Stage IV	28 (58.3)	9 (18.8)	11 (22.9)	0.109
Metastasis	Present	32 (60.4)	10 (18.9)	11 (20.8)	
	Absent	117 (52.7)	25 (11.3)	80 (36.0)	0.066
Follow dietician	No	70 (51.1)	26 (19.0)	41 (29.9)	
	Yes	79 (57.2)	9 (6.5)	50 (36.2)	**0.008**
Treatment duration	<6 months	52 (49.5)	7 (6.7)	46 (43.8)	
	6–12 months	47 (56.6)	11 (13.3)	25 (30.1)	
	>12 months	50 (57.5)	17 (19.5)	20 (23.0)	**0.009**
Chemotherapy	No	92 (60.5)	9 (5.9)	51 (33.6)	
	Yes	57 (46.3)	26 (21.1)	40 (32.5)	**0.001**
Surgical treatment	No	89 (54.6)	14 (8.6)	60 (36.8)	
	Yes	60 (53.6)	21 (18.8)	31 (27.7)	**0.029**

Continued

Table 1 Continued

Variables	Category	Nutritional status, n (%)			P value
		Moderate	**Severe**	**Nourished**	
Performance status	<2	75 (48.7)	18 (11.7)	61 (39.6)	**0.035**
	≥2	74 (61.2)	17 (14.0)	30 (24.8)	
Hospitalisation	No (outpatient department)	47 (65.3)	3 (4.2)	22 (30.6)	**<0.001**
	Up to 15 days	65 (46.1)	17 (12.1)	59 (41.8)	
	>15 days	37 (59.7)	15 (24.2)	10 (16.1)	

p<0.05 was considered as statistically significant.
BDT, Bangladeshi taka; P value, Probability value.

Therefore, early systematic nutritional status must be monitored to ensure favourable clinical outcomes in patients of all ages and with age progression.

Our study found that female patients with cancer had a 7.74-time higher risk of malnutrition than male patients. Opanga *et al* reported that more males than females were severely malnourished in their study (55% vs 45%). The samples were taken from Kenyan patients with cancer, and this was statistically significant (p<0.001).[21] We also found that patients going through surgical treatment were 2.60 times more susceptible to malnutrition. Similarly, a more recent cohort study has reported a high incidence of severe malnutrition among patients undergoing surgery for gastrointestinal cancer.[13] A Swedish study is

Table 2 Multinomial logistic regression of possible predictors and nutritional category

Variables	Category	Estimate	Significance	AOR (95% CI)
Age, years	40–60	1.08	**0.004**	**2.96 (1.40 to 6.24)**
	>60	0.41	0.287	1.92 (0.866 to 4.262)
	<40	Reference	.	
Gender	Female	2.05	**0.001**	**7.74 (2.03 to 19.80)**
	Male	Reference	.	
Cancer site	Breast	−1.70	**0.004**	**0.18 (0.06 to 0.58)**
	Lower gastrointestinal tract	1.45	**0.034**	**4.25 (1.12 to 16.20)**
	Lung	0.84	0.090	2.31 (0.88 to 6.09)
	thers	−0.97	0.205	0.38 (0.08 to 1.69)
	Reproductive system	0.93	0.098	2.55 (0.84 to 7.64)
	Upper gastrointestinal tract	Reference	.	
Follow dietician	Yes	−0.32	0.337	0.72 (0.37 to 1.40)
	No	Reference	.	
Treatment duration	6–12 months	0.55	0.130	1.73 (0.85 to 3.54)
	>12 months	1.40	**0.001**	**4.06 (1.82 to 9.08)**
	<6 months	Reference	.	
Chemotherapy	Yes	0.09	0.779	1.10 (0.54 to 2.10)
	No	Reference	.	
Surgical	Yes	0.96	**0.008**	**2.60 (1.29 to 5.26)**
	No	Reference		
Performance status	<2	−0.38	0.256	0.69 (0.36 to 1.31)
	≥2	Reference	.	
Duration of hospital stay	>15 days	0.96	0.058	2.62 (0.97 to 7.08)
	Up to 15 days	−0.27	0.486	0.76 (0.35 to 1.64)
	No (outpatient department)	Reference	.	

Statistically significant=p<0.05.
AOR, adjusted odd ratio; CI, confidence interval.

consonant with our finding, where they reported malnutrition to be a problem occurring after oesophagectomy.[40] Another study resonated with our finding, where they mentioned that patients undergoing pancreatic resection for malignant tumours are usually malnourished.[41] It is important to point out that people with metastatic cancer have lower quality of life, which is linked to poorer treatment outcomes.[42] Therefore, the authors emphasise that causality must be established through further causal inferential studies.

The study has several strengths. Out study's main strength is that it collected data from two tertiary-level cancer care hospitals, and health professionals were involved in the data collection process. Furthermore, our results provide some insight into the status of malnutrition among patients with cancer in Bangladesh. Moreover, we maintained all appropriate guidelines during study period which is crucial for the study. The study also has limitations. First, our calculated study sample size was 316; however, we were able to collect 275 data from two cancer hospital due to lack of time and human resources. Such a small sample size can lead to fallacious conclusions and less accurate results. So, the rate of malnutrition may not be representative for each patient with cancer. However, longitudinal studies that include larger numbers of patients to better determine the results found in our research are still needed. Second, our study data were not homogeneous, which may have affected the results. Finally, there is a possibility that response-related biases may exist in our study.

In conclusion, our data revealed a relatively high prevalence of malnutrition among patients with cancer in Bangladesh. Furthermore, patients aged over 40, females, who underwent surgery and were hospitalised for more than 12 months had a higher risk of malnutrition. These results highlight the need for nutritional screening and assessment both for characteristics of malnutrition and for underlying risk factors soon before and after treatment/hospitalisation to enable early and multidisciplinary or interdisciplinary interventions for better treatment outcomes.

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