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Nutritional Status in Patients with Gastrointestinal Cancer in Comparison to Other Cancers in Shiraz, Southern Iran, A Case Control Study

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ABSTRACT

Background: Malnutrition leads to decreased survival rate, quality of life and the response to treatment and increases the risk of mortality in patients with cancer. Clinical evaluation is essential for ontime detection and treatment of malnutrition in these patients. On the other hand, patients with gastrointestinal (GI) cancers are expected to have a higher risk of malnutrition due to the poor digestion and malabsorption. Therefore, the purpose of this study was to compare the nutritional status in patients with GI tract cancers with non-GI cancers.

Methods: Sixty-nine patients with GI cancers and 65 patients with other types of cancer participated in this case-control study. Anthropometric evaluation (weight, body mass index (BMI), mid arm circumference, calf circumference) and biochemical indices (albumin, C-Reactive Protein (CRP)) were measured and the Subjective Global Assessment (SGA) questionnaire was completed to assess the nutritional status of the patients.

Results: BMI, weight and serum albumin levels were significantly lower in patients with GI cancers. Other anthropometric measurements were lower in the case group and the serum CRP level was higher than the control group, although they were not statistically significant. The incidence of malnutrition was higher in case group compared to the control group, but it was not statistically significant.

Conclusion: Anthropometric, biochemical and SGA evaluation showed a poor nutritional status in patients with GI cancer compared to other forms of cancer. Therefore, early assessment of the nutritional status of patients with cancer can be effective in order to initiate a nutritional intervention.

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Introduction

Cancer is one of the leading causes of mortality in developed and developing countries. In the coming years, cancer is expected to increase worldwide, especially in less developed countries, due to population growth and aging, as food patterns change and the use of unhealthy ready-to-eat foods (1). Malnutrition is a common cancer-related

condition, with an incidence of about 40-80% in these patients (2). Malnutrition in cancer patients has many consequences, including reduced response and tolerance to treatment, lower quality of life, reduced survival and increased care costs (3, 4). Therefore, early diagnosis of malnutrition and dietary intervention can be effective in preventing symptoms in these patients, depending on the severity and complications of the disease and the therapeutic approach (5).

Accordingly, since the nutritional status of these patients is of particular importance, clinical evaluation and follow-up are necessary in order to minimize the severity of symptoms and malnutrition (6). The use of appropriate tools for fast and accurate nutrition assessment is one of the most challenging topics for the study in patients with cancer, among the tools proposed in this area, Nutrition Risk Index (NRI), Malnutrition Universal Screening Tool (MUST), and Subjective Global Assessment (SGA) can be referred to as non-invasive methods (7).

Meanwhile, the instrument of Nutrition Risk Index, which uses the serum albumin and current and the normal weight of the patient in determining the nutritional status, is not very acceptable due to the acute effects of the disease on the albumin level. In relation to the malnutrition universal screening tool for malnutrition, the focus is on screening rather than assessing the patient's condition. Therefore, the subjective global assessment that is based on history (weight change, change in food intake, gastrointestinal symptoms, changes in functional capacity), and physical examinations (loss of subcutaneous fat, muscle, ankle and sacral edema and ascites) of the patient, according to previous studies, has high value in these patients (8).

In addition, in order to assess the patients' nutritional status, anthropometric measurements such as measuring body mass index (BMI), muscle mass, and body fat mass can also provide more accurate information at the same time as well as biochemical measurements such as serum albumin level. Studies have shown that these patients had weight loss and reduced muscle mass (sarcopenia) along with systemic inflammation, which can have a poor prognosis (9, 10). Among patients with various cancers, it is thought that patients with gastrointestinal (GI) cancers, due to digestive system involvement experience more severe complications such as vomiting, diarrhea, dysphagia, weakness of the body and, as a consequence, affecting the catabolic state of the cancer and increase the severity of malnutrition (11).

However, based on our studies, no study has been done to show the effect of the type of cancer on nutritional status. Therefore, the purpose of this study was to compare the nutritional status in terms of malnutrition intensity and anthropometric measurements in patients with GI and non-digestive cancers, in order to determine whether the location of the cancer has had an effect on the patients' nutritional status. Based on this finding, different recommendations on timely nutritional interventions can be made from the beginning in both groups.

Materials and Methods

In this case-control study, the sample size was calculated based on the difference ratio formula (P1=61.4, P2=37.8) (12) and by considering the power of 80% and the type 1 error, 0.05, 67 patients in each group (GI and non-digestive cancers) were estimated. Finally, 69 patients with GI and 65 patients with other cancers who referred to Shiraz University of Medical Sciences clinics during the first six months of 2017 were included in the study. These patients were selected on the basis of their easy access.

All the eligible individuals in each group provided written informed consent and then completing a form of history of diseases; including diabetes, pre diabetes, hypertension, liver and kidney diseases, history of surgery, surgery area and familial history of the heart diseases. It is worth noting that age and sex were two conditions for entering the study; all the participants were female and over 18 years. Conditions for exclusion of both groups were patients with diseases such as liver and kidney failure, patients with cardiovascular problems, anorexia nervosa, people on special diets, such as weight loss regimens. Furthermore, Patients with metastatic cancer were also excluded from the study.

Anthropometric measurements, including weight (Seca scale, Germany), height (by a flexible meter attached to the wall with a precision of 0.1 cm), BMI, mid arm circumference (in centimeter), calf circumference (in centimeter) by a specialist for the participants in the study. From each person, 3 milliliters of blood were taken for biochemical measurements. After separating the blood serum and until measuring the biochemical factors, the samples were kept at -80°C. Serum levels of albumin, total protein and CRP were measured by applying biochemical methods. The SGA questionnaire that its reliability and validity were approved in Iranian patients (13), were completed by an experienced nutritionist.

The first section of this questionnaire aimed to collect relevant information about the patients' history regarding 5 aspects: (i) Weight changes (during the past 2 weeks and 6 months ago), (ii)

Food intake, (iii) Gastrointestinal symptoms, (iv) Functional capacity and (v) Metabolic need of the patient based on their underlying illness. The second section intended to assess the patients physically. So, it paid attention to loss of subcutaneous fat in the triceps muscle, muscle loss in the deltoid and quadriceps, ankle and sacral edema and ascites. Each section of the questionnaire, depending on the severity of malnutrition, received points A, B or C, and ultimately gives the individual a general score, according to the above mentioned items.

Score A in this questionnaire indicated a good nutritional status, B indicated being at risk of malnutrition or mildly to moderately malnutrished, and C pointed to severe malnutrition (14). At the end, all the collected information from each patient were analyzed with SPSS Software (Version 20, Chicago, IL, USA). In order to analyze the data, after confirmation of the normal distribution of the quantitative data, independent t-test was used to compare the two groups and Chi-square and Fisher exact tests for comparing the qualitative data between the two groups. Due to the non-normal distribution of data for weight variable, a non-parametric Mann-Whitney test was used. Significant levels were considered to be less than 0.05.

Results

For patients with GI cancers, the mean age was 49.2±11.1 and for patients with other cancers, the mean age was 45.4±12.55. As shown in Table 1, there was no significant difference in the type of treatment between the patients in both groups.

The data presented in Table 2 indicated the comparison of anthropometric and biochemical nutritional data of the patients in the two groups. As seen, from the anthropometric data between the two groups, weight and BMI were significantly different between the two groups (P≤0.15) which were lower in patients with GI cancers than in patients of the control group. No significant changes were observed in other anthropometric indices. Among the studied biochemical indices, serum albumin was significantly different between the two groups (P=0.02). Serum albumin level in patients with GI cancers was significantly lower than in patients of the control group.

Regarding malnutrition, according to the SGA questionnaire, 86.9% of patients with GI cancers and 73.8% of patients in the control group suffered from malnutrition (score B or C), which were not significant between the two groups (P=0.13). Also, as Table 3 shows, there was no significant difference between the two groups in terms of the distribution of malnutrition intensity (lack of malnutrition, mild, moderate and severe malnurtition).

Discussion

The results of this study showed that the type of treatment and frequency of malnutrition based on the SGA questionnaire in patients with GI and non-digestive cancers was not significantly different. However, from a clinical point of view, malnutrition rate was higher among patients with GI cancers. On

Table 1: Basic information of patients among two groups.

Type of cancer / Type of treatment	Gastrointestinal cancers (n=69) % (n)	Non-digestive cancers (n=65) % (n)	*p* value
Chemotherapy	40.6 (28)	56.9 (37)	0.26
Surgery	7.24 (5)	6.2 (4)	
Radiotherapy	2.89 (2)	1.5 (1)	
Radiation therapy and chemotherapy	18.84 (13)	26.2 (17)	
Chemotherapy before surgery	20.29 (14)	4.6 (3)	
Chemotherapy after surgery	10.14 (7)	4.6 (3)	

Table 2: Comparison of anthropometric and biochemical measurements among two groups.

Factors	Gastrointestinal cancers (n=69) mean±SD	Other cancers (n=65) mean±SD	*p* value
Weight (kg)	57.07±7.91	64.43±8.58	≤0.001
Body mass index (kg/m)^2	20.53±3.19	21.89±2.52	0.04
Mid arm circumference (cm)	27.49±3.28	28.84±4.59	0.31
Calf circumference (cm)	30.88±3.39	32.5±3.34	0.67
Albumin (g/dL)	4.04±0.45	4.15±0.56	0.02
CRP (mg/L)	2.8±0.63	2.52±0.63	0.35

*Values less than 0.05 were considered significant.

Table 3: Comparison of malnutrition severity between the two groups.

Status		Gastrointestinal cancers (n=69) % (n)	Other cancers (n=65) % (n)
Lack of malnutrition		13.04 (9)	26.2 (17)
Malnutrition	Moderate	65.22 (45)	56.9 (37)
	Severe	21.74 (15)	16.9 (11)

p value=0.1

the other hand, levels of BMI and serum albumin in patients with GI cancers were significantly lower than those with non-digestive cancers. Malnutrition is a potential condition in cancer that can occur in the first stages of the disease. Since anorexia and reduced intake of food in patients with cancer are often overlooked, this factor leads to other metabolic disorders, disrupting in the treatment process and progression of the disease (5).

In the current study, based on the SGA questionnaire, 86.9% of the patients with GI cancers and 73.8% of patients with non-digestive cancers sufferred from malnutrition, that in comparison with other related studies, indicated a higher incidence of malnutrition. However, in the study of Movahed et al., 65% of patients with lower digestive cancers, 64.3% of brain cancer patients and 60% of those with upper GI cancers were at high risk of malnutrition (15). In another study in Iran, 52 patients with colorectal cancer were evaluated for malnutrition status. According to the SGA questionnaire, 52% of patients and based on the Nutrition Risk Index (NRI), 45% of the patients suffered from malnutrition (16). Wie et al. also reported that 86.6% of patients with liver cancer, 60.5% of patients with lung cancer and 60.5% of patients with advanced cancers experienced malnutrition, whose early diagnosis can be helpful in improving nutritional interventions (12).

In a study conducted by Ryu et al., with the aim of assessing the nutritional status of patients with GI cancers, the prevalence of malnutrition was reported to be 80% (17). The importance of nutritional status in cancer patients is so far as studies have shown that the duration of hospitalization and the prevalence of mortality in patients with GI cancers who had malnutrition were higher than those with a favorable nutritional status (11). cachexia, as a complication of various cancers, is a multi-factorial syndrome, characterized by severe weight loss, loss of fat and muscle, early satiety, anemia, edema, weakness and increased protein catabolism; and is a factor in increasing the risk of death in patients (5, 18).

In the same line, in a study done on patients with lung cancer, the researchers observed that systemic inflammation in these patients was accompanied with weight loss, decreased functional status, increased fatigue and mortality (19). In GI cancers due to gastrointestinal tract disorders, complications such as nausea, vomiting, diarrhea, decreased intake of food, malabsorption and indigestion were more evident. Therefore, these patients experienced a poor nutritional status followed by a greater weight loss (11). The results of the current study indicated a higher reduction of albumin in patients with GI cancers. Albumin, as the main protein of the plasma with a half-life of about 20 days, was used to assess the nutritional status, severity of disease and progression of the disease. Its levels in cancer patients are reduced due to a reduction of protein synthesis. While the main function of this protein is helping in the transferring of drugs in the body and the lack of it can disrupt the treatment process (20, 21).

In this regard, Oscar et al. in their study of lung cancer patients reported that inflammation of the cancer was associated with hypoalbeminemia, weight loss and malnutrition (22). In another study, CRP and albumin levels were identified as factors in the assessment of survival in patients with colon and rectal cancers (23). Siddiqui et al. in their study among patients with pancreatic cancer, suggested reduced albumin and increased white blood cell count as two predictors of patient survival within six months (24). As studies have shown that some clinical indicators such as weight, BMI, skin thickness, mid arm circumference, calf circumference along with biochemical and immune markers are of great value in assessing the nutritional status of patients (25).

In this regard, in the present study, the indices of mid arm circumference and calf circumference were not significant between the two groups of patients. However, these indexes were lower in the patients with GI cancers. Also, in the present study, CRP level was not significantly different between the two groups, but it increased in patients with GI cancers. CRP is an acute positive-phase protein that is secreted from the liver in the response to interleukin 6 and increases during inflammation. In a cohort study in patients with colorectal cancer, it was reported that the increased plasma level of CRP was associated with progression of cancer.

Since there is a two-way communication between inflammation and malnutrition and each one can strengthen another (27), it seems that higher CRP level in patients with GI cancers to be the cause of a small difference in malnutrition in the two study groups. In addition, increased inflammation in cancer patients is also a factor of muscle loss (28). In addition, lower midarm circumference and calf circumference in patients with GI cancer were representatives of a little bit inflammation. However, the measurement of pro-inflammatory markers such as interleukin-6 could be a better indicator of the inflammatory process of these two groups.

One of the weaknesses of this study is the lack of measuring accurate biochemical markers, indicating malnutrition, such as pre-albumin. On the other hand, food intake has not been recorded for comparison of the received energy and macronutrients. Therefore, in future studies, in addition to focusing exclusively on the type of cancer, it is recommended that the dietary intake of patients along with a complete anthropometric evaluation, including body composition and biochemical measurements to be evaluated. It is also recommended that in future studies, an interventional method of intravenous nutritional support should be used and evaluated periodically to improve the nutritional status of patients with GI cancer.

Conclusion

Based on the findings of this study and previous studies, malnutrition has been reported as a common complication in cancer patients, which can be due to methods of treatment, systemic inflammation, reduced dietary intake, and malabsorption. The results of the present study, based on anthropometric, biochemical and SGA measurements, indicated that patients with GI cancers had a weaker nutritional status. Therefore, early assessment of nutritional status in these patients can be effective in order to initiate the necessary interventions.

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Conflict of Interest

None declared.

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