Nutritional assessment among patients with cervical cancer and controls

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Summary

The present study aims to acquire an insight into the nutrition of cervical cancer patients, to assess food consumption pattern in patients and controls, to identify assess dietary deficiencies in women recently diagnosed with cervical cancer compared to controls, and to investigate dietary changes during treatment. This study was conducted among 65 patients diagnosed with cervical cancer, and 170 controls, at the Division of Gynecological Oncology of the University of Debrecen, in Hungary. The authors used the food frequency questionnaire and the three-day diet record to assess nutrition. Based on the results, the consumption frequency of vegetables and legumes was significantly lower among the cases. Patients’ dietary intake of vitamin D, C, and folate was significantly lower at the time of diagnosis, compared to controls. Nutrient intake is similarly insufficient among patients during the treatment. The present results show nutritional problems among cervical cancer patients and further research is required.

Key words: Cervical cancer; Nutrition survey; Nutrient intake; Food consumption.

Introduction

The number of malignant cancers is rising. The cervical cancer is the fourth (with 528,000 new cases diagnosed worldwide in 2012) most common cancer in women and it caused an estimated 266,000 number of deaths worldwide in 2012, therefore it definitely an important public health problem [1]. Cervical cancer is presumed to have a cofactorial etiology, with the well-known the infection of HPV as the major risk factor, but it is also a non-sufficient cause of cervical cancer because several other factors are also associated, interacts with other cofactors, including nutritional ones, which influence the progression [2-4]. Oxidative stress is considered to be involved in the pathogenesis of cervical cancer, so antioxidant deficiency can be an important promoting factor in cervical carcinogenesis [3]. Based on previous studies it is presumable that folate, retinol, and vitamin E probably have a protective effect, while this effect is possible for vegetables, vitamins C and B12, alphacarotene, and beta-carotene, in relation cervical dysplasia [2].

Nutrition does not receive enough attention in the risk of cervical cancer and during treatment. There are limited studies conducted on the relationship between diet and cervical cancer and the findings are inconsistent, so there is need for more research on nutrition before and during treatment. In order to be able to formulate suggestions, either for prevention or for treatment period, it is important to know the patients’ nutritional habits, and to discover possible deficiencies or nutritional problems. The aim of this study was to assess food consumption pattern in cervical carcinoma patients and controls, to identify assess dietary deficiencies in women recently diagnosed with cervical cancer compared to controls, and to investigate the differences of the nutrient intake between patients under treatment and patients at the time of diagnosis.

Materials and Methods

The study subjects included 65 female adult patients (≥ 18-years-old) diagnosed with cervical cancer, who were compared with 170 female controls. The controls were selected at random and appeared in the different departments of the same clinic. The control group did not include women with malignant disease, and they do not follow a special or different nutrition from the traditional diet. During the study, 34% patients had early and 66% had advanced-stage of cancer. The survey was created during the time of diagnosis-before any therapeutic intervention, in case of 54% of the patients, and during treatment, including chemotherapy and/or radiation therapy at 46%. This study was conducted at the University of Debrecen, Faculty of Medicine, Department of Obstetrics and Gynecology, Division of Gynecological Oncology, in Hungary, between 2016 and 2018. The ethics commission approved the study protocol (ETT-TUKEB license: 18424-2/2016/ EKU 0430/16).

The authors used a questionnaire to identify risk factors, which included information about sociodemographic factors, gynecology history (including family history of gynecological cancer, parity, use of oral contraceptive), consumption of dietary supplements, anthropometric characteristics (height, weight), which were measured when the questionnaire was presented. BMI was...
| Table 1. — *Frequency of various food consumption in cervical cancer cases and controls.* |
|-------------------------------------------------|
| Frequency of food consumption | Cases (n = 65) | Controls (n = 170) | *p*-value |
|--------------------------------|----------------|-----------------|-----------|
| **Milk**                       |                |                 |           |
| Low-fat                        |                |                 |           |
| Frequent                       | 46%            | 47%             | 1.000     |
| Rare                           | 54%            | 53%             |           |
| Fatty                          |                |                 |           |
| Frequent                       | 40%            | 43.5%           | 0.660     |
| Rare                           | 60%            | 56.5%           |           |
| **Sour cream**                 |                |                 |           |
| Low-fat                        |                |                 |           |
| Frequent                       | 34%            | 38%             | 0.550     |
| Rare                           | 66%            | 62%             |           |
| Fatty                          |                |                 |           |
| Frequent                       | 51%            | 56.5%           | 0.466     |
| Rare                           | 49%            | 43.5%           |           |
| **Cheese**                     |                |                 |           |
| Low-fat                        |                |                 |           |
| Frequent                       | 26%            | 24%             | 0.738     |
| Rare                           | 74%            | 76%             |           |
| Fatty                          |                |                 |           |
| Frequent                       | 69%            | 70%             | 1.000     |
| Rare                           | 31%            | 30%             |           |
| Processed (cube cheese)       |                |                 |           |
| Frequent                       | 49%            | 39%             | 0.183     |
| Rare                           | 51%            | 61%             |           |
| **Kefir, yogurt**              |                |                 |           |
| Frequent                       | 75%            | 74%             | 1.000     |
| Rare                           | 25%            | 26%             |           |
| **Eggs**                       |                |                 |           |
| Frequent                       | 91%            | 93%             | 0.588     |
| Rare                           | 9%             | 7%              |           |
| **Pork**                       |                |                 |           |
| Low-fat                        |                |                 |           |
| Frequent                       | 71%            | 71%             | 1.000     |
| Rare                           | 29%            | 29%             |           |
| Fatty                          |                |                 |           |
| Frequent                       | 45%            | 39%             | 0.553     |
| Rare                           | 55%            | 61%             |           |
| **Poultry meat**               |                |                 |           |
| Chicken, turkey-without        |                |                 |           |
| Skin                           |                |                 |           |
| Frequent                       | 74%            | 66.5%           | 0.346     |
| Rare                           | 26%            | 33.5%           |           |
| Chicken, turkey-with skin,     |                |                 |           |
| Duck, goose                    |                |                 |           |
| Frequent                       | 48%            | 39%             | 0.238     |
| Rare                           | 52%            | 61%             |           |
| **Beef**                       |                |                 |           |
| Frequent                       | 14%            | 10%             | 0.485     |
| Rare                           | 86%            | 90%             |           |
| **Fish, canned fish**         |                |                 |           |
| Frequent                       | 38.5%          | 49%             | 0.146     |
| Rare                           | 61.5%          | 51%             |           |
| **Offals**                     |                |                 |           |
| Liver, kidney                  |                |                 |           |
| Frequent                       | 18.5%          | 17%             | 0.848     |
| Rare                           | 81.5%          | 83%             |           |
| **Cold cuts**                  |                |                 |           |
| Frankfurter                    |                |                 |           |
| Frequent                       | 57%            | 55%             | 0.884     |
| Rare                           | 43%            | 45%             |           |
| Ham                            |                |                 |           |
| Frequent                       | 66%            | 57%             | 0.236     |
| Rare                           | 34%            | 43%             |           |
| Salami                         |                |                 |           |
| Frequent                       | 46%            | 42%             | 0.559     |
| Rare                           | 54%            | 58%             |           |
| **Smoked goods**               |                |                 |           |
| Frequent                       | 45%            | 41%             | 0.658     |
| Rare                           | 55%            | 59%             |           |
| **Bacon, greaves**             |                |                 |           |
| Frequent                       | 45%            | 41%             | 0.658     |
| Rare                           | 55%            | 59%             |           |
| **To spread on bread**         |                |                 |           |
| Butter                         |                |                 |           |
| Frequent                       | 37%            | 28%             | 0.209     |
| Rare                           | 63%            | 72%             |           |
| Margarine                      |                |                 |           |
| Frequent                       | 74%            | 79%             | 0.485     |
| Rare                           | 26%            | 21%             |           |
| Fat                            |                |                 |           |
| Frequent                       | 29%            | 24%             | 0.504     |
| Rare                           | 71%            | 76%             |           |
| **Oil seeds**                  |                |                 |           |
| Walnut, peanut, pumpkin seed   |                |                 |           |
| Frequent                       | 66%            | 73.5%           | 0.264     |
| Rare                           | 34%            | 26.5%           |           |
| **“Fast foods”**               |                |                 |           |
| Hamburger, hot dog             |                |                 |           |
| Frequent                       | 12%            | 6.5%            | 0.180     |
| Rare                           | 88%            | 93.5%           |           |
| **Muesli, cereal-flakes**      |                |                 |           |
| Natural                        |                |                 |           |
| Frequent                       | 38.5%          | 39%             | 1.000     |
| Rare                           | 61.5%          | 61%             |           |
| Flavored                       |                |                 |           |
| Frequent                       | 28%            | 25%             | 0.621     |
| Rare                           | 72%            | 75%             |           |
| **White bread, bakery products**|            |                 |           |
| Frequent                       | 71%            | 77%             | 0.316     |
| Rare                           | 29%            | 23%             |           |
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derived from a weight/height$^2$ ratio and the authors assessed it according to the WHO classifications [5]. They measured waist circumference too, besides the BMI, which is a simple method for the assessment judgement of central obesity. The measurement was carried out halfway between the top of the hip blade and the lower rib edge [6]. The food frequency questionnaire was used to obtain information regarding their food consumption pattern. The consumption frequency questionnaire provides information on the consumption patterns of a larger period of time and can provide information about the connection between specific food and diseases [7]. The study subjects were asked to indicate the average frequency of consumption of the last one year. The FPQ included 39 main food and beverage categories, which the most common ones in the diet. The frequency of food consumption was as follows: several times a day, daily, 1-3 times a week, and 1–3 times a month were coded frequent; furthermore less frequently than one month and not consumed, were coded rare. The authors used the three-day diet record to gather information on different nutritional variables, such as caloric intake, fats, protein, carbohydrates, cholesterol, fiber intake, vitamins and minerals among cervical cancer patients and controls, detailing nutrient intake for three non-consecutive weekdays, including one weekend day, which is one of the generally accepted test methods for a nutrition consumption, based on National Population Health Survey 2003 sample [7, 8]. After detailed information, a nutritional specialist instructed the patients to complete the record in their home. They also recorded the supplements in their dietary diary. At the next meeting, when they returned the record, the nutritional specialist checked the validity of the responses, interviewed the patients to check for incomplete recordings, preparation procedures, and consumed quantities. Nutrient intakes were estimated by using the NutriComp Étrend Sport 3.0 software, by a nutritional specialist.

| Food Category | Frequent | Rare | p-value |
|---------------|----------|------|---------|
| Brown bread, bakery products | | | |
| Whole wheat bread, bakery products | | | |
| Cooked pasta | Noodles, macaroni, spaghetti | | |
| Baked noodles, cake | Pancakes, cake, strudel | | |
| Potato | pottage, masked potatoes, cooked potatoes, fried potatoes in fat | | |
| Rice | | | |
| Dry legumes | Beans, yellow peas, lens | | |
| Soy, soy products | | | |
| Green pottage | | | |
| Vegetables | Paprika, tomatoes, cucumber, raw salads.. | | |
| Pickles | Cucumber, mixed pickles, beets.. | | |
| Fruits | Apple, pear, banana, lemon.. | | |
| Compote, jam | | | |
| Juice | Fibrous and fresh | | |
| Soft drink | Carbonated soft drink, filtered juice, syrup | | |
| Tap water | | | |
| Mineral water | | | |
| Tea | | | |
| Coffee | | | |
| Sweets: candy, chocolate, cookies.. | | | |
| Ice cream | | | |
In terms of nutrition intake, and controls were compared only with the patients at the time of diagnosis, as the dietary habits could have changed during treatment, the patients undergoing treatment, were compared separately to patients before treatment, that are at the time of diagnosis. During assessing of nutrient intake (including macronutrients, retinol equivalents), the authors took into account the national nutrition data table [9], and the results for the intake of vitamins and minerals were compared with the Recommended Dietary Allowance (RDA), as presented by the European Commission Directive 2008/100/EC [10]. Statistical significance was achieved when \( p < 0.05 \). Statistical significance was evaluated by Wilcoxon rank-sum (Mann-Whitney) test and Fisher’s exact test.

### Results

There was no significant difference between patients (n = 65) and controls (n = 170) with aspect to age (\( p = 0.0906 \)), education (\( p = 0.266 \)), settlement (\( p = 0.686 \)), parity (\( p = 0.759 \)), age at first birth (\( p = 0.5318 \)), marital status (\( p = 0.968 \)). Although not significant, the use of oral contraceptives was more common in patients (\( p = 0.436 \)) and used for an extended period (\( p = 0.9954 \)), compared to controls. Seventy-two percent of patients consumed oral contraceptives for nine years on average, while 66% of controls, for seven years. Twenty-five percent of patients had gynecological tumor in their family histories, significantly higher (\( p = 0.034 \)) than in controls (12%), while 8% of cases and 11% of controls did not know it.

No significant differences were observed between cases and controls for BMI and waist circumference, but in both cases, among patients and controls, it was higher than the ideal value. The average BMI was 25.3 kg/m\(^2\) in patients, and 26 kg/m\(^2\) in controls (\( p = 0.3911 \)), which presents abdominal obesity.

The food consumption frequency did not differ between cases (n = 65) and controls (n = 170), except for the consumption of vegetables (\( p = 0.022 \)), and legumes (\( p = 0.054 \)). Among the cases, their consumption was more common. Among the patient subjects 51%, while 64% among controls consumed vegetables daily or several times a day, 26% of cases, 30% of controls 1-3 times a week, while a high rate of cases, 17% consumed only 1-3 times a month and 6% less frequently than one month. Legumes are consumed 1-3 times a week in 14.7% of the controls and 12.3% of the cases, 1-3 times a month 47.6% of controls and 35.4% of the cases, while consumed less frequently than one month 31.8% and not consumed 5.9% of controls, 43.1% and 9.2% of cases. The non-significant results are not detailed separately. The results of food frequency consumption are summarized in Table 1.

Based on the results of nutrition diaries, compared with controls, patients at the time of diagnosis (n = 35) had significantly higher protein intakes, within that animal protein (\( p = 0.0074 \)), but the energy, total and specific fats, cholesterol, carbohydrate and dietary fiber intake did not differ significantly. Considering nutrient ratios, there was no significant difference among cases and controls, but the fat energy exceeded the upper limit of the recommen-

### Table 2. — The average macronutrients intake among patients before treatment and controls.

|                     | Controls (n = 170) | Patients before treatment (n = 35) | \( p \)-value |
|---------------------|-------------------|-----------------------------------|--------------|
| Energy (kcal)       | 1 764.18          | 1 787.25                          | 0.8979       |
| Protein (grams)     | 66.35             | 70.57                             | 0.0600       |
| Animal protein (grams) | 36.04          | 41.36                             | 0.0074       |
| Vegetable protein (grams) | 30.23        | 29.21                             | 0.2457       |
| Fat (grams)         | 69.63             | 69.11                             | 0.7425       |
| Animal fat (grams)  | 35.25             | 37.34                             | 0.7567       |
| Vegetable fat (grams) | 34.38         | 31.77                             | 0.1920       |
| MUFA (grams)        | 21.31             | 21.15                             | 0.4932       |
| PUFA (grams)        | 17.53             | 17.55                             | 0.9153       |
| SFA (grams)         | 19.60             | 20.12                             | 0.8658       |
| Cholesterol (mg)    | 261.95            | 291.06                            | 0.1984       |
| CHO (grams)         | 214.25            | 217.06                            | 0.8732       |
| Dietary fiber (grams) | 20.44           | 18.77                             | 0.1610       |
| % Energy from Protein | 15.13            | 15.96                             | 0.0935       |
| % Energy from Fat   | 35.49             | 34.76                             | 0.4775       |
| % Energy from SFA   | 10.01             | 10.10                             | 0.8218       |
| % Energy from MUFA  | 10.97             | 10.64                             | 0.4195       |
| % Energy from PUFA  | 8.98              | 8.82                              | 0.6210       |
| % Energy from CHO   | 49.00             | 48.94                             | 0.6388       |

MUFA: monounsaturated fatty acids; PUFA: polyunsaturated fatty acids; SFA: saturated fatty acids; CHO: carbohydrates.

### Table 3. — The average micronutrients intake-with RDA among patients before treatment and controls.

|                     | EU RDA Controls (n=170) | Patients before treatment (n=35) | \( p \)-value |
|---------------------|------------------------|----------------------------------|--------------|
| Ca (mg)             | 800                    | 518.36                           | 0.8535       |
| Mg (mg)             | 375                    | 313.94                           | 0.3447       |
| Fe (mg)             | 14                     | 8.27                             | 0.4932       |
| Cu (mg)             | 1                      | 0.79                             | 0.5459       |
| Zn (mg)             | 10                     | 6.40                             | 0.1984       |
| Mn (mg)             | 2                      | 1.50                             | 0.6478       |
| Cr (\( \mu \)g)     | 40                     | 43.67                            | 0.1307       |
| Vitamin A (\( \mu \)g) | 800                   | 491.92                           | 0.1826       |
| RE (mg)             | 0.8                    | 0.74                             | 0.1676       |
| Vitamin B1 (\( \mu \)g) | 1100              | 812.61                           | 0.7591       |
| Vitamin B2 (\( \mu \)g) | 1400             | 911.17                           | 0.5840       |
| Vitamin B6 (\( \mu \)g) | 1 400             | 1 569.91                         | 0.5274       |
| Vitamin B12 (\( \mu \)g) | 2.5                | 2.11                             | 0.4322       |
| Vitamin C (\( \mu \)g) | 80                  | 148.95                           | 0.0113       |
| Vitamin D (\( \mu \)g) | 5                    | 4.00                             | 0.0336       |
| Vitamin E (\( \mu \)g) | 12                   | 12.13                            | 0.1051       |
| Niacin (mg)         | 16                     | 11.40                            | 0.1857       |
| Folate (\( \mu \)g)  | 200                    | 115.32                           | 0.0487       |
| Biotin (\( \mu \)g)  | 50                     | 22.98                            | 0.2062       |
| Pantothenic acid (mg) | 6                    | 2.82                             | 0.8462       |

Ca: calcium; Mg: magnesium; Fe: iron; Cu: copper; Zn: zinc; Mn: manganese; Cr: chromium; RE: retinol equivalent.
Table 4.—The average macro- and micronutrients’ intake among patients before treatment and patients undergoing treatment.

| Nutrient                  | Patients before treatment (n=35) | Patients undergoing treatment (n=30) | p-value  |
|---------------------------|---------------------------------|------------------------------------|----------|
| Energy (kcal)             | 1,787.25                        | 1,747.86                           | 0.2018   |
| Protein (grams)           | 70.57                           | 66.28                              | 0.1671   |
| Animal protein (grams)    | 41.36                           | 36.67                              | 0.7422   |
| Vegetable protein (grams) | 29.21                           | 29.54                              | 0.0617   |
| Fat (grams)               | 69.11                           | 69.09                              | 0.7125   |
| Animal fat (grams)        | 37.34                           | 35.53                              | 0.9266   |
| Vegetable fat (grams)     | 31.77                           | 33.36                              | 0.4221   |
| MUF A (grams)             | 21.15                           | 21.53                              | 0.7027   |
| PUFA (grams)              | 17.55                           | 17.34                              | 0.3347   |
| SFA (grams)               | 20.12                           | 19.58                              | 0.7422   |
| Cholesterol (mg)          | 291.66                          | 268.82                             | 0.7224   |
| CHO (grams)               | 217.06                          | 211.54                             | 0.0947   |
| Dietary fiber (grams)     | 18.77                           | 19.92                              | 0.1972   |
| % Energy from Protein     | 15.96                           | 13.27                              | 0.4938   |
| % Energy from Fat         | 34.76                           | 35.58                              | 0.5276   |
| % Energy from SFA         | 10.10                           | 10.08                              | 0.4221   |
| % Energy from MUFA        | 10.64                           | 11.09                              | 0.0896   |
| % Energy from PUFA        | 8.82                            | 8.97                               | 0.0980   |
| % Energy from CHO         | 48.94                           | 48.77                              | 0.6451   |
| Ca (mg)                   | 506.82                          | 505.02                             | 0.8081   |
| Mg (mg)                   | 294.80                          | 305.46                             | 0.1084   |
| Fe (mg)                   | 8.01                            | 8.19                               | 0.5337   |
| Cu (mg)                   | 0.76                            | 0.77                               | 0.2415   |
| Zn (mg)                   | 6.64                            | 6.31                               | 0.0355   |
| Mn (mg)                   | 1.59                            | 1.49                               | 0.4221   |
| Cr (µg)                   | 40.98                           | 43.35                              | 0.7823   |
| Vitamin A (µg)            | 328.42                          | 511.57                             | 0.2210   |
| Vitamin B1 (µg)           | 770.01                          | 800.33                             | 0.2365   |
| Vitamin B2 (µg)           | 935.57                          | 908.72                             | 0.5450   |
| Vitamin B6 (µg)           | 1,518.60                        | 1,562.85                           | 0.3709   |
| Vitamin B12 (µg)          | 2.07                            | 2.11                               | 0.3173   |
| Vitamin C (mg)            | 83.86                           | 149.80                             | 0.1591   |
| Vitamin D (µg)            | 1.81                            | 3.71                               | 0.1055   |
| Vitamin E (mg)            | 11.13                           | 11.90                              | 0.6170   |
| Niacin (mg)               | 12.63                           | 11.37                              | 0.3709   |
| Folate (µg)               | 101.45                          | 114.46                             | 0.4453   |
| Biotin (µg)               | 20.84                           | 22.80                              | 0.5805   |
| Pantothenic acid (mg)     | 2.85                            | 2.82                               | 0.6357   |

MUF A: monosaturated fatty acids; PUFA: polyunsaturated fatty acids; SFA: saturated fatty acids; CHO: carbohydrates; Ca: calcium; Mg: magnesium; Fe: iron; Cu: copper; Zn: Zinc; Mn: manganese; Cr: chromium; RE: retinol equivalent.

Discussion

This study assessed the nutrition of cervical cancer patients, compared with controls. Based on the present results, food frequency consumption for most items was not different between cases and controls, except for vegetables and legumes, whose consumption frequency was significantly lower in cases. Earlier studies reported that vegetable consumption has a protective role against several common cancers [11, 12]. The micronutrients intake of cervical cancer patients and controls, was largely insufficient with reference to RDAs, so not specifically the patients are characterized by inadequate intake; this is probably associated with the home national dietary habits, but there are sharper deficiencies among patients, any important micronutrients intake values, such as vitamin A, E, retinol equivalents, even if not significant, was higher in controls compared to the patients at the time of diagnosis. There were significant differences in vitamin C, D, and folate intake; their intake was considerably higher among the con-
trols. So the results of nutrition diaries suggest that the intake of vitamins in women with cervical cancer is more defective, which may be related to less frequent consumption of vegetables, because these are the rich sources of vitamins that function as antioxidants [13]. Labani et al. studied similarly the dietary pattern among uterine cervical cancer patients and normal controls, they did not find significant differences in the food consumption profile among patients and controls, but similarly the nutrient intake was low compared to the RDA in both groups [14]. Several studies suggest that the intake of antioxidant vitamins influences the risk of cervical cancer [15-17]. Evidence indicates that micronutrient deficiencies may contribute to DNA damage and could promote tumorigenesis; in this way dietary deficiencies can be a serious factor in cancer risk [18], furthermore, oxidative stress, can play a role in the progression and pathogenesis of cervical cancer [19], therefore insufficient consumption of vegetables - which contain high concentrations of dietary fiber, vitamins, minerals, and antioxidants [13] may be an important risk factor. The nutrient intake of patients undergoing treatment did not deviate significantly from the patients at the time of diagnosis; the intakes were deficient compared to the recommendation. Although the intake of some micronutrients was slightly higher than in patients at the time of diagnosis, presumably they are trying to pay more attention to their nutrition and this can be related to the significantly higher consumption of dietary supplements, but unfortunately even these many micronutrients did not reach the recommended values, furthermore, also the protein intake was lower than the recommended for cancer patients, although adequate protein intake is essential during cancer treatment, intake of at least 1 gram of protein per kilogram body weight has been suggested for cancer patients, and a target supply of 1.2-2 g/kg/day [20]. The diet and the proper nutritional status have an important role not only in prevention, but they may also influence the course of disease and cancer progression. After cancer diagnosis, the consumption of a nutrient-dense diet is essential to provide adequate elements for healing and a defense side effects, against a later cancer recurrence [21]. This study focused on the evaluation and comparison of nutrition due to the lack of such data. Although the number of cases may not necessarily be extrapolated to a larger population the results, and it is aimed at the population of Hungary, the present study suggests that there are significant nutritional deficiencies among cervical cancer women so further nutritional studies are justified. The adequate micronutrient intake, may be a protective factor, so it is necessary to optimize vitamin and mineral intake by encouraging dietary change, and to increase the consumption of vegetables to reduce the risk of cancer [18]; furthermore it is necessary to evaluate deficiencies during treatment, to expand women’s knowledge with nutritional guidance, and to emphasize the role of nutrition for successful healing [20, 21].

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