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Original Article

Nutritional status and dietary quality index of head and neck cancer patients undergoing chemoradiotherapy

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Abstract

Introduction: Considering the important role of early detection of malnutrition in patients with cancer and its negative effects on the outcome, as well as the lack of any published article (to the best of our knowledge) about the dietary quality index in head and neck cancer patients treated with chemoradiotherapy, we decided to evaluate the nutritional status and dietary quality index in these patients.

Methods: In this study, thirty-seven volunteer patients with head and neck cancer were recruited. Nutritional status of the patients was evaluated by Mini Nutritional Assessment (MNA) questionnaire. Dietary diversity score, dietary variety score, and diet quality index–international were calculated to assess the dietary quality of the patients.

Results: Our findings indicated that about half of the patients were well nourished and 48.6% were at the risk of malnutrition. We did not find any significant differences between various dietary quality indices and nutritional status of the patients. However, a significant reverse correlation was observed between dietary quality indices and nutritional status of the patients.

Conclusion: According to our findings, the evaluation of nutritional status and the prediction of the patients at higher risks of chemoradiotherapy-induced adverse events, may have a major role in the prevention of treatment gaps.

Introduction

Progression in the early detection of cancer and its treatments has increased the survival rate of patients suffering from this disease.[1,2] Moreover, the supportive care to improve the quality of life in these patients is an important issue. Despite the ever-growing advances in the management of cancer, malnutrition is still unsolved problem in these patients.[3,4] Patients with head and neck cancers are susceptible to malnutrition because of the tumor site per se, as well as the treatment with multi anticancer treatments. The negative effects of malnutrition in these patients can cause decreased response and tolerance to treatments, lower quality of life, and higher risk of complications, healthcare costs and mortality.[5] Therefore, nutritional status of patients in all the stages of anticancer treatment should be assessed by highly sensitive and specific tools, from the early stages at diagnosis and the beginning of the disease through the anticancer-therapy period.[6] In addition, the results of some studies have showed that there is an association between dietary quality index and cancer mortality.[7,8] However, there are few studies about the dietary quality of cancer cases, and the findings of the studies evaluating the relationship between dietary quality index and cancer mortality are controversial.[9,10] On the other hand, most studies have previously assessed the relationship between diet quality and cancer incidence and it should be noted that the role of a single nutrient have been assessed rather than the whole diet in these studies.[10-12] Recently, researchers have suggested evaluating the whole diet, as the dietary quality index is more valuable than a single nutrient. Taking into account the negative effect of malnutrition on the outcome and the important role of its early detection in cancer patients, as well as the lack of any published article (to the best of our knowledge) about dietary quality index in head and neck cancer patients treated with chemoradiotherapy (i.e. the combination of chemotherapy and radiotherapy to treat the cancer), we decided to assess the nutritional status and dietary quality index in these patients.

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Methods

Thirty-seven volunteer patients with head and neck cancers in the stages II to IV (based on TNM staging; tumor, node, metastasis) who were referred to radiotherapy department of Imam Reza hospital were recruited. We used convenience sampling method. Inclusion criteria were ambulatory head and neck cancer patients in stages II to IV candidates to receive standard preoperative chemoradiotherapy. Exclusion criteria consisted of underweight patients (body mass index [BMI] <18.5 kg/m^2), history of any other cancers, and already receiving radiotherapy and chemotherapy. Clinical information and demographic characteristics of patients was collected by a questionnaire. At the beginning of the study, weight and height were measured using a Seca scale and mounted tape, respectively. BMI was calculated by dividing weight (in kilogram) by the square of height (in meter). At the onset of the study, Mini Nutritional Assessment (MNA) questionnaire was used to assess the nutritional status of the patients. The MNA is a questionnaire with 18 items which is originally validated to be used in elderly patients suffering from non-malignant diseases.[13] The questions are composed of two main parts: the screening part and the assessment part. The screening part evaluates the changes in weight, BMI, oral intake, mobility, and stress. A score of less than 11/14 indicates malnutrition suggesting that the clinician must progress to the questions of the assessment part. This part consists of anthropometric measurements, questions on eating habits plus medical history and medications. A score more than 23.5 indicates nutritional sufficiency (group A), 17–23.5 shows risk of malnutrition (group B), while less than 17 is indicative of malnutrition (group C).

Assessment of dietary quality

A 24-hour food recall and food frequency questionnaire was used to assess the dietary intake of the patients. The dietary quality of the patients was assessed by Dietary Diversity Score (DDS). DDS is the number of food groups (grain, meat, dairy, vegetable and fruit) consumed in one day. The minimum amount for the dairy group is15 g for solid or 30 g for liquid foods. For foods in grain, meat, vegetable and fruit groups, the minimum amount is 30 g for solid foods and 60 g for liquid foods. Food groups which were consumed less than the minimum amounts were excluded.[14]

The maximum DDS can be 5 as each food group provides 1 point. To evaluate the dietary quality, Dietary Variety Score (DVS) was also defined by counting the number of food items consumed each day. After disaggregation of the foods in the meals which were consumed in one day, the number of consumed food was counted only if the amount was greater than a standard value.

Diet Quality Index–International (DQI-I) was used for an overall measurement of diet quality.[15] The DQI-I consists of four main aspects: adequacy, moderation, variety, and overall balance. Adequacy and moderation are determined by the amounts of the consumed diet (0–40 and 0–30 points, respectively). Variety is evaluated by the consumed food groups and the protein sources in the diet (0–20 points). Overall balance is determined by the fatty acid and macronutrient ratio in the diet (0–10 points). Thus, the total score of DQI-I can range between 0 and 100; the higher the score, the better the diet quality.

Statistical analysis

Statistical Package for the Social Sciences (SPSS, version 11.5, Chicago, IL) was used to analyze the data. The independent *t* test was used to determine the difference of dietary quality index between well-nourished and patients at the risk of malnutrition. The correlation between the dietary quality index and the nutritional status was assessed by Spearman correlation test. *P* values less than 0.05 was considered statistically significant.

Results

Baseline characteristics of patients are presented in Table 1. Of 37 patients, 54.05% were male and 40.54% were in stage III. Findings of our study indicated that 73% of patients were in normal ranges of BMI. The mean energy intake of patients was 1960.6±177.8 and the percentage of the daily energy intake from carbohydrate, fat and protein were 59.18%±2.56%, 15.13%±0.96% and 25.6%±2.2%, respectively. As indicated in Figure 1, about half of patients were well nourished and 48.6% were at risk of malnutrition. We did not find any significant differences between various dietary quality indices and nutritional status of the patients (Table 2). As shown in Table 3, there

Table 1. Baseline characteristics of patients (n=37)

Variables	Mean ± SD
Age (y)	49.08±9.6
Weight (kg)	70.7±13.7
Body mass index (kg/m^2)	25.65±4.42
Energy intake (kcal/d)	1960.6±177.8
Carbohydrate (%)	59.18±2.56
Protein (%)	15.13±0.96
Fat (%)	25.6±2.2
	No. (%)
Gender	
Male	20 (54.05)
Female	17 (45.94)
Stage disease	
II	10 (27.02)
III	15 (40.54)
IV	12 (32.43)
BMI (kg/m^2) classification	
18.5-24.9	27 (73)
25-29.9	7 (18.9)
30-34.9	3 (8.1)

BMI, body mass index.

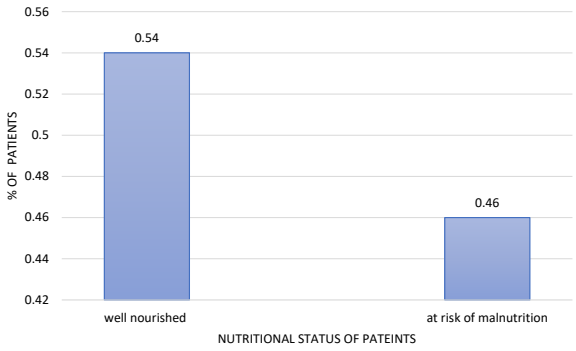

Figure 1. Nutritional status of patients according to mini nutritional assessment questionnaire

Table 2. Dietary quality index of patients stratified by nutritional status

	Well nourished	At risk of malnutrition	*P* value[a]
Dietary Diversity Score	3.6±0.16	3.5±0.22	0.82
Dietary Variety Score	10.96±0.66	9.49±1.3	0.6
Dietary Quality Index	56.82±2.4	55.5±3.7	0.78

[a] Independent *t* test.

Table 3. The correlation between nutritional status and dietary quality index scores

	R	*P* value[a]
Dietary Diversity Score	-0.31	0.01
Dietary Variety Score	-0.32	0.01
Dietary Quality Index	-0.37	0.006

[a] Spearman correlation test.

is a significant reverse correlation between dietary quality indices and nutritional status of the patients.

Discussion

Our results indicated that a high percentage of head and neck cancer patients had malnutrition. Moreover, the scores of dietary quality indices did not differ between well-nourished subjects and patients at risk of malnutrition. However, there is a significant reverse association between dietary quality indices, dietary diversity and variety scores and nutritional status. As far as we know, there is no published article about dietary quality index in cancer patients treated with chemoradiotherapy. Thus, we have to compare our results with previous studies which evaluated the effect of dietary quality index on cancer mortality.

Previously, it has been reported that patients with head and neck cancers are vulnerable to malnutrition[16,17] which is consistent with the findings of the present study. The prevalence of malnutrition in these patients is high and varies between 48% and 64%.[18,19] The differences in the reports of malnutrition in cancer patients can be attributed to the differences in tumor locations, stages of the disease, types of anti-cancer treatments, and nutritional status screening tools.[20]

Most of the researches have determined the relationship between diet quality index and cancer risk while the correlation between diet quality index and cancer outcomes has been less studied.

In this regard, Kant et al. reported that in women who had high dietary quality index, the risk of mortality from all kinds of cancer were 40% lower than those with low dietary quality indices.[21]

It has been stated that high dietary quality index is inversely associated with the risk of cancer mortality. [22,23] Findings of other studies indicated that there is no relationship between dietary quality index and risk of mortality caused by cancers.[24,25] In another word, it means that other factors such as socioeconomic factors may have some possible roles.

We supposed that a lack of significant differences in dietary quality index between well-nourished patients and those at risk of malnutrition, may be due to the fact that our patients were not severely malnourished. Therefore, their food intake was not influenced by the disease and anti-cancer treatments. On the other hand, the significant correlation between dietary quality index and nutritional status indicates that the dietary quality index affects nutritional status of cancer patients. Thus, in nutritional assessment of cancer patients, dietary intake of these patients should be carefully assessed. Considering the important role of nutritional status of patients with cancer in response to the treatment, duration of hospitalization and quality of life, early and intensive dietary counselling can withhold critical weight loss during chemoradiotherapy.

Excluded underweight patients is a limitation of this study. Moreover, the Small sample size and the different stages of the disease, which made the assessment and the interpretation difficult are also limitations to address. Thus, further larger and well-designed studies are needed. Moreover, large-scale analysis for the evaluation of new indices in the field of head and neck oncology is needed based on the recent progresses in medical nutrition therapy as well as treatment modalities.[26]

The strength of this study is the evaluation of the dietary quality index in head and neck cancer patients treated with chemoradiotherapy. As far as we know, this study is the first one to assess dietary quality index in head and neck cancer patients undergoing chemoradiotherapy.

Conclusion

In conclusion, our findings indicated that about half of our sample were at risk of malnutrition and there was a significant correlation between dietary quality index components and nutritional status of the patients. Therefore, the evaluation of nutritional status and the prediction of the patients at higher risks of chemoradiotherapy-induced adverse events may have a

major role in the prevention of treatment gaps.

Conflict of Interest
The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval
This descriptive study was approved by Ethics Committee of Tabriz University of medical sciences (tbzmed.1395.559).

Author's contributions
EF and SF contributed to the conception and design of the study and literature review. SF, FS and TP performed data collection. EF and SS contributed to data analysis and interpretation and also manuscript drafting. All authors reviewed and approved the final version of the article.

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Study Highlights

What is current knowledge?

- Prevalence of malnutrition is high in head and cancer patients treated with chemoradiotherapy.

What is new here?

- As far as we know, this study is the first one to evaluate dietary quality index in head and neck cancer patients undergoing chemoradiotherapy. There is a significant correlation between dietary quality index components and nutritional status of the patients.

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