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The Association between Planetary Health Diet Index with the Odds of Breast Cancer: A Case-Control Study

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Abstract

Background: Breast cancer is the most common cancer among women worldwide. Diet is recognized as an important factor in the prevention of cancer. No research has evaluated the association between the Planetary Health Diet Index (PHDI) and breast cancer risk in the Iranian population. Therefore, the association between PHDI and breast cancer odds in Iranian women was examined in this study.

Methods: The present case-control study (n=134 cases, n=267 controls) was conducted in two hospitals in Tehran, Iran. Women aged 30 or older diagnosed with breast cancer through biopsy were included. In the current study, the participants' food consumption was assessed using a food frequency questionnaire, a reliable and valid tool.

Results: A lower odds of breast cancer was observed in the last tertile of the PHDI compared to the first tertile in both crude and adjusted models [adjusted model: Odds Ratio (OR)=0.54; 95% Confidence Interval (CI): 0.31-0.95]. In the subgroup analysis, based on the menopausal status, in the fully adjusted model, lower odds of breast cancer were found in the last tertiles of PHDI compared to the first tertile in the post-menopausal group (OR=0.38; 95% CI: 0.17-0.84).

Conclusion: The findings suggest an inverse association between higher PHDI scores and breast cancer risk. An inverse association between PHDI and breast cancer risk was also evident, particularly among post-menopausal women.

Keywords: Biopsy, Breast neoplasms, Confidence intervals, Diet, Iran, Odds ratio, Postmenopause, Surveys and questionnaires

Introduction

In the global context, breast cancer is responsible for 15% of all new annual cancer cases (1). Lifestyle changes, environmental changes, and genetic mutations all play a major role in cancer development (2). Epidemiological findings have shown that lifestyle changes, including a healthy diet, can positively impact breast cancer risk (3). It is hoped that these changes in the dietary habits will help prevent cancer and improve the overall health (4).

The findings support a healthy diet rich whole grains, fruits, and vegetables, which may play a role in reducing breast cancer (5). Many evidence-based recommendations suggest that adherence to a plant-based diet rich in nuts, whole grains, vegetables, fruits, and legumes is important for potentially reducing breast cancer risk (4). Recently, studies have suggested potential benefits for cancer survivors who follow a plant-based diet (4). Studies have demonstrated that the Mediterranean diet, Dietary Approaches to Stop Hypertension diet (DASH), and other prudent dietary patterns are linked to a lower risk of breast cancer. Conversely, adhering to a Western dietary pattern may contribute to a higher risk of breast cancer (6). Similarly, previous studies have reported an inverse association between whole grains, vegetables, fruits, and beans and breast cancer risk, while finding a direct association between processed meat, red meat, animal fats, and sugar-sweetened beverages and the risk of breast cancer (7). Growing evidence has shown that focusing on plant-based diets improves health status compared to Western diets high in animal products, which have been linked to a higher risk of chronic diseases (8).

The Eat-Lancet diet emphasizes plant-based foods like whole grains, vegetables, fruits, nuts, and legumes, with limited saturated fats and animal products (8,9). In 2019, the Eat-Lancet Commission proposed the planetary diet as a healthy dietary pattern that reduces deaths associated with a poor diet. The Eat-Lancet diet focuses on reducing animal and processed products and increasing fiber intake through plant products (10,11). It recommended that half of the planetary diet plate should contain fruits and vegetables, and the other half should include whole grains, unsaturated vegetable fats, and limited animal products (8).

Recently, to assess adherence to a healthy and sustainable dietary pattern, a new tool called the Planetary Health Dietary Index (PHDI) has been proposed. This index consists of 16 components. A higher score on this index is related to better diet quality, greater adherence to the Eat-Lancet diet, and 24% lower chance of being overweight or obese (12). However, a recent cohort study revealed no statistically significant association between adherence to the EAT-Lancet diet and breast cancer risk (13). Another cohort study also found no significant relationship between adherence to the EAT-Lancet diet and breast cancer risk in females (14).

To our knowledge, no research has evaluated the association between the PHDI and breast cancer risk in the Iranian population. Therefore, in the current study, the association between the PHDI and breast cancer odds was investigated in Iranian women.

Materials and Methods

Study population

The present case-control study was conducted at two hospitals (Shohada Tajrish and Imam Hossein) in Tehran, Iran, from September 2015 to February 2016. Women (n=136) aged ≥30 years who were newly diagnosed with breast cancer through biopsy (in-situ tumors) were included. The control group comprised women (n=272) admitted to the same hospitals for non-cancer-related illnesses who were not smokers, did not abuse alcohol, and did not have long-term dietary changes. Data collection for both groups occurred simultaneously and at the same place. Only a small percentage of the participants refused to participate in the study. Seven participants were excluded from the study since their daily calorie intake fell outside the normal range [± three standard deviations (SDs)] compared to the average intake of the entire study population. After excluding the participants with outlying energy intake, the final analysis included 134 participants in the case group and 267 participants in the control group. All the participants provided written informed consent before enrollment. This research was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences, ensuring adherence to ethical guidelines. Some details of the present study have been published previously (15,16).

Data collection

All the participants completed questionnaires regarding their sociodemographic characteristics, dietary habits, and medical history. These questionnaires assessed sociodemographic data, lifestyle factors (including smoking habits), and clinical information such as age, family history of cancer (particularly breast cancer), and use of dietary supplements or medications relevant to breast cancer risk.

The participants' weight (measured with a precision of 0.5 *kg*) was measured using a digital scale while they wore lightweight clothing and no shoes. Height (measured with an accuracy of 0.5 *cm*) was determined using a wall-mounted tape meter. Body Mass Index (BMI) was computed by dividing weight (*kg*) by the square of height (*m*).

Physical activity was assessed using a validated IPAQ questionnaire [International Physical Activity Questionnaire (IPAQ)], which categorized the activities into nine groups based on Metabolic Equivalents of Tasks (METs). Physical activity level (MET-hours/day) was calculated by multiplying IPAQ-reported time spent in each activities by its corresponding METs value and summing the products (17).

Dietary assessment

In the current research, the participants' food intake was assessed using a valid and reliable Food Frequency Questionnaire (FFQ) consisting of 168 items. This assessment covers the year before diagnosis (for cases) or before the interview (for controls). The participants reported the frequency of consuming each food item annually, monthly, weekly, or daily (18). The reported frequencies were converted into daily intake in grams using a standardized food consumption database. The nutrient and energy content of each food item was calculated based on the food composition Tables from the United States Department of Agriculture (USDA), except for traditional Iranians food items not available in the USDA database, which were assessed using Iranian food composition Tables. Alcohol consumption was not included in the analysis due to the cultural beliefs in Iran.

PHDI scores were calculated based on their dietary intake for all the participants. This tool was developed to assess the adherence to a sustainable and healthy diet recommended by the EAT-Lancet Commission (19). The PHDI assigns scores based on adherence to recommended intake levels for various food groups outlined in the EAT-Lancet Commission's healthy and sustainable dietary pattern. The score is determined by comparing the number of calories consumed from foods within a specific food group (numerator) to the total number of calories consumed from all foods in the index (denominator). The sixteen PHDI components are classified into four categories:

1. The optimum components include vegetable oils, dairy products, tubers, potatoes, fish and seafood, and eggs.
2. Ratio components include red, orange, and dark green vegetables to total vegetables.
3. Adequacy components encompass whole cereals, total vegetables, nuts and peanuts, fruits, and legumes.
4. Moderation components cover animal fats, added sugars, chicken and substitutes, and red meat.

Components in the moderation, optimum, and adequacy categories receive scores ranging from 0 to 10 points, while those in the ratio group are scored with a maximum of 5 points. The PHDI yields a total score ranging from 0 to 150 (11).

Statistical analysis

The Kolmogorov-Smirnov test was used to check the normality of the distribution of the variables. For normally distributed data, independent-samples T-test were employed to compare means between the case and control groups. Non-normally distributed data were analyzed using the Mann-Whitney U-test, a suitable non-parametric test. Additionally, the association between the categorical variables were assessed using the chi-square test of independence.

To assess the association between PHDI score and breast cancer risk, PHDI scores were first categorized into tertiles based on the dietary intake of the entire study population. The logistic regression was then employed to calculate Odds Ratios (ORs) and their corresponding 95% Confidence Intervals (CIs). The regression model adjusted for several covariates, including age, BMI, menopausal status, family history of breast cancer, energy intake, vitamin D levels, and physical activity. Statistical analysis was performed using SPSS software (v.26.0), and a significance level of $p<0.05$ was used.

Table 1. Basic features of the case and control population

Variables	Cases (134)	Controls (267)	p-value
Energy (*kcal*/day)[1]	2406.9(888.4)	2549.6(1055.4)	0.063
Fiber (*g*/day)[1]	33.5(17.4)	35.4(22.0)	0.220
Adequacy score[1]	22.0(10.0)	23.0(10.0)	0.133
Optimum score[1]	14.0(8.0)	14.0(8.0)	0.356
Ratio score[1]	0.0(3.0)	0.0(3.0)	0.343
Moderation score[1]	9.0(9.5)	8.0(9.0)	0.892
PHDI total score[1]	44.0(16.0)	47.0(18.0)	0.151
Age (year)[2]	49.4±10.7	47.1±10.1	0.035
Marriage age (year)[1]	19.0(6.0)	18.0(4.0)	0.078
Age at first pregnancy (year)[1]	20.0(8.0)	20.0(5.0)	0.056
Breastfeeding time (month)[1]	38.0(40.0)	48.0(46.0)	0.113
BMI (kg/m^2)[1]	29.6(7.3)	28.5(6.2)	0.137
Physical activity (MET-h/day)[1]	32.1(6.5)	31.4(5.8)	0.660
Menopausal status,[3%]			0.115
Pre-menopause	46.6	57.2	
Post-menopause	53.4	42.8	
Vitamin D supplement,[3%]			0.038
Yes	15.0	24.4	
No	85.0	75.6	
Omega-3,[3%]			0.077
Yes	6.0	11.7	
No	94.0	88.3	
Herbal drugs,[3%]			0.110
Yes	19.5	27.1	
No	80.5	72.9	
Cancer family history,[3%]			0.034
Yes	0.8	20.7	
No	69.2	79.3	
Smoking,[3%]			1.000
Yes	3.0	3.4	
No	97.0	96.6	

PHDI: planetary healthy diet index, BMI: body mass index, MET: metabolic equivalent of task.

[1]Using Mann-Whitney for non-parametric (variables are expressed as median (IQR)).

[2]Using independent sampless T-test for parametric variables (values are expressed as mean±SD).

[3]Using chi-square test for categorical variables (values are expressed as percentage).

Results

The analysis of table 1 showed statistically significant differences between the case and control groups in age, vitamin D intake, and family history of breast cancer (all $p<0.05$). No statistically significant differences were observed in other variables between the control and case groups. Table 2 presents the average dietary intake (as a percentage of energy intake) for each PHDI component in both the case and control groups. Notably, the case group exhibited significantly higher amounts of vegetable oils ($p= 0.027$) and added sugar ($p = 0.037$) compared to the control group. Tables 3 and 4 illustrate the association between PHDI score and breast cancer odds. Table 3 examines this relationship for all the participants, while table 4 explores it stratified by menopausal status.

Table 3 shows a significantly lower odds of breast cancer in the highest tertile (third group) of PHDI score compared to the lowest tertile (first group). This association remained significant in both crude (OR= 0.55; 95% CI: 0.33-0.92) and adjusted models (OR= 0.54; 95% CI: 0.31-0.95).

In table 4, the subgroup analysis for post-menopausal women revealed a significantly reduced odds of

Table 2. Mean intake of PHDI components based on energy percent between the case and control groups.

Variables	Cases (134)	Controls (267)	p-value
Nuts (energy percent)	3.30±0.27	3.85±0.22	0.141
Legumes (energy percent)	2.39±0.15	2.73±0.13	0.129
Whole grains (energy percent)	11.75±0.82	12.39±0.63	0.547
Fruits (energy percent)	15.17±0.54	15.87±0.37	0.287
Vegetables (energy percent)	2.64±0.27	2.58±0.21	0.874
Starchy vegetables (energy percent)	2.27±0.16	2.34±0.10	0.704
Leafy vegetables (energy percent)	6.99±0.77	5.99±0.52	0.284
Yellow vegetables (energy percent)	3.65±0.45	2.96±0.30	0.196
Vegetable oils (energy percent)	15.43±9.57	13.33±0.52	0.027
Animal fats (energy percent)	3.02±0.30	2.93±0.23	0.831
Red meats (energy percent)	2.71±0.18	2.75±0.12	0.862
Chicken (energy percent)	4.75±0.28	4.55±0.18	0.561
Fishes (energy percent)	1.00±0.09	1.08±0.07	0.525
Eggs (energy percent)	1.51±0.14	1.58±0.07	0.643
Dairy products (energy percent)	24.17±0.85	25.45±0.66	0.255
Added sugars (energy percent)	9.82±0.60	8.49±0.33	0.037

PHDI: planetary healthy diet index.

Using independent samples T-test for parametric variables and values are mean ± SD.

Table 3. Association between PHDI and breast cancer.

Tertiles of Index	Case/Control	Crude model		Adjusted model	
		OR	95% CI	OR	95% CI
T_1 (≤41)	55/80	1.00	Ref.	1.00	Ref.
T_2 (42-52)	41/90	0.66	0.40-1.09	0.68	0.40-1.16
T_3 (≥53)	37/97	0.55	0.33-0.92	0.54	0.31-0.95
P_{trend}		0.023		0.034	

PHDI: planetary healthy diet index.

Obtained from logistic regression.

These values are odds ratio (95% CIs).

Significant values are shown in bold.

Adjusted model: adjusted for age, BMI, menopausal status, breast cancer family history, energy, vitamin D, and physical activity.

breast cancer in the second (OR=0.30; 95% CI: 0.13-0.68) and highest (OR=0.36; 95% CI: 0.18-0.75) tertiles of PHDI score compared to the lowest tertile in the crude model. This significant association between higher PHDI scores and lower breast cancer odds in post-menopausal women persisted even after adjusting for factors such as age, BMI, family history, and lifestyle habits (T_2: OR=0.36; 95% CI: 0.15-0.84; T_3: OR= 0.38; 95% CI: 0.17-0.84).

Discussion

The current research is the first to investigate the utility of the PHDI's as an indicator of adherence to the Eat-Lancet dietary recommendations among Iranian women, providing valuable insights for this specific population group. This study identified a positive association between adherence to the Eat-Lancet recommendations, reflected by higher PHDI scores, and a reduced risk of breast cancer, particularly

Table 4. Associations between PHDI and breast cancer by menopausal status.

Tertiles of Index	Case/Control	Crude model		Adjusted model	
		OR	95% CI	OR	95% CI
Pre-menopausal					
T_1 (≤41)	23/53	1.00	Ref.	1.00	Ref.
T_2 (42-52)	26/52	1.15	0.58-2.27	1.11	0.55-2.25
T_3 (≥53)	13/46	0.65	0.29-1.43	0.69	0.30-1.57
P_{trend}		0.337		0.435	
Post-menopausal					
T_1 (≤41)	32/25	1.00	Ref.	1.00	Ref.
T_2 (42-52)	15/38	0.30	0.13-0.68	0.36	0.15-0.84
T_3 (≥53)	24/51	0.36	0.18-0.75	0.38	0.17-0.84
P_{trend}		0.008		0.019	

PHDI: planetary healthy diet index.

Obtained from logistic regression.

These values are odds ratio (95% CIs).

Significant values are shown in bold.

Adjusted model: adjusted for age, BMI, family history of breast cancer, energy, vitamin D, and physical activity.

among the post-menopausal women.

Results of the current study found a negative association between higher PHDI scores and breast cancer risk. The results regarding the association between PHDI and breast cancer risk were inconsistent with the past studies, suggesting the need for further investigation in diverse populations. Previous studies in cohorts like UK Biobank cohort and NutriNet-Santé, where adherence to EAT-Lancet recommendations was likely assessed through dietary questionnaires, reported no significant association with breast cancer risk (13,14). Differences in the study design and sample characteristics could potentially explain the observed discrepancies between our findings and those of the previous studies. For example, variations in dietary assessment methods, inclusion/exclusion criteria, or population ethnicity might contribute to these contrasting results. However, other studies have reported an inverse relationship between adherence to healthy dietary pattern, measured by scores like the healthy eating index, Mediterranean diet score, and DASH, and breast cancer risk (6,20-22). In line with our findings on the PHDI, a recent meta-analysis found that a Western diet increased breast cancer risk by 14%. Conversely, a prudent diet offered an 18% reduction in risk (3). Conversely, research suggests that diets rich in whole grains, fruits, vegetables, and legumes – compared to those high in refined grains, processed meats, red meat, and saturated fats – are associated with a lower risk of breast cancer (23).

A PHDI consists fruits, vegetables, whole grains, minimal meat, and limited saturated fat (8). In this dietary plan, substituting animal fats with plant-based oils and incorporating whole grains accounts for 32% of daily energy intake. Higher consumption of these food categories is associated elevated intake of fiber, phytochemicals, and folate within the diet (6, 8). Phytochemicals shield against oxidative stress-induced damage to deoxyribonucleic acid (DNA) by serving as antioxidants (7). The presence of dietary folate influences the activation of genes, including tumor suppressors, through its involvement in DNA methylation (6). Dietary fiber's anticarcinogenic properties encompass the generation of anti-inflammatory cytokines, enhancement of immunity, reduction of N-Nitroso compounds, and elimination of damaged cells via the dilution of bile acids in the digestive system (6). Another beneficial impact of dietary fiber involves decreasing the circulating estrogen levels through enhanced excretion and reducing Insulin-like Growth Factor (IGF-1) (7). Elevated levels of IGF-1 have been demonstrated to support cancer progression through the stimulation of cell growth (7). Dietary fiber, being a primary

nutrients source for gastrointestinal bacteria, is linked to increase diversity in gut microbiota and diminished inflammation, attributed to higher level of Short Chains Fatty Acids (SCFA) synthesized by gut microbiota. Therefore, it is proposed that boosting dietary fiber intake in line with adherence to a PHDI, may offer protective benefits for overall health by elevating levels of SCFA derived from the gut microbiome (10). Thus, adhering to dietary patterns abundant in fruits, vegetables, and legumes correlates with elevated SCFA levels, decreases pro-inflammatory cytokines, and lower level of LPS, consequently leading to reduced inflammation (24).

Moreover, there is a suggestion that diets rich in fiber and vegetable contribute to the enhancement of gut microbiota equilibrium and reduction in inflammatory status (8). New discoveries highlight the involvement of gut microbiota in the development of cancer. In this context, a distribution in gut microbiome balance has been observed in women diagnosed with breast cancer compared to those who are healthy. Imbalance in the gut microbiota significantly contributes to the developments of inflammatory conditions, suppression of the immune response, and ultimately, the process of carcinogenesis (25). Since intestinal dysbiosis plays an important role in causing clinical complications and carcinogenesis by increasing intestinal permeability and the transfer and circulating the levels of Lipopolysaccharides (LPS) (25), it is suggested that maintaining the integrity of the intestine and improving the balance of intestinal microbiota can be effective in reducing these changes and complications.

An instance is the adoption of the Mediterranean diet, which prioritizes augmenting dietary fiber intake through higher consumption of plant-based foods while decreasing red meat and processed food intake, alongside moderate portions of fish, poultry, and dairy products. This dietary approach demonstrates beneficial effects on intestinal microbiota and overall health. The research outcome also indicated that adhering to a Mediterranean diet is linked with heightened diversity in the gut microbiota and microbiome by-products such as SCFA (10,26). The PHDI similarly emphasizes augmenting dietary fiber intake through increased consumption of whole grains, vegetables, fruits, and nuts, resulting in a comparable impact on the intestinal microbiome as observed with the Mediterranean diet and plant-based diet (10).

The study's strengths lie in its adjustment for numerous confounding factors, utilization of a validated FFQ for dietary intake assessment, and notably, being the pioneering research conducted in the field of breast cancer. While this study is valuable, its case-control design introduces limitation, including susceptibility to recall and selection biases. Although the study adjusted for numerous confounders, there remains the possibility of unmeasured and unidentified confounding variables. Additionally, the study's weakness included its small sample size.

Conclusion

The results of the current study demonstrated a negative correlation between a higher PHDI score and the odds of breast cancer. Moreover, a negative association was observed between PHDI and the risk of breast cancer among post-menopausal individuals. Nevertheless, it is recommended that further studies, particularly those employing a prospective design, be carried out to validate the findings of the present study.

Ethical approval

This study was conducted in accordance with the ethical standards of the Declaration of Helsinki and was approved by the Research Institute of Nutrition and Food Sciences of Shahid Beheshti University of Medical Sciences. All the participants read and signed the informed consent form.

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Conflict of Interest

There was no conflict of interest in this manuscript.

References

1. Xu H, Xu B. Breast cancer: epidemiology, risk factors and screening. Chin J Cancer Res 2023 Dec 30;35(6):565-83.

2. Kapinova A, Stefanicka P, Kubatka P, Zubor P, Uramova S, Kello M, et al. Are plant-based functional foods better choice against cancer than single phytochemicals? A critical review of current breast cancer research. Biomed Pharmacother 2017 Dec;96:1465-77.

3. Xiao Y, Xia J, Li L, Ke Y, Cheng J, Xie Y, et al. Associations between dietary patterns and the risk of breast cancer: a systematic review and meta-analysis of observational studies. Breast Cancer Res 2019 Jan 29;21(1):16.

4. Hardt L, Mahamat-Saleh Y, Aune D, Schlesinger S. Plant-based diets and cancer prognosis: a review of recent research. Curr Nutr Rep 2022 Dec;11(4):695-716.

5. Anyene IC, Ergas IJ, Kwan ML, Roh JM, Ambrosone CB, Kushi LH, et al. Plant-based dietary patterns and breast cancer recurrence and survival in the pathways study. Nutrients 2021 Sep 25;13(10):3374.

6. Rigi S, Mousavi SM, Benisi-Kohansal S, Azadbakht L, Esmaillzadeh A. The association between plant-based dietary patterns and risk of breast cancer: a case-control study. Sci Rep 2021 Feb 9;11(1):3391.

7. Sasanfar B, Toorang F, Booyani Z, Vassalami F, Mohebbi E, Azadbakht L, et al. Adherence to plant-based dietary pattern and risk of breast cancer among Iranian women. Eur J Clin Nutr 2021 Nov;75(11):1578-87.

8. Ojo O, Jiang Y, Ojo OO, Wang X. The association of planetary health diet with the risk of type 2 diabetes and related complications: a systematic review. Healthcare (Basel) 2023 Apr 13;11(8):1120.

9. Stubbendorff A, Sonestedt E, Ramne S, Drake I, Hallström E, Ericson U. Development of an EAT-Lancet index and its relation to mortality in a Swedish population. Am J Clin Nutr 2022 Mar 4;115(3):705-16.

10. Rehner J, Schmartz GP, Kramer T, Keller V, Keller A, Becker SL. The effect of a planetary health diet on the human gut microbiome: a descriptive analysis. Nutrients 2023 Apr 16;15(8):1924.

11. Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermeulen S, et al. Food in the Anthropocene: the EAT-Lancet commission on healthy diets from sustainable food systems. Lancet 2019 Feb 2;393(10170):447-92.

12. Marchioni DM, Cacau LT, De Carli E, Carvalho AM, Rulli MC. Low adherence to the EAT-Lancet sustainable reference diet in the brazilian population: findings from the national dietary survey 2017-2018. Nutrients 2022 Mar 11;14(6):1187.

13. Karavasiloglou N, Thompson AS, Pestoni G, Knuppel A, Papier K, Cassidy A, et al. Adherence to the EAT-Lancet reference diet is associated with a reduced risk of incident cancer and all-cause mortality in UK adults. One Earth 2023 Dec 15;6(12):1726-34.

14. Berthy F, Brunin J, Allès B, Fezeu LK, Touvier M, Hercberg S, et al. Association between adherence to the EAT-Lancet diet and risk of cancer and cardiovascular outcomes in the prospective NutriNet-Santé cohort. Am J Clin Nutr 2022 Oct 6;116(4):980-91.

15. Pourhabibi-Zarandi F, Kahrizsangi MA, Eskandarzadeh S, Mansouri F, Vali M, Jalali S, et al. Dietary quality index and the risk of breast cancer: a case-control study. BMC Womens Health 2023 Sep 1;23(1):469.

16. Hosseini Y, Hadi Sichani P, Moslemi E, Nouri M, Rajabzadeh-Dehkordi M, Jalali S, Heidari Z, et al. Pro-vegetarian dietary pattern and risk of breast cancer: a case-control study. Breast Cancer Res Treat 2024 Jun;205(2):395-402.

17. Aadahl M, Jørgensen T. Validation of a new self-report instrument for measuring physical activity. Med Sci Sports Exerc 2003 Jul;35(7):1196-202.

18. Asghari G, Rezazadeh A, Hosseini-Esfahani F, Mehrabi Y, Mirmiran P, Azizi F. Reliability, comparative validity and stability of dietary patterns derived from an FFQ in the Tehran lipid and glucose study. Br J Nutr 2012 Sep 28;108(6):1109-17.

19. Cacau LT, De Carli E, de Carvalho AM, Lotufo PA, Moreno LA, Bensenor IM, et al. Development and validation of

an index based on EAT-Lancet recommendations: the planetary health diet index. Nutrients 2021 May 17;13(5):1698.

20. van den Brandt PA, Schulpen M. Mediterranean diet adherence and risk of postmenopausal breast cancer: results of a cohort study and meta-analysis. Int J Cancer 2017 May 15;140(10):2220-31.

21. Kord-Varkaneh H, Salehi-Sahlabadi A, Zarezade M, Rahmani J, Tan SC, Hekmatdoost A, et al. Association between healthy eating index-2015 and breast cancer risk: a case-control study. Asian Pac J Cancer Prev 2020 May 1;21(5):1363-7.

22. Soltani S, Benisi-Kohansal S, Azadbakht L, Esmaillzadeh A. Association between adherence to "dietary approaches to stop hypertension" eating plan and breast cancer. Nutr Canc 2021 Mar 16;73(3):433-41. DOI: https://doi.org/10.1080/01635581.2020.1756354

23. Dandamudi A, Tommie J, Nommsen-Rivers L, Couch S. Dietary patterns and breast cancer risk: a systematic review. Anticancer Res 2018 Jun;38(6):3209-22.

24. Sidhu SRK, Kok CW, Kunasegaran T, Ramadas A. Effect of plant-based diets on gut microbiota: a systematic review of interventional studies. Nutrients 2023 Mar 21;15(6):1510.

25. Sampsell K, Hao D, Reimer RA. The Gut Microbiota: a potential gateway to improved health outcomes in breast cancer treatment and survivorship. Int J Mol Sci 2020 Dec 3;21(23):9239.

26. Nagpal R, Shively CA, Register TC, Craft S, Yadav H. Gut microbiome-mediterranean diet interactions in improving host health. F1000 Res 2019 May 21;8:699.