DIETARY HABITS AND USE OF DIETARY SUPPLEMENTS AMONG FEMALE CANCER PATIENTS

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Summary

Cancer is one of the leading causes of death globally. Breast cancer has the highest incidence and mortality rate among female population in the world and in Croatia. There are many factors believed to affect cancer prevention and development, one of important is lifestyle including diet and dietary habits. The aim of this work was to determine dietary habits and dietary supplements intake among female cancer patients. For this purpose, dietary questionnaire was designed and conducted among 190 women, cancer patients, members of the Association of women affected by cancer EVERYTHING for HER. Most women surveyed had breast cancer (86%), average age 52.9 ± 0.9 years. According to body mass index, 40.5% of the patients were overweight while 8.4% were obese, and 2.1% undernourished. Dietary habits improvement after cancer diagnosis reported 85.3% of surveyed patients what was self-assessed by the patients and specially referred to fruit, vegetable and red meat intake. After the diagnosis, 77.9% patients consumed fruits, with 41.9% consuming more than 2 servings, and 98.4% consumed vegetables, with 72.1% consuming more than 2 servings, every day. Red meat was consumed by 22.6% of patients consuming meat while only 4.7% of patients stopped eating meat after diagnosis. Dietary supplements were used by 76.3% of patients, mainly probiotics, vitamin D and C, with boosting of the immune system as the main reason for use.

Keywords: carcinoma, breast cancer, dietary habits, dietary supplements, diet improvement

Introduction

Cancer is one of the leading cause of mortality in the world and number of cancer patients is increasing globally. Breast cancer has the highest incidence and mortality rate among female population in the world and in Croatia (WHO, 2018; HZJZ, 2019).

There are many factors believed to affect cancer prevention and development, with lifestyle factors, including diet, assumed to have the major impact. Factors affecting the incidence of cancer often interact and together can decrease or increase risk of cancer development (WCRF, 2007).

Diet plays an important role in the development of malignancies. High intake of fruits and vegetables, high consumption of soy products, reduced intake of processed and red meat as well as reduced intake of alcohol showed a positive impact (reducing) on the cancer incidence and reduced risk of cancer recurrence. The Mediterranean diet, characterised by the high intake of fruit, vegetables, cereals, grains and nuts, dairy products, fish and olive oil as the principal source of fat has been associated with reduced incidence or mortality from cancer (Escrich et al., 2011).

Patients with cancer should consume 5 to 9 servings of fruits and vegetables every day, where one serving represents 150 g of fruit and 75 g of vegetables. Adequate consumption of fruits, vegetables and whole grains provides the required amount of fibres (21 - 38 g per day) (Ruiz et al., 2014).

Red meat contains high levels of hem iron that can initiate the process of carcinogenesis by generating genotoxic free radicals and N-nitroso compounds (Diallo et al., 2018). Available studies suggest that for cancer prevention consumption of red and processed meat should be limited to less than 300 g per week (Lippi et al., 2016). Alcohol consumption is positively associated with the risk of upper gastrointestinal cancer (oral cavity, pharynx, larynx, oesophagus) as well as colon, liver, and breast cancer (LoConte et al., 2018).

Dietary supplements are considered to be food intendent to enrich the usual diet with the purpose of maintaining health, made from concentrated sources of nutrients or other substances with a nutritional or physiological effect (Regulation, 2013). Cancer patients and survivors often consume dietary supplements to control development of cancer (Patterson et al., 2003). American Cancer Society, World Cancer Research Fund and American Institute for Cancer do not support usage of dietary supplements for cancer prevention and suggest that all necessary nutrients should be taken from food (Harvie, 2014).

Aim of this study was to determine dietary habits and dietary supplements intake among female cancer patients.

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Materials and methods

Participans

190 female cancer patients, members of the Association of women affected by cancer EVERYTHING for HER, aged 26 to 82 participated into study. Recruitment was done from March to the May 2019 and the data were collected during 35 days (from 20 May to 30 June 2019) in accordance with the Helsinki Declaration and General Data Protection Regulation (GDPR).

Questionnaire design

The questionnaire was composed from 87 questions designed as combination of open, closed and multiple-choice questions. The dietary questionnaire consisted of three parts: general information, dietary habits and dietary supplementation. The general part of the questionnaire had 43 questions collecting data on age, working status, income, body weight and height, physical activity, place of residence, menopause and lifestyle. The second part of the questionnaire had 33 questions that concerns the dietary habits of respondents. Data about consummation of food that can have positive or negative impact on cancer risk such as intake of fruits and vegetables, nuts, red meat and food preparation were collected. The third part of the questionnaire had 11 questions regarding dietary supplements consumption where data about beginning of taking, reasons of using, sources of information, risk researching as well as type of dietary supplements used were collected.

Questionnaire was filled out anonymously in paper-based form or in electronic form for those that were unable to came into the association.

Statistical analysis

The collected data were statistically analysed in Microsoft Excel 2013 and SPSS StatisticV.22 (SPSS Inc., Chicago, Il, USA). Standard methods of descriptive statistics (mean, standard deviation, standard error, minimum, maximum) were used. Distribution normality was examined by the Shapiro-Wilk test.

Results

General informations

Average age of subjects was 52.9 ± 0.9 years. To assess the degree of malnutrition, body mass index (BMI) was used, where BMI under $18.5$ kg/m^2 indicates underweight, BMI between $18.5 - 24.9$ kg/m^2 indicates adequate weight, BMI between $25.0 - 29.9$ kg/m^2 indicates overweight and BMI over 30 kg/m^2 shows obesity (WHO, 2000). According to the BMI adequate body mass had 48.9% of patients, 40.5% were overweight, 8.4% obese and 2.1% undernourished. 85.3% of surveyed patients stated that they improved their dietary habits after cancer diagnosis. In this study, most patients (68%) had breast cancer, and the remaining had ovarian cancer, cervical cancer, lung cancer, leukemia, gastric cancer and others, what was expected according to the trends in Western Europe and in Croatia (Ferlay et al., 2018; HZJZ, 2019).

Dietary habits

The questions about dietary habits were designed to get information about dietary consumption after cancer diagnosis what represents their actual food consumption. In this study, 26.3% of women stated that they did not changed, while 73.7% of them changed their dietary habits after cancer diagnosis which includes increased intake of fruits and vegetables, olive oil and reduced intake of alcohol, caffeine and caffeinated beverages. One earlier research showed that 30-48 % of women had changed their dietary habits after cancer diagnosis, what included increased consumption of fruits and vegetables (Limon-Miro et al., 2017).

To the question "Do you pay more attention to your diet and what do you eat since you have been diagnosed with the disease?", 82.31% of women responded positively.

According to the American Cancer Guidelines, it is recommended daily consumption of 5 servings from fruit and vegetable food groups (Doyle et al., 2006). The UK guidelines gives similar recommendations that include a minimum intake of 400 g of fruits and vegetables per day (BNF, 2018). Canada also has its own guidelines for women with cancer with focus on consuming 7 to 8 servings of fruits and vegetables every day, where ½ cup of certain fruit represent one serving (BCCANCER, 2012). About 65.2% of all surveyed women consume one serving of fruit per day, while according to the collected data, 55.3% of the respondents consume up to 2 servings of vegetables a day (Fig. 1). Dietary habits of surveyed patients do not comply with the recommendations. Most studies conclude that 5-9 servings of fruits and vegetables, where one serving represents 150 g of fruit and/or 75 g of vegetables, are needed daily to ensure adequate intake of antioxidants and fibres, with suggestion that vegetables included into diet should be rich in beta-carotene and vitamins A, C and E (Limon-Miro et al., 2017).
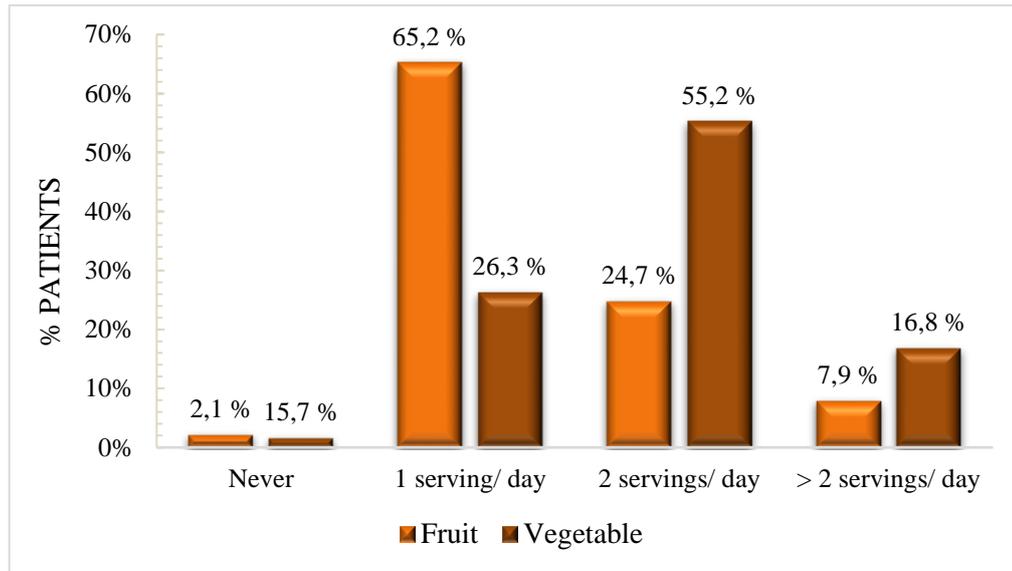
Fig. 1. Intake of fruits and vegetables among female cancer patients (n=190)

About 39% of patients surveyed consumed mostly leafy green vegetables, and 19.8% consume cabbage. Li et al. (2017) suggest a higher intake of cabbage because it is rich in isothiocyanates such as benzyl isothiocyanate, phenethylisothiocyanate and sulforafan which can inhibit tumor cell growth. Citrus fruits and apple fruits were the most commonly consumed fruits among women in this research. Apple fruits were consumed by 24.6% of women, while 19.8% of women consume citrus fruits (Table 1). Consumption of citrus fruits is recommended during treatment and recovery for certain cancers, including breast cancer (Li et al., 2017).

Table 1. Groups of consumed fruits and vegetables among female cancer patients (n=190)

Fruit food group	Respondents (%)
Citrus	19.8%
Berries	18.7%
Apple fruits	24.6%
South tropical fruits	16.6%
Nuts	11.2%
Vegetable food group	**Respondents (%)**
Cabbages	26.2%
Dark green leafy vegetables	39%
Beans and peas	9.1 %

Poultry meat was the most common type of meat consumed in this study. Most of women (87.3%) consume poultry meat and only 12.7% consumed red meat. Limon-Maroet al. (2017) propose that meat such as chicken and turkey meat should be prioritized for women with cancer (1-2 times per week) because is good source of animal protein and have a low fat content. According to the US recommendations, cancer patients should not consume more than 3 servings of red meat (350-500 g) per week (Doyle et al., 2006).

The consumption of processed meat is often one of controversy when it comes to patients with some type of cancer. The Fig. 2 shows that an equal number of women in this research (up to 30.5%) consumed processed meat several times a week and 1-3 times per month. About 19.5% of women never consumed processed meat, and 16.3% reported that they consume processed meat several times in a few months. Consumption of red and processed meat should be limited less than 300 g per week (Lippi et al., 2016). According to the results obtained in this study, it is evident that the intake of processed meat among surveyed patients is in accordance with the recommendations.
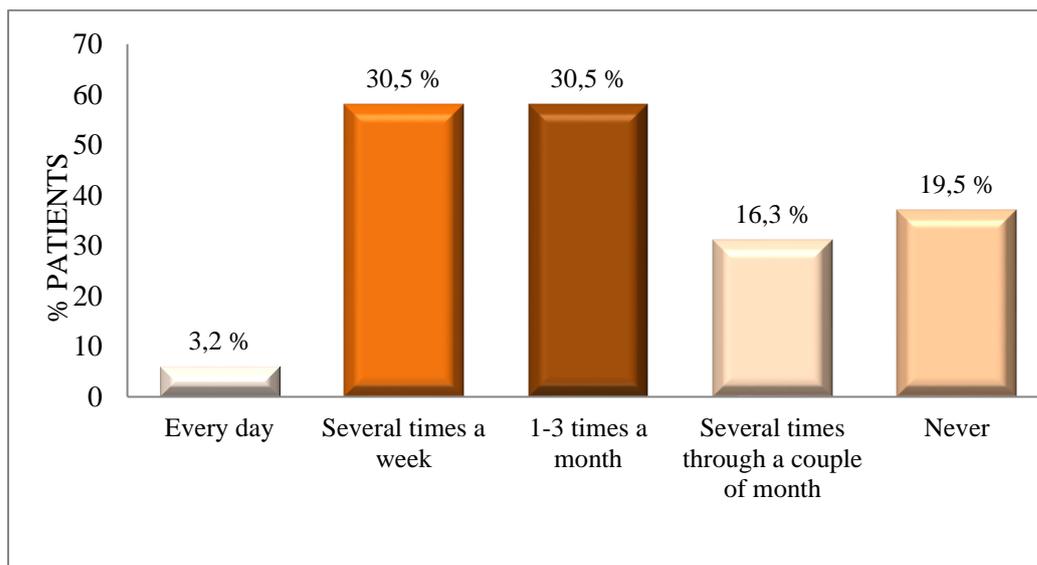
Fig. 2. Intake of processed meat among female cancer patients (n=190)

The Table 2 shows that blue fish was the most common choice among 56.9% of respondents, while white fish was more commonly consumed by 34% of women. Most of women (36.8%) eat fish once a week, while 30.5% of women eat fish several times a month. The UK recommendations focus on fish intake, recommending fish intake at least 2 times per week (BNF, 2018) and when compared to the results obtained in this study, it is clear that the intake does not comply with recommendations (Fig. 3). Consumption of fish is particularly important because it is a good source of omega-3 fatty acids especially during chemotherapy (Kotepui et al., 2016), among that fish intake is important because it is a source of high quality protein and fat-soluble vitamins such as A and D, as well as trace elements such as selenium and iodine.

Table 2. Consumed fish species in research (n=190)

Fish	Respondents (%)
Blue fish	56.9%
White fish	34%
Freshwater fish	9%
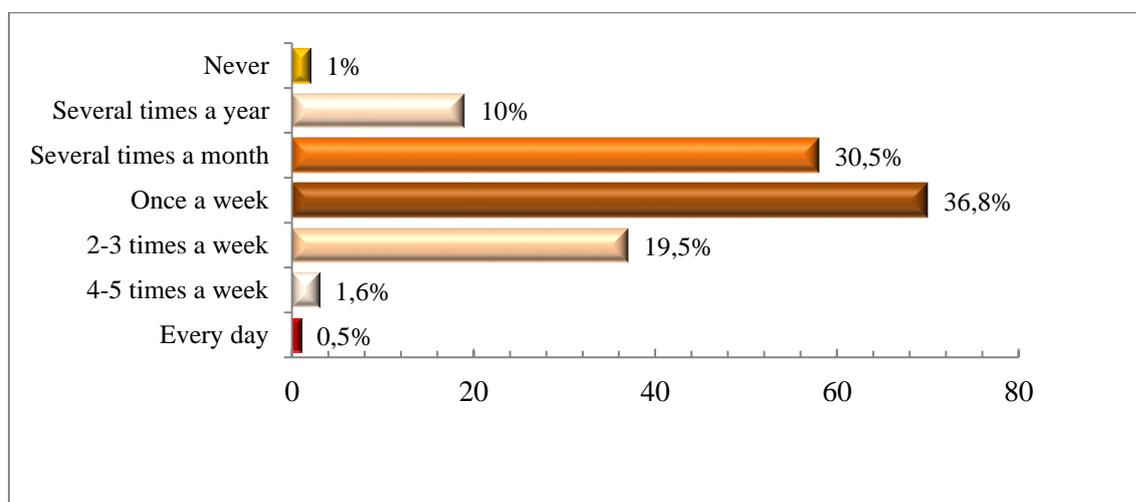
Fig. 3. Intake of fish among female cancer patients (n=190)

There was no significant difference between women according to the alcohol consumption. About 60.5% of respondents consume alcohol, while 39.5% do not. If we focus only on women who consume alcohol, 52% of them consume alcohol less than once a month. In this research, despite the fact that almost 60% of the respondents consumed alcohol, the frequency of consumption was rare. In particular, the effect of alcohol on women after diagnosed cancer is not clear. Some researchers showed that alcohol consumption which include ≥3 alcoholic drinks per week after a breast cancer diagnosis may increase risk of breast cancer recurrence, particularly among postmenopausal and overweight/obese women (Kwan et al., 2010).

Alcohol avoidance is preferred and consumption should be limited to one drink a day, what means a glass (145 mL) of wine, or bottle of beer (359 mL), or a glass of strong alcoholic beverage (45 mL) such as whiskey and gin (BCCANCER, 2012).

Dietary supplements

According to the obtained result about dietary supplements intake, there were differences in level of education between respondents with respect to dietary supplements intake. A lower education level implied elementary school and high school (n = 75), while higher education level included college, bachelor´s, master´s or higher degree. There was observed nominal, but not a significant difference (*p=0.472*) in consumption of dietary supplements regarding education level. Among patients with lower education level there is higher proportion of those who do not use dietary supplements, while among women with higher education level situation is the opposite. Song et al. (2017) found similar relationship between education level and use of dietary supplements, where patients with higher education level were more likely to use dietary supplements compared to those with lower education level.

In this study, 147 patients (77%) were using dietary supplements what is in accordance to previous where was assumed that 65% of the European cancer survivors use other methods which are not part of the conventional cancer treatment and as most commonly stated is the use of dietary supplements (Lopes et al., 2017).

Velicer and Urlich (2008) found the difference in the use of dietary supplements between breast cancer survivors compared to other types of cancer, where breast cancer survivors are more likely to use dietary supplements than patients suffering from other types of cancer. In this study, there was no difference (*p=0.875*) in consumption of dietary supplements among breast cancer patients (77.7%) compared to patients suffering from other types of cancer (76.7%). In earlier research there was estimated that 75% breast cancer survivors use dietary supplements (Astin et al., 2006).

Main reason for using dietary supplements in this study was boosting the immune system (Fig. 4). That can be explain by the fact that most of the patients start using dietary supplements during therapy because of decline of immunity and general weakness so they wanted to boost the immune system to help withstand the therapy.

In the literature, the main reasons for using dietary supplements is also boosting immune system, following by: curing the disease, decreasing side effects of chemotherapy, better quality of life, controlling disease, enhancing recovery and prevention of cancer recurrence (Vidal et al., 2013; Wong et al., 2010). Same results were obtained in this study (Fig. 4).
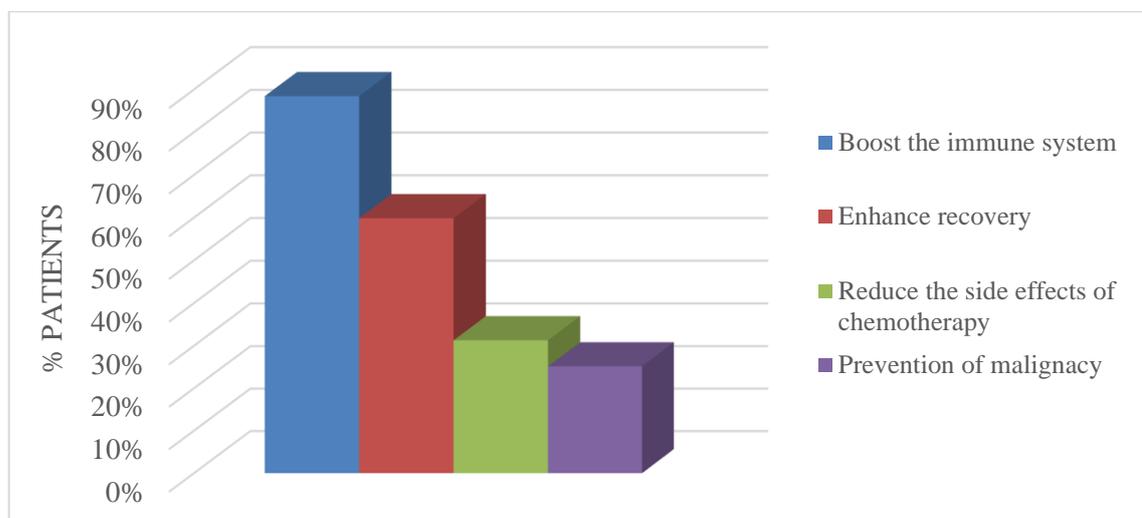
Fig. 4. Main reasons for using dietary supplements

Probiotics (41.5%) were the most commonly used dietary supplement in this study, followed by vitamin D (40.1%) and vitamin C (36.1%). Equal number of respondents (33.3%) used multivitamins, antioxidants and omega-3 fatty acid supplements. The similar results were obtained for consumption of curcumin and calcium supplements, used by 32.7% respondents. From all respondents who use dietary supplements, only 20 (13.6%) used one supplement exclusively, while others used two or more dietary supplements. Song et al. (2017) compared the consumption of dietary supplements between general population and cancer survivors, where cancer survivors were mostly using multivitamins and minerals, after that vitamin C, omega-3 fatty acid, red ginseng and calcium. In *Intergroup phase III Breast Cancer Chemotherapy trial (S0221)* most patients were using multivitamins, followed by calcium, vitamin C, vitamin D and omega-3 fatty acids (Harvie, 2014). Similar results

were obtained in *WHEL study* (*Women´s Healthy Eating and Living study*), where the most commonly used dietary supplements were multivitamins, vitamin E and vitamin C (Rock et al., 2004). The main difference between results from literature and results obtained in this study are probiotics, with no differences in consumption of other supplements. Probiotics help reducing digestive disorders, which are often reported as side effects of chemotherapy (Serna-Thome, 2018). Also, probiotics were the most prevalent during therapy among respondents in this study. So it is possible that probiotics may have helped to reduce side effects of chemotherapy among patients, partially facilitated toleration of the therapy and improved quality of life. Of all consumed supplements in this study(Fig. 5), only probiotics and omega-3 fatty acids shows potential positive effects on cancer survivors (Serna-Thome, 2018; Fabian et al., 2015).
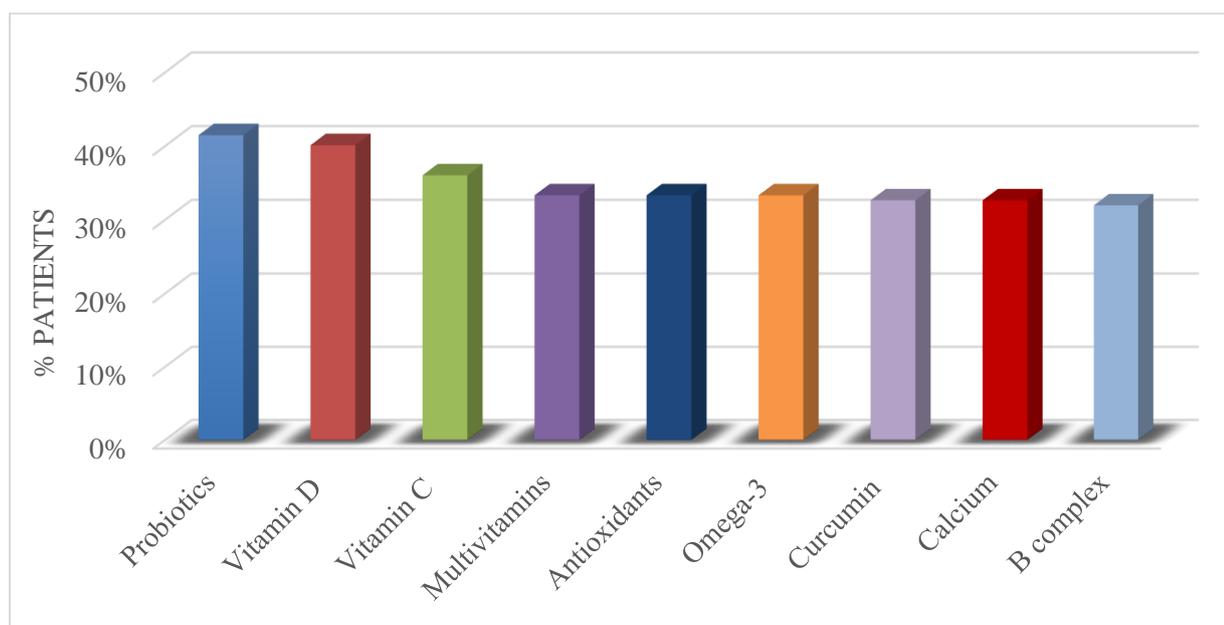
**Fig. 5.** The most commonly used dietary supplements

The majority of respondents (61%) began to use dietary supplements during therapy, 21% respondents started with supplementation before cancer was diagnosed and 18 % respondents started with supplements after the therapy. Only 28 respondents (19%) used dietary supplements only during therapy and did not continue using it after finishing therapy.
It is estimated that, in the US population, 45 – 80 % breast cancer survivors use antioxidants as dietary supplements, including a period during therapy (Greenlee et al., 2009). During therapy, 55

respondents used antioxidants as dietary supplement, including mix of antioxidants, vitamin C and vitamin E. That means that 63.21% respondents who were using supplements during therapy used some kind of antioxidants as dietary supplements. Possible problems with usage of antioxidants during therapy, is their possible pro-oxidative effect of weakening the effect of chemotherapy (Lawenda et al., 2008).
Among all respondents who used dietary supplements, 64% investigated the possible risks and side effects of using dietary supplements before staring using them.

Respondents were divided into three categories according to timing when started using dietary supplements - respondents who were using supplements before cancer diagnose, respondents who started using supplements during therapy and respondents who started with supplementation after therapy (Fig. 6). In the group of respondents who were using dietary supplements before cancer diagnose, multivitamins and probiotics were the most commonly used supplements. Similar results were given by *Pathway study*, where the most commonly used were multivitamins, vitamin C, calcium, vitamin D (Greenlee et al., 2014), the main difference between *Pathway study* and this study was probiotics usage. During the therapy respondents in this study mostly used probiotics, omega-3 fatty acids, and antioxidants, while vitamin D was the most commonly used supplement after therapy. In the study from Zirpoli et al. (2013), multivitamins were the most commonly used supplement before cancer diagnose and during therapy, also after therapy there was increase in vitamin D supplementation.
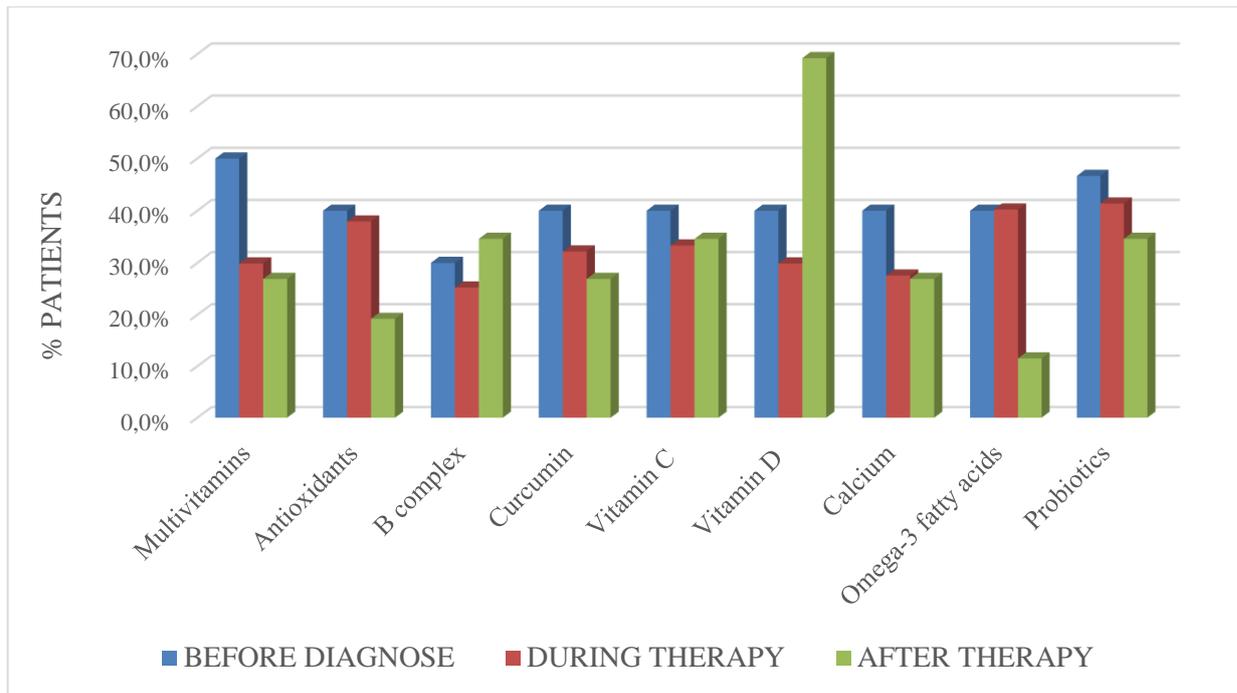
Fig. 6. Comparison of dietary supplements used before diagnose, during therapy and after therapy (n = 147)

The respondents in this study used more dietary supplements compare to herbal (alternative) supplements. Consumption ratio was 8:1 on behalf of dietary supplements. The most commonly used herbal supplement was beta glucan (41.5% of respondents who used herbal supplements). According to the frequency of use, glucosamine (24.6%) was at second place, and green tea extract and *Echinacea* were at the third place (21.5%).

Conclusions

In this study, about 7.9% of women, cancer patients, consumed an adequate amount of fruit, while 16.8% consumed adequate amount of vegetables. White meat was the choice of most women in this study. Only 19.5% of women met the recommendations for fish intake. In general, women cancer patients should increase their intake of fruits and vegetables (at least 400 g per day), fish (twice a week), and reduce intake of processed and red meat (less than 300 g per week). Alcohol consumption should be moderate (1 drink per day).

Regarding dietary supplements, 77.3% of respondents used dietary supplements at some stage of treatment with more educated respondents more likely to used dietary supplements. Dietary supplements were more likely used than herbal supplements. The main reasons for using dietary supplements were boosting the immune system and enhancing recovery. In this study, most commonly used supplements were probiotics, vitamin D, vitamin C, multivitamins, calcium and omega-3 fatty acids. Before diagnosis, most frequently consumed were multivitamins and probiotics, during the treatment probiotics, omega-3 fatty acids and antioxidants, while after therapy vitamin D was the most commonly used.

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