Dietary vitamins intake and obesity among breast cancer females, Egypt: A case-control study

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Abstract

The incidence rate of breast cancer (BC) varies greatly worldwide. Vitamins are essential nutrients for human metabolism, taking part in an essential function; enhance immune response, alleviate oxidative stress, inhibit angiogenesis, and induce apoptosis. Obesity is associated with an increased breast cancer risk in postmenopausal women and may contribute to worse outcome. The study aims to:a) explore a relation between daily vitamins intake and BC risk in a sample of Egyptian women, b) study the associations between obesity and breast cancer risk. This is a case-control study, where 222 women were divided into three groups, Group 1a: 83 malignant tumor lesion group, Group 1b: 54 women diagnosed with benign lesion, and Group 2: 85 healthy control women. Relevant anthropometric measurements, 24 dietary recalls and food frequency were reported. Result, showed that, body mass index, weight, waist and hip circumference, were all significantly higher among benign and BC patients compared to controls ($p \leq 0.0001$).Data revealed very low daily intake of vitamin D, C, folic acid and pantothenic acid with significant differences between the three groups.The daily intake of vitamins A and E reached the RDA in BC patients with a significant difference between groups; however, the difference was not significant for vitamin E. Vitamins B daily intake reported high levels especially for B12. The results showed that weight, BMI, waist, and hip circumference were all significantly higher in both the benign tumor group and the BC group compared to the healthy control group. The results suggested that maintaining a healthy weight and consuming a diet rich in vitamin C, D, folic acid, and pantothenic acid can help lower the risk of BC.

Keywords: Dietary Vitamins, breast cancer, benign, malignant, obesity, Egyptian women.

Introduction

The prevalence of breast cancer (BC) varies greatly around the world because of differences in educational levels, environmental conditions, economic status, lifestyle factors, dietary practices, and other cultural customs. BC incidence among women's population has considerably grown recently, especially among those under 50, and is predicted to quadruple by 2030 ***(Sung et al., 2021).***

A variety of vitamins and dietary components have been discovered to hinder the molecular events and signaling pathways involved in the various stages of BC development. The in vitro, in vivo, and epidemiological human studies; ***Mokbel and Mokbel,*** reported that specific vitamins, including vitamin D3, vitamin B6, beta carotene, and folate have antitumoral activity ***(Mokbel and Mokbel 2019).***Many studies have discovered an inverse relationship between serum vitamin D content and the occurrence of various malignancies such as breast, kidney, colorectal, lung, and pancreatic cancer ***(Atoum&Alzoughool 2017).***

Optimal vitamin D serum levels may help to prevent BC. Vitamin D might help prevent cancer by boosting autophagy in healthy breast tissue of mice suggesting that the VDR and vitamin D regulate autophagy and cell death in both healthy and diseased BC and mammary gland cells ***(Tavera-Mendoza et al., 2017). Zhang et al.,*** found a strong correlation between increased vitamin C intake and a lower incidence and mortality of BC. Contrarily, taking vitamin C supplements has no impact on preventing BC ***(Zhang et al., 2020).***

In recent study, B-vitamins (niacin, folate, riboflavin, thiamine, pyridoxine, pantothenic acid, and cobalamin) and other micronutrients that involved in one-carbon metabolism have been shown to reduce the risk of BC via genetic and epigenetic pathways, by interfering with DNA replication, repair, and gene expression regulation, it can cause cancer ***(Ali et al., 2022).***A large prospective cohort study, found that dietary, supplemental, and total pyridoxine intakes, as well as total thiamin intake, were linked to a lower risk of BC ***(Mokbel and Mokbel 2019).*** According to another large prospective trial, that included a quantitative assessment of supplemental consumption ***(Egnell et al., 2017),*** pyridoxine and thiamin may have a preventive impact against BC risk in middle-aged women. Epidemiological studies haven't reached a clear conclusion on whether folate affects BC risk ***(Ren et al., 2020).***

Obesity is well-established risk factors for breast cancer (BC) development and is associated with a 30% increased chance of recurrence or death ***(Mohamed et al., 2023).*** Breast tissue is predominantly composed of white adipose, and developing breast cancer readily and directly interacts with cells and signals from adipose remodeled by obesity ***(Devericks et al., 2022).***This study aimed to investigate the daily vitamins intake of Egyptian women and BC risk. the associations between obesity and breast cancer risk have been studied.

Cases and methods

Study design:

A case-control study was conducted in which 83 women were diagnosed with malignant tumor lesion (BC) group (1a), while 54 cases were found to have benign lesion group (1b). In addition, 85 healthy women (group 2) who received free mammograms on both sides were chosen as a control group, and their age and socioeconomic status were matched with the patients.

Sample size justification:

PASS 11 Power Analysis was used to determine the minimum required sample size for this case-control study, which was 222 patients (group 1a= 83 BC patients, group 1 b=54 women with benign tumors, and group 2=85 healthy controls) with a power 85% and α level =0.05 to detect a 0.2000 difference in the group proportions. According to the alternative hypothesis, the proportion in women with BC is 0.3500, while under the null hypothesis, it is supposed to be 0.1500.

Inclusion criteria:

Women scheduled for a breast biopsy, have been diagnosed with a malignant tumor. Women were found to have benign lesions in group (1b). Women in the second group, known as the healthy controls, were free of any conditions or known chronic diseases, such as hypertension, type 2 diabetes, a tendency to bleed, and diagnosed normal mammograms.

Exclusion criteria:

Pregnant or lactating women, individuals with any other health problems that could affect the results of the study were not eligible for this study. Diabetic women or women that had any chronic disease rather than cancer or being obese/ overweight women on specific diet regimen, women receiving chemotherapy and radiation.

Anthropometric evaluations:

Following the guidelines of the International Biological Program (Dao et al., 2019), measurements of the body's weight, height, hip and waist circumferences, as well as the thickness of the skin folds, were taken. With the participant wearing only the barest of garments and no shoes, body weight was calculated to the nearest 0.01 kg using a Seca Scale Balance. The height of the body was measured with a Holtain portable stadiometer to the nearest 0.1 cm. BMI was calculated by dividing a person's weight in kilograms by their height in square meters.

Dietary assessment:

Data on dietary intake were reported using the 24 hours dietary intake recall that repeated for 3 successive days by phone call and by face-to-face interviews, in addition to the food frequency method. The total dietary intake was analyzed using the Nutri survey computer program. Data was collected by an expert nutritionist.

Statistical analysis:

Data were analyzed by the Statistical Package for Social Science (IBM SPSS, IBM Corp, NY, USA), version 23. The quantitative data were presented as mean, ±SDs, and ranges when parametric and median, inter quartile range when data were found nonparametric. Also, qualitative variables were presented as number and percentages. The Kruskal-Wallis test was used to compare two independent groups with a nonparametric comparison of more than two independent groups. Comparisons between the three parametric groups were made using the analysis of variance test.

Results

Table. 1 showed that in both women with benign and malignant tumor, their weight, BMI, waist, and hip circumference were all significantly higher compared to the healthy control group ($P \leq 0.001$). Healthy women and women with begin breast lesion had low vitamin E and vitamin A levels, but reached the RDA in BC patients with a significant difference from the control group. The Results showed that the three groups had very low vitamin D intake daily—30.0, 26, 8, and 25, 8%, respectively, compared with the RDAs. Vitamin C intake was below the RDA daily, especially for the benign and BC groups (58.73 and 53.13%, respectively), with a significant difference between controls and BC patients, (Table 2).

Significant differences were found between the control group and the benign and BC patients in their daily intake of folic acid and pantothenic acid (B5), which was found to be 39.89, 45.50, and

49.13% and 49.0, 75.20, and 80.0% of the RDA for the two vitamins, respectively (Table 3). Except for vitamin D, no significant differences in vitamin intake were found between the benign and malignant groups. The daily intake of the other B vitamins reported high levels, especially for B12, (Table 3).

A high percentage of BC patients, 86.7%, reported daily consumption of carbohydrate food, including pasta, bread, and bakery goods, or eating sweets with a significant difference from the other groups at p≤0.042 and (p≤0.002), only a small percentage of BC patients compared to healthy women (9.6 and 26.5%, respectively) consumed fresh and cooked vegetables (p≤ 0.022), The total number of participants who consumed fruits and fruit juices was reported to be twice a week for the control group (47.3%), and once a week for women with benign and malignant BC (54.6 & 44.0%), with a significant difference at p≤0.013,(**Table 4a).** Moreover, BC patients had the lowest consumption level of the most animal protein foods/week, including chicken, meat, fish,eggs, and the lowest consumption level of milk and dairy product, then healthy women and with benign tumors with significant differences (21.2, 42.5, and 44.4 %, and p≤0.05), The highest percentage of BC patients (91.5 & 92.2%) used butter and vegetable ghee daily, compared to the control 58.8 and 49.4% and benign tumor 59.2 & 55.5%, (p≤ 0.001), (**Table 4b).**

Discussion

Patients with BC were more likely to be obese because of their high intake of non-carbohydrate, fatty, and sugary foods. In a dietary study, researchers reported that very low daily intakes of vitamins D, C, and E, but slightly lower intakes of vitamin A in the control and benign breast tumor groups but reached RDAs in BC patients ***(Olmos et al., 2021).***Primary cancer prevention measures that address both dietary and lifestyle issues can be improved ***(Azmy et al., 2023).***According to Vitamin D dietary intake, where Fatty fish, red meat, liver, and eggs are all high in vitamin D. Only a small percentage of women with Breast cancer (12.1%), consumed these items daily. Many studies investigated the vitamin D supplementation and its effect on risk of BC, revealed that there was a decreased risk with vitamin D intake; case-control research, ***(MisottiGnagnarella 2013) and (Shamsi et al., 2013)*** reported a 21% and 73% reduction in risk, respectively. Researchers have found that many women with BC or at risk for it have low vitamin D levels (below 20 ng/ml).

There's debate about the link between vitamin D and BC, the U-shaped relationship between 250 H-D levels observed in several research emphasizes the need to avoid both deficient and excessive levels ***(CharoenngamHolick 2020).*** Our study aligns with this idea.The current study found that patients with BC had the lowest daily intake of vitamin C compared to the RDA (53.39%). According to prior research findings, the findings of this study corroborated what they discovered on the link between poor vitamin C intake and BC ***(Zolota et al., 2021).***

There were 76 meta-analyses (51 publications) of randomized controlled trials and observational studies with 63 distinct health outcomes. Increased vitamin C intake of 50-100 mg per day was associated with a lower risk of all-cause, and different types of cancer like esophageal, cervical, gastric, and lung cancer according to a dose-response analysis.

Previously, extensive research found that vitamin E supplementation did not protect against BC ***(de Oliveira et al., 2023). Fulan et al. (2011)*** reported in a meta-analysis of 38 vitamin E with BC research, that dietary and total vitamin E lowered the incidence of BC by 18% and 11%, respectively.

Our finding is consistent with the findings of ***(Xiao et al., 2018),*** which found that vitamin E daily intake was within the RDA range, particularly among BC patients, with no significant difference between the three groups.

This study's findings revealed that the level of daily intake of vitamin A among women with BC was sufficient and equal to the RDA, compared to the low daily intake among the control and benign tumor groups. Seven research were discovered that investigated the links between vitamin A supplementation and BC risk. There was only one case-control study that found a statistically significant increase in risk.

Our current study showed that BC women' daily intake of various foods revealed their high vitamin B1(Thiamin) content. This could be because they consume a lot of items derived from high extraction wheat, such traditional bread and other baked delicacies. Moreover, vitamin B5 is yet another B vitamin that promotes anti-cancer immunity ***(Bourgin et al., 2022).***

Meat, chicken and dairy products are rich sources in vitamin B5. According to the findings of this study, only a small percentage of participants consume these foods daily. As a result, a low daily intake of vitamin B5 in all groups included BC patients was reported, when compared to the RDAs. On other hand,because of the small proportion of women who consumed folate-rich foods daily, such as fresh fruits, dark green vegetables, nuts, and fish, the level of folate consumption was low in all groups. Studies suggested that folate may protect against the estrogen progesterone positives ER+PR+subtypes of cancer***(Vollset et al., 2013, NewmanMaddocks 2017, Peterson et al., 2020, Huang et al., 2022).***

Conclusion:

The findings of this study suggest that a healthy diet, particularly one rich in vitamins D, C, folic, and pantothenic acid, as well as a healthy weight, can help reduce the risk of BC. It may also be concluded from this study that the severe decrease in the daily intake of vitamin D has a strong relationship with BC among women. However more reserch on diet and breast cancer is needed.

Ethics Statement:

This study was approved by Ethical Committee of the National Research Centre (Registration Number 19/202). The research was carried out in conformity with the Declaration of Helsinki's ethical principles. all subjects signed an informed consent form to participate in this study.Informed consent: Informed written consent was obtained from all participants after the study objectives were explained and before blood sampling. Confidentiality of patient data was guaranteed.

Availability of data and materials:

All data and materials are available and can be submitted when needed, Corresponding Author is responsible person who should be contacted if someone wants to request the data from this study.

Consent for publication

The authors declare no conflict of interest.

Competing interests:

All authors report no conflict of interest. "No financial or nonfinancial benefits have been received or will be received from any party related directly or indirectly to the subject of this manuscript.

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Authors' contributions:

W. S. M. contributed to the project preparation, study design, submission for funding and writing draft of the manuscript. O. A, S and M. E. S were responsible for the management of purchasing tasks and schedules. N. A., and I. T, H. T coordinated specimen collection and transport and implemented a quality policy throughout the laboratory analysis workflow. M. M. M. G, and M. M. K, contributed to laboratory analysis. Appropriate patient selection and data collection were performed by W.S.Mand D.Y.H., supervised by W. Y, and M. A. E, Contributed to laboratory analysis, statistical analysis of data and tabulation of results. All authors have read and approved the final manuscript.

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List of abbreviation: breast cancer (BC), Body mass index (BMI), waist circumference (WC), and hip circumference (HC), Waist//Hip Ratio (WHR).

Table (1)

Mean ± SD of the Anthropometric parameters of the studied groups

Parameters	Control group No. 85	Benign group No. 54	Malignant group No. 83	P-value
Weight (Kg)	70.18 ± 17.49	82.67 ± 18.42**a	87.05 ± 21.44**b	0.000 **
Height (cm)	158.99 ± 7.42	161.02 ± 7.08	154.68 ± 24.66	0.060
BMI (kg/ht2)	27.51 ± 7.10	31.39 ± 6.77*a	31.39 ± 6.77**b	0.000 **
WC (cm)	84.33 ± 13.78	98.85 ±13.53**a	101.24 ± 15.01**b	0.000 **
HC (cm)	102.74 ± 20.11	117.24 ± 14.41**a	114.64 ± 25.88**b	0.000 **
Suprailiac skin fold (mm)	22.25 ± 4.68	23.87 ± 5.12**a	24.14 ± 4.93**b	0.030*
Abdominal skin fold (mm)	26.87 ± 3.51	26.24 ± 4.62	26.64 ± 4.78	0.702

**statistically highly significant (p<0.01) *statistically significant (p<0.05)

Table (2)

Mean ± SE of Vitamins intake by the studied women.

Nutrient intake	Control group No. = 85	Benign group No. = 54	Malignant group No. = 83	RDAs	P-value
Vitamin A (µg)	460.56±4.31 57.57%	638.75± 1.89 79.83%	807.91± 3.64 100.99%	800	0.015 a*, b*
Vitamin E (mg)	12.43±1.56 82.87%	14.71±1.67 98.07%	14.71±1.48 98.07%	15	0.850
Vitamin D (µg)	1.50±0.49 30.0%	1.34±0.72 26.80%	1.29±0.57 25.8%	5	0.341
Vitamin C	52. 79±4.52 87.48%	35.24±2.14 58.73%	32.37±4.02 53.93%	60	0.049b*
Vitamin B1 (Thiamin) (mg)	0.90±0.03 100%	0.99±0.05 110%	0.98±0.07 108.9%	0.90	0.0001 a**b**
Vitamin B2 (Riboflavin) (mg)	1.12±0.09 124.4%	1.33±0.04 147.8%	1.31±0.02 145.6%	0.9	0.396
Niacin (mg)	15.75±1.85 112.5%	14.90±1.46 106.43%	14.80±1.32 105.71%	14	0.997
Vitamin B6 (pyridoxine) (mg)	1.92±0.01 128.0%	2.12±0.03 141.%3	2.06±0.06 137.3%	1.5	0.621
Vitamin B12 (cobalamin) (mcg)	7.33±3.16 366.5%	7.44±3.41 372.0%	6.20±2.33 310.0%	2	0.472
Pantothinic. acid (B5) (mg)	2.45±0.93 49.0%	3.76±0.87 75.2%	4.04±1.02 80.8%	5	0.0001 a*b**
Folic acid (µ g)	159.56±6.30 39.89%	181.98±11.15 45.50%	196.53±8.42 49.13%	400	0.001 a**b**

*p≤0.05, **0.01, a Control group Vs Benign group, b Control group Vs Malignant group, c Benign group Vs Malignant group

Table (3)

Comparison of nutrient intake in different study groups

Nutrient intake	Control Vs Benign No. = 85	Control Vs Malignant No. = 54	Benign Vs Malignant No. = 83
Vitamin A (µg)	0.061	0.005	0.550
Vitamin D (µg)	0.000	0.010	0.010
Vitamin E(mg.)	0.150	0.001	0.127
Vitamin C (mg)	0.196	0.014	0.450
Vitamin B1 (Thiamin) (mg)	0.010	0.000	0.303
Vitamin B2 (Riboflavin) (mg)	0.004	0.000	0.511
Niacin equiv (mg)	0.011	0.000	0.336
Vitamin B6 (mg)	0.040	0.920	0.401
Vitamin B12 (mcg)	0.062	0.651	0.511
Pantothenic acid (mg)	0.004	0.000	0.447
Folic acid (µ g)	0.012	0.001	0.686

Table (4a)

Distribution of frequency consumption carbohydrate and plant origin foods for the studied groups

Food items	Control group No. = 85			Benign group No. = 54			Malignant group No. = 83			P – Value
	Every day	Twice / week	Every /Week	Every day	Twice / week	Every/week	Every day	Twice / week	Every /Week	
Carbohydrate Foods										
Bread	78 91.7%	7 8.2%	0.0 0.0%	51 94.4%	3 5.3%	0.0 0.0%	79 95.1%	4 4.8%	0.0 0.0%	
Bakery products	60 70.5%	23 27.1%	2 2.3%	48 88.8%	4 7.4%	2 3.7%	73 87.9%	6 7.2%	4 4.8%	
Pasta	32 37.6%	50 58.8%	3 3.5%	42 77.7	7 12.9%	5 9.2%	64 77.1%	8 9.6%	11 13.2%	
Total	66.5%	31.3%	1.9%	86.9%	8.5%	4.3%	86.7%	7.2%	6.0%	0.042*
Sweet	38 44.7%	40 47.1%	7 8.2%	45 83.3%	5 9.2%	4 7.4%	72 86.7%	7 8.4%	4 4.8%	0.002**
Plant protein foods										
Legumes & nuts	25 29.7%	34 40.0%	26 30.5%	18 33.3%	30 55.5%	6 11.1%	12 14.4%	38 45.7%	33 39.7%	0.012**
Vegetables										
Fresh Vegetables	28 32.9%	40 47.1%	17 20.0%	10 18.5%	32 59.2%	12 22.2%	8 9.6%	30 36.1%	45 54.2%	
Cooked vegetables	30 35.2%	46 54.1%	9 10.5%	23 42.5%	18 33.3%	13 42.1%	22 26.5%	44 53.0%	17 20.4%	
Total	34.1%	50.6%	15.3%	30.5%	46.3%	32.2%	18.1%	44.6%	37.3%	0.022*
Fruits										
Fresh Fruits	36 42.3%	42 49.4%	7 8.2%	6 11.1%	22 40.7%	26 48.1%	30 36.1%	34 40.9%	19 22.8%	
Fruit Juices	12 14.1%	46 45.1%	27 31.7%	3 5.5%	18 33.3%	33 61.1%	7 8.4%	22 26.5%	54 65.1%	
Total	28.2%	47.3%	20.0%	8.3%	37.0%	54.6%	22.3%	33.7%	44.0%	0.013**

Significant difference *p≤0.05, High significant **p ≤0.001

Table (4b)

Distribution of frequency consumption of different animal origin foods for studied groups

Food items	Control group No. = 85			Benign group No. = 54			Malignant group No. = 83			P- Value
	Every day	Twice / week	Every /Week	Every day	Twice / week	Every /Week	Every day	Twice / week	Every /Week	
Animal Protein foods										
Chicken	0.0 0.0%	23 27.1%	62 72.9%	0.0 0.0%	28 51.8%	26 48.1%	0.0 0.0%	32 38.5%	51 61.4%	
Red Meat	12 14.1%	20 23.5%	53 62.3%	18 33.3%	32 59.2%	4 7.4%	20 24.1%	34 40.9%	49 59.0%	
Fatty Fish	0.0 0.0%	10 11.8%	75 88.2%	0.0 0.0%	8 14.8%	46 85.1%	0.0 0.0%	5 6.0%	78 93.9%	
Eggs	38 44.7%	31 36.5%	16 18.8%	23 42.5%	28 51.8%	3 5.5%	20 24.1%	26 31.3%	37 44.5%	
Total	14.7%	24.7%	60.6%	19.0%	44.4%	36.5%	12.1%	29.2%	64.7%	0.040*
Milk & Dairy Products										
Milk	42 59.4%	34 40.0%	9 10.5%	30 55.5%	10 18.5%	14 25.9%	21 25.3%	25 30.1%	37 44.5%	
Cheese	48 56.4%	31 36.5%	6 7.1%	33 61.1%	18 33.3%	3 5.5%	26 31.3%	32 38.5%	25 30.1%	
Yoghurt	10 11.8%	28 32.9%	47 55.2%	9 16.6%	20 37.0%	25 46.2%	6 7.2%	18 21.6%	59 71.1%	
Total	42.5%	36.4%	24.2%	44.4%	29.6%	25.8%	21.2%	30.1%	48.5%	0.051*
Dietary Fats										
Oil	79 92.9%	4 4.7%	2 2.3%	43 79.6%	8 14.8%	3 5.5%	80 96.3%	3 3.6%	0.0 0.0%	
Butter	50 58.8%	32 37.6%	3 3.5%	32 59.2%	20 37.0%	2 3.7%	76 91.5%	7 8.4%	0.0 0.0%	
Vegetable Ghee	42 49.4%	38 44.7%	5 5.8%	30 55.5%	18 33.3%	6 11.1%	77 92.7%	4 4.8%	2 2.4%	
Total	67.1%	29.0%	3.9%	64.8%	28.4%	6.8%	93.5%	5.7%	2.4%	0.001**

Significant difference *p≤0.05, High significant **p ≤0.001

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تناول الفيتامينات الغذائية والسمنة بين الإناث المصابات بسرطان الثدي، مصر: دراسة الحالات والشواهد

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الملخص العربي

يختلف معدل الإصابة بسرطان الثدي بشكل كبير في جميع أنحاء العالم. الفيتامينات هي عناصر غذائية أساسية لعملية التمثيل الغذائي البشري، وتشارك في وظيفة أساسية؛ تعزيز الاستجابة المناعية، وتخفيف الإجهاد التأكسدي، ومنع تكوين الأوعية، والحث على موت الخلايا المبرمج. ترتبط السمنة بزيادة خطر الإصابة بسرطان الثدي لدى النساء بعد انقطاع الطمث وقد تساهم في نتائج أسوأ. تهدف الدراسة إلى: أ) استكشاف العلاقة بين تناول الفيتامينات اليومية وخطر الإصابة بسرطان الثدي في عينة من النساء المصريات، ب) دراسة الارتباط بين السمنة وخطر الإصابة بسرطان الثدي. هذه دراسة الحالات والمجموعة الضابطة، حيث تم تقسيم ٢٢٢ امرأة إلى ثلاث مجموعات، المجموعة ١ أ: ٨٣ مجموعة آفة ورم خبيث، المجموعة ١ ب: ٥٤ شخصًا تم تشخيص إصابتهم بسرطان حميد، والمجموعة ٢: ٨٥ مجموعة مراقبة صحية. تم الإبلاغ عن القياسات الأنثروبومترية ذات الصلة، وتكرار تناول الطعام. أظهرت النتائج أن مؤشر كتلة الجسم والوزن ومحيط الخصر والفخذ، كانت جميعها أعلى بشكل ملحوظ بين المرضى سرطان الحميد ومرضى سرطان الثدي مقارنة بالمجموعة الضابطة ($p<0.0001$). كشفت البيانات عن تناول يومي منخفض للغاية لفيتامين D وC وحمض الفوليك وحمض البانتوثينيك مع وجود اختلافات كبيرة بين المجموعات الثلاث. وصل المدخول اليومي من الفيتامينات A وE إلى الكمية الموصى بها يومياً لدى مرضى سرطان الثدي مع اختلاف كبير بين المجموعات؛ ومع ذلك، لم يكن الفرق كبيرًا بالنسبة لفيتامين E. فقد أظهر تناول فيتامينات B يوميًا مستويات عالية خاصة بالنسبة لفيتامين B12. وأظهرت النتائج أن الوزن ومؤشر كتلة الجسم والخصر ومحيط الفخذ كانت جميعها أعلى بشكل ملحوظ في كل من مجموعة الأورام الحميدة ومجموعة مرضى سرطان الثدي مقارنة بالمجموعة الضابطة الصحية. تشير النتائج إلى أن الحفاظ على وزن صحي وتناول نظام غذائي غني بفيتامين C وD وحمض الفوليك وحمض البانتوثينيك يمكن أن يساعد في تقليل خطر الإصابة بمرض سرطان الثدي.

الكلمات المفتاحية: الفيتامينات الغذائية، سرطان الثدي، الحميد، الخبيث، السمنة، المرأة المصرية