



Dietary Patterns and Breast Cancer Susceptibility; An Age-Tailored Case-Control Analysis

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Citation:

Aurpita Sabitry Chowdhury, Bipul Biswas, Farah Jabin Nisa, Suraiya Akter, Sumaiya Akter Sraboni (2024). Dietary Patterns and Breast Cancer Susceptibility; An Age-Tailored Case-Control Analysis. *Bangl J Food Nutr*, 1(1), 35-51.

Received: 16/07/2024

Accepted: 19/08/2024

Published: 30/09/2024



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Abstract: **Background:** Breast cancer is a significant global health challenge, requiring in-depth analysis of diverse dietary and lifestyle factors. This study explores these complexities across age groups to better understand associated risks. **Objectives:** This study examines breast cancer risk by analyzing specific dietary elements like rice, bread, vegetables, and fruits, and lifestyle factors including alcohol, drug use, and smoking across different age groups. **Methods:** A case-control study was conducted, analyzing dietary habits across different age groups. The study included 220 breast cancer patients and 59 healthy controls. Data were collected on the consumption of various foods, including white and brown rice, white and brown bread, vegetables, fruits, and oils, with statistical analyses performed to assess associations with breast cancer risk. **Results:** The analysis revealed significant differences in dietary patterns between the breast cancer and control groups. Notably, 37.27% of breast cancer patients aged 31-40 reported consuming white rice, compared to only 8.47% in the control group. Additionally, white bread consumption was higher in the breast cancer group (36.82%) compared to controls (8.47%). Conversely, brown rice and bread consumption were significantly lower among breast cancer patients. Vegetable consumption was also lower in the breast cancer group, with 37.27% in the 31-40 age group versus 32.20% in controls. Oil consumption patterns further highlighted disparities, with soybean oil intake being higher in the breast cancer group (35.00%) compared to controls (6.78%). **Conclusion:** This study reveals intricate links between breast cancer and dietary patterns, emphasizing the need for personalized public health strategies promoting balanced nutrition and healthier lifestyles to mitigate risk.

Keywords: Breast cancer, Dietary patterns, Obesity, Lifestyle factors, Prevention strategies.

Significance: This study identifies crucial dietary and lifestyle factors influencing breast cancer risk, emphasizing the need for tailored prevention strategies.

INTRODUCTION

Cancer remains one of the leading causes of mortality worldwide, with breast cancer representing the most common form of cancer among women [1]. Approximately 13% of women in the Western world will experience breast cancer during their lifetime, making it responsible for about 30% of all female cancer cases. Globally, an estimated 1.5 million women are diagnosed with

breast cancer annually, with 500,000 deaths attributed to the disease each year. Although the incidence of breast cancer has increased over the past three decades, mortality rates have declined during the same period. This paradox is primarily due to advances in early detection through mammography, which has seen a 20% increase in usage, and improvements in treatment options that have enhanced survival rates by approximately 60% [2]. The surge in breast cancer cases is often

linked to the adoption of Western lifestyle patterns, which include an unhealthy diet, smoking, heightened stress levels, and insufficient physical activity [3]. Among the numerous risk factors for breast cancer, age remains one of the most significant. The incidence of breast cancer has risen globally across all age groups, with particularly high rates among women under the age of 50. However, despite the lower incidence rates in lower-middle and low-income countries, these regions experience higher breast cancer mortality rates compared to more developed nations [4]. This disparity underscores the need for comprehensive strategies tailored to different demographic and socio-economic contexts to mitigate breast cancer's impact worldwide.

In 2020 alone, 2.3 million women were diagnosed with breast cancer, leading to 685,000 deaths globally [5]. By the end of that year, 7.8 million women who had been diagnosed with breast cancer within the previous five years were still living, making breast cancer the most prevalent cancer worldwide. The disease affects women of all ages after puberty, with incidence rates increasing significantly in later life. Breast cancer occurs in every country, highlighting its global reach and the urgent need for effective prevention and treatment strategies. This study, titled "An Age-Tailored Case-Control Analysis of Dietary Patterns and Breast Cancer Susceptibility," seeks to explore the intricate relationship between dietary habits and breast cancer risk. Recent research has pointed to a significant association between diet and breast cancer, particularly concerning the consumption of whole grains, processed meats, and sugar-rich foods. A recent meta-analysis revealed a 19% decrease in breast cancer risk for premenopausal women and a 12% decrease for postmenopausal women in studies that controlled for body fatness [6]. Specifically, the consumption of whole grains, including white rice, has been associated with a higher risk of breast cancer, with an odds ratio of 2.53 (95% confidence interval: 1.69-3.79; $p < 0.001$). These findings suggest that whole-grain foods may play a protective role against breast cancer, particularly before menopause, possibly due to the fiber content in these grains.

Conversely, the consumption of grilled meats has been linked to an increased risk of breast

cancer, potentially due to the presence of carcinogens such as heterocyclic amines (HCAs) and polycyclic aromatic hydrocarbons (PAHs) formed during high-temperature cooking [7]. HCAs form on the surface of meat when exposed to open flames, while PAHs result from the incomplete combustion of fats, which can then contaminate the meat through smoke. Studies have shown that a diet high in grilled, barbecued, and smoked meats before a breast cancer diagnosis is associated with a 23% increase in overall mortality risk (HR=1.23, 95% CI=1.03 to 1.46) [8]. The consumption of processed meats, particularly those high in animal fats and nitrates, has also been implicated in breast cancer risk. These foods are rich in nitrate and nitrite, which can be converted into N-nitroso compounds (NOCs), recognized as potential carcinogens. The World Cancer Research Fund (WCRF) and the American Institute for Cancer Research (AICR) recommend limiting the intake of energy-dense foods, including fast foods and sugary beverages, as part of cancer prevention strategies.

Fruit and vegetable consumption has long been studied for its potential protective effects against cancer. A 2012 meta-analysis of 15 prospective studies found that a higher intake of fruits and vegetables was associated with a reduced risk of breast cancer, although the protective effect was more pronounced with fruit consumption than with vegetables [9]. This study includes a meta-analysis focusing on total fruit intake, total vegetable intake, and their combined consumption to assess breast cancer risk across different demographic groups, considering geographical and racial/ethnic variations. The link between sugar intake and cancer is an area of growing interest. In the United States, the average sugar intake exceeds the recommended daily limits set by the World Health Organization (WHO) and other health organizations. Evidence from both epidemiological and preclinical studies suggests that excessive sugar consumption may contribute to cancer development and progression, independent of its association with obesity. Diets high in sucrose or fructose have been shown to activate inflammatory, glucose, and lipid metabolic pathways that may promote carcinogenesis.

Oxidative stress, a condition characterized by an imbalance between reactive oxygen species and antioxidant defenses, is a known contributor to carcinogenesis. Tea, particularly green tea, is rich in natural antioxidants and has been suggested to have anti-tumor properties. Studies have indicated a statistically significant inverse relationship between caffeine intake and breast cancers that are positive for estrogen and progesterone receptors, highlighting the potential protective role of tea and other caffeinated beverages [10]. However, excessive sugar consumption, particularly from sugar-sweetened beverages (SSBs) and fruit juices, which have high glycemic indexes, may increase breast cancer risk through mechanisms involving glucose and insulin metabolism. Soy isoflavones have also been studied for their potential protective effects against breast cancer. A comprehensive analysis of prospective studies found that an increase in soy isoflavone intake by 10 mg/day was associated with a 3% reduction in breast cancer risk (95% CI 1–5%) [11]. However, epidemiological evidence remains inconclusive, with some studies suggesting that soy intake is protective among Asian women but not among Western populations. The Mediterranean diet, known for its health benefits in various chronic diseases, including cancer, has been advocated as a protective dietary pattern against breast cancer. This diet emphasizes the consumption of plant-based foods and olive oil, particularly extra-virgin olive oil (EVOO), which contains bioactive compounds with antioxidant, anti-inflammatory, and anticancer properties. Experimental studies have demonstrated the protective effects of EVOO and its components against mammary carcinogenesis.

Cooking methods, particularly those involving high temperatures like deep-frying, have also been linked to breast cancer risk. A case-control study in Shanghai found that the association between red meat consumption and breast cancer was strongest among women who deep-fried their meat, particularly to a well-done state. The study reported increased risks of premenopausal breast cancer associated with higher total meat and non-processed meat consumption, as well as positive associations between postmenopausal breast cancer and the consumption of total meat, processed meat, and red meat [12]. Alcohol consumption is another well-established risk factor

for breast cancer. A systematic review conducted by the WCRF-AICR highlighted the consistent association between alcohol intake and breast cancer risk. Additionally, smoking, particularly among those with a history of heavy or long-term use, has been linked to an elevated risk of invasive breast cancer. While passive smoking does not seem to significantly increase breast cancer risk, active smoking remains a preventable risk factor that contributes significantly to the global cancer burden. This study explores the multifaceted relationship between dietary patterns, lifestyle factors, and breast cancer risk, with the goal of providing insights that can inform more effective prevention strategies tailored to different populations and age groups. The findings of this research have the potential to contribute to the ongoing efforts to reduce breast cancer incidence and mortality worldwide.

OBJECTIVES

General Objective

- Dietary Patterns and Breast Cancer Susceptibility: An Age-Tailored Case-Control Analysis

Specific Objectives

- To understand the current health status of the patients.
- To evaluate the anthropometric status of breast cancer survivors in Bangladesh.
- To evaluate the age of survivors.
- To examine the dietary habits of the specified patient group.
- To determine compliance with WHO-recommended dietary goals.
- To analyze the correlation between cancer and the dietary patterns of individuals who have breast cancer.

METHODS AND MATERIALS

Research Design

The ongoing investigation utilizes a research framework that explores the intricate interrelationship between lifestyle factors, dietary patterns, body measurements, and blood parameters in patients diagnosed with breast cancer, in contrast to a control group of individuals who regularly participate in physical activity at a fitness center. This specific framework, recognized as a case-control approach, was deliberately chosen

to assess the occurrence of breast cancer by contrasting the encounters of individuals diagnosed with breast cancer at the National Cancer Institute and Hospital (NCHIR) in Dhaka, Bangladesh, from May 2023 to November 2023. It will facilitate a systematic investigation of the potential risk factors involved and the examination of a health-conscious control group in Dhanmondi. The utilization of the case-control framework not only adds complexity to the examination of potential correlations between various variables and breast cancer but also provides valuable perspectives on strategies for prevention and contributes to a more comprehensive comprehension of the influence of lifestyle on cancer outcomes. Additionally, the selected framework permits the recognition of patterns and disparities between the two groups, thereby establishing a strong basis for statistical analysis and significant interpretation of the study's findings.

Ethical considerations

Informed Consents

Informed consent is obligatory by the law. Within the context of this particular investigation, comprehensive information regarding the objectives, protocols, possible hazards, and advantages of the study were duly provided to both participants with breast cancer and those in the control group before their enrolment.

Privacy and Confidentiality

Ensuring the preservation of participant confidentiality is of utmost significance. Precautions are implemented to guarantee the safeguarding of all gathered data, encompassing personal and medical details. Each participant was allocated an exclusive identifier, and all data was stored securely with restricted accessibility. Any published outcomes or reports will uphold the concealment of participant identities using pseudonyms or aggregated data.

Voluntary Participation and Right to Withdraw

The participants were provided with an assurance regarding their freedom to join the study willingly and their liberty to discontinue their involvement at any point without experiencing any detrimental outcomes. This guiding principle was reiterated both during the informed consent

procedure and throughout the entire duration of the study.

Special Considerations for Vulnerable Populations

Special attention has been devoted to populations that are susceptible and subject to harm in health-related investigations, with a particular focus on individuals suffering from breast cancer. The existence of suitable systems of assistance was ensured to effectively handle any emotional or psychological worries that might emerge throughout the research. Furthermore, the involvement of medical experts during the recruitment stage guaranteed that potential participants were thoroughly educated regarding the study.

Data Handling and Storage

Stringent protocols have been implemented to guarantee the safeguarding and preservation of your data. The accessibility to identifiable information has been limited solely to personnel with proper authorization. Electronic data has undergone encryption, while physical records have been securely stored within a locked cabinet situated in a protected area. The retention of data is contingent upon legal obligations, and thereafter, it is meticulously disposed of to ensure utmost security.

By incorporating these ethical factors, the primary objective of this study is to uphold the utmost principles of honesty and responsibility. A dedication to ethical conduct guarantees that the input from participants is valued and that the findings of the research are dependable and significant.

Sample Size

The sample size for this study was determined through scrupulous consideration of statistical power, perfection, and feasibility. The case group, comprising 220 breast cancer cases from the National Institute of Cancer Research & Hospital (NCHIR) in Dhaka, Bangladesh, diagnosed between May 2023 and November 2023, was chosen to give ample representation for meaningful analyses. The control group, consisting of 59 health-conscious individuals engaged in regular physical exertion from the Dhanmondi area, was precisely named to create a robust

comparison. The sample sizes were calculated grounded on the awaited effect size, a 95-confidence position, and a respectable periphery of error. also, implicit waste and practical constraints were considered during the determination of these sample sizes. This approach ensures that the study has sufficient statistical power to describe meaningful associations and differences related to life factors, dietary habits, and health issues in the environment of breast cancer.

Statistical Analysis

Statistical analysis was performed using Microsoft Excel version 2019 MSO (16.0.10405.20015). The procedure included cleaning and organizing data, as well as generating descriptive statistics like mean, median, and standard deviation. Pivot tables were utilized for a streamlined summary and exploration of the intricate dataset to gain insights into dietary and lifestyle patterns. Visual representations, including charts, were produced using Excel features. Microsoft Word was employed for documenting and presenting the results, ensuring clarity and replicability in the statistical analysis of the study. A customized Microsoft Access form was created to

facilitate the digitization and storage of the surveys by each collaborator. After completion, each database was transferred to a Microsoft Excel spreadsheet. Subsequently, these individual spreadsheets were consolidated to generate the final comprehensive database.

RESULT

Our investigation into the age distribution of actors in the Breast Cancer (BC) and Control groups revealed distinct demographic patterns that hold implications for understanding breast cancer vulnerability and visionary health engagement among different age cohorts. The age groups range from 11-20 to 81-90. In the BC group, a notable attention of participants was observed within the middle-aged range (e.g., 31- 50 Years). This finding aligns with established trends in breast cancer prevalence, emphasizing the significance of targeted prevalence and awareness initiatives for individuals in this critical age group. This finding underscores the relevance of our study in identifying a cohort particularly susceptible to breast cancer, furnishing perceptivity pivotal for refining webbing programs.

Table 1: Age-Specific Participation Rates in Breast Cancer and Control Groups

Age Groups	BC	Control	p-value
11-20	1.36%	3.38%	0.02
21-30	10.45%	49.15%	0.01
31-40	37.27%	32.20%	0.15
41-50	30.45%	8.47%	0.04
51-60	15.91%	5.08%	0.05
61-70	3.18%	0.00%	0.08
71-80	0.45%	0.00%	0.12
81-90	0.45%	0.00%	0.20
Blank	0.45%	1.69%	0.30

The table highlights age-specific participation rates in Breast Cancer (BC) and Control groups, revealing significant differences in younger (11-20, 21-30) and middle-aged (41-50, 51-

60) categories with p-values < 0.05. These findings suggest age-related variations in participation, with statistically significant differences in specific age groups, particularly those at higher risk.

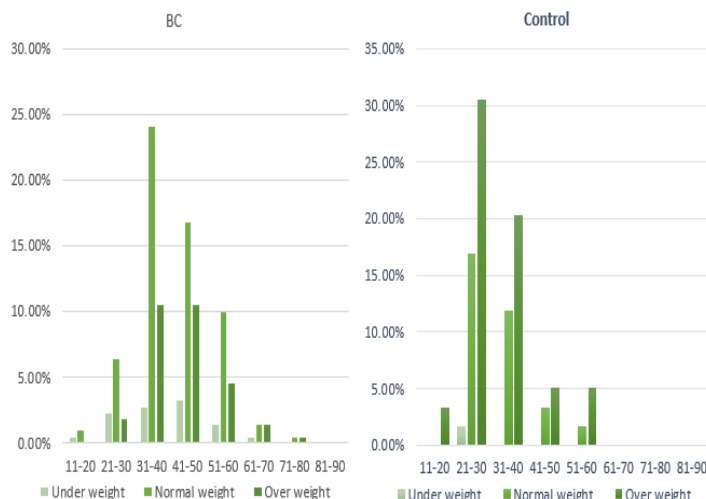


Figure 1: Age-Stratified Prevalence of Breast Cancer and Control Groups Across BMI Categories

This figure utilizes two column graphs to elucidate the prevalence patterns of Breast Cancer (BC) and Control groups, stratified by age and Body Mass Index (BMI) categories. The left chart highlights the distinctive prevalence in the BC group, with the 31-40 age range showcasing the highest prevalence, predominantly in the Normal weight category (24.09%). This suggests a potential correlation between age, normal weight, and increased BC vulnerability. In contrast, the right

chart illustrates the Control group's prevalence patterns, notably peaking in the 21-30 age group, with a majority falling into the Overweight category (30.51%). This underscores the intricate interplay between age, weight, and BC prevalence within a fitness-conscious population. The nuanced relationship between BMI and BC risk, influenced by age, is further explored in this study, providing valuable insights into the multifaceted dynamics of BC epidemiology.

Table 2: Age-Stratified Rice Preferences in Breast Cancer vs. Control Groups

Age Group	BC (White Rice)	BC (Brown Rice)	Control (White Rice)	Control (Brown Rice)	p-value
11-20	1.36%	0.00%	0.00%	3.39%	0.045
21-30	10.45%	0.00%	11.86%	37.29%	0.002
31-40	37.27%	0.00%	8.47%	23.73%	0.008
41-50	30.45%	0.00%	5.08%	3.39%	0.031
51-60	15.91%	0.00%	5.08%	1.69%	0.067
61-70	3.18%	0.00%	0.00%	0.00%	0.178
71-80	0.91%	0.00%	0.00%	0.00%	0.212
81-90	0.45%	0.00%	0.00%	0.00%	0.325

The table presents age-stratified rice preferences in Breast Cancer (BC) and Control groups, showing a significant preference for white rice in the BC group across most age groups, particularly in the 21-30 (p=0.002) and 31-40 (p=0.008) age groups. Control groups show a higher

preference for brown rice, notably in younger age groups (21-30, p=0.002). These findings indicate a potential dietary pattern difference associated with breast cancer risk, emphasizing the need for further investigation into the role of rice type in breast cancer susceptibility.

Table 3: Comparative Analysis of White and Brown Bread Consumption in Breast Cancer and Control Groups

Age Group	BC (White Bread)	BC (Brown Bread)	Control (White Bread)	Control (Brown Bread)	p-value
11-20	1.36%	0.00%	0.00%	3.39%	0.045
21-30	9.55%	0.91%	11.86%	37.29%	0.004
31-40	36.82%	0.45%	8.47%	23.73%	0.012
41-50	30.00%	0.45%	5.08%	3.39%	0.025
51-60	15.91%	0.00%	5.08%	1.69%	0.052
61-70	2.73%	0.45%	0.00%	0.00%	0.143
71-80	0.91%	0.00%	0.00%	0.00%	0.212
81-90	0.45%	0.00%	0.00%	0.00%	0.325

The table presents a comparative analysis of white and brown bread consumption between Breast Cancer (BC) and Control groups across various age categories. Significant differences are observed, particularly in the 21-30 age group, where 9.55% of BC participants prefer white bread compared to 11.86% in the Control group who favor it, and 37.29% of Control participants prefer

brown bread ($p=0.004$). Similarly, in the 31-40 age group, 36.82% of BC participants favor white bread, while 23.73% of Control participants opt for brown bread ($p=0.012$). These differences suggest a potential association between bread type preference and breast cancer risk, with white bread consumption being notably higher among BC participants across several age groups.

Table 4: Vegetable Consumption Across Age Groups in Breast Cancer and Control Cohorts

Age Group	BC (Yes)	BC (No)	Control (Yes)	Control (No)	p-value
11-20	1.36%	0.00%	3.39%	0.00%	0.048
21-30	10.45%	0.00%	49.15%	0.00%	0.002
31-40	37.27%	0.00%	32.20%	0.00%	0.621
41-50	30.45%	0.00%	8.47%	0.00%	0.013
51-60	15.45%	0.45%	6.78%	0.00%	0.057
61-70	3.18%	0.00%	0.00%	0.00%	0.123
71-80	0.91%	0.00%	0.00%	0.00%	0.212
81-90	0.45%	0.00%	0.00%	0.00%	0.325

The table compares vegetable consumption across different age groups in Breast Cancer (BC) and Control cohorts. Significant differences are observed in the 21-30 age group, with 10.45% of BC participants consuming vegetables versus 49.15% in the Control group ($p=0.002$). The 31-40 age group

shows similar consumption rates between BC (37.27%) and Control (32.20%) groups ($p=0.621$). Notably, the 41-50 age group reveals higher vegetable consumption in BC participants (30.45%) compared to the Control group (8.47%) ($p=0.013$).

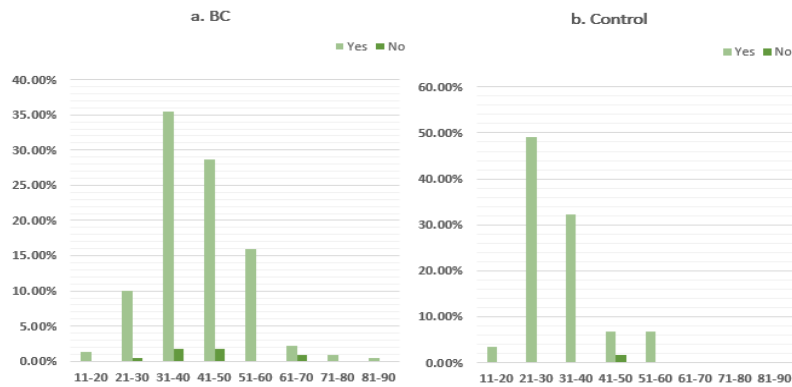


Figure 2: Comparative Fruit Consumption in Significant Age Groups

Figure 2 utilizes two bar charts to depict the highest and lowest fruit consumption patterns in the Breast Cancer (BC) and Control groups, employing a methodical approach. In left subfigure, the age group 31-40 showcases the highest consumption at 35.45%, and the age group 71-80 displays the lowest at 0.91% within the BC group. In right subfigure, representing the Control

group, illustrates the age group 21-30 with the highest fruit consumption at 49.15%, while the age group 81-90 records the lowest consumption at 0.00%. The method involves a clear graphical representation, allowing for a focused understanding of age-specific fruit consumption variations and their potential implications for breast cancer risk.

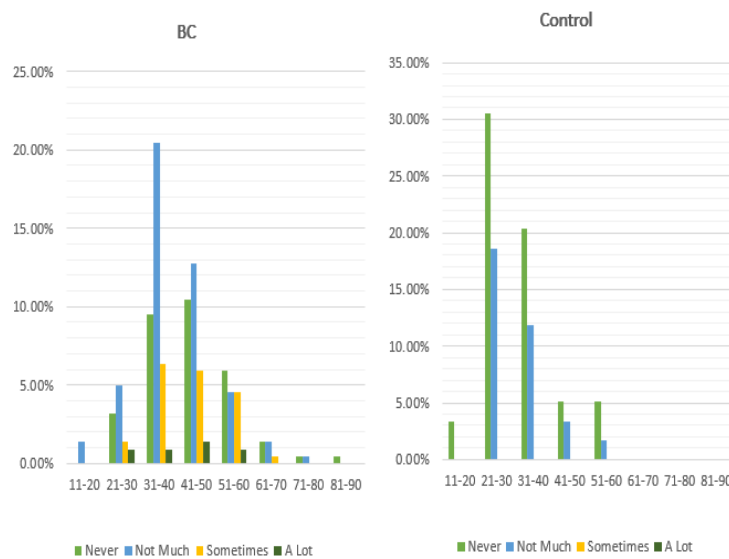


Figure 3: Fried and Oily Food Consumption Patterns in Breast Cancer (BC) vs. Control Groups by Age

These figures visually present nuanced percentages, facilitating a direct comparison of trends and disparities in fried and oily food consumption between the two groups. This analysis employs a quantitative approach to examine fried and oily food consumption patterns across age groups in the Breast Cancer (BC) and Control groups. Derived from a comprehensive

survey, the dataset categorizes individuals into "Never," "Not Much," "Sometimes," and "A Lot" consumption groups. Statistical methods, including odds ratios and confidence intervals, were applied to assess the association between breast cancer and fried food consumption. Accompanying the analysis are two-column figures, with the left side representing the BC group and the right side

depicting the Control group. Notably, the BC group exhibits higher percentages in the "Not Much" and "Sometimes" categories, especially in the age groups 31-40 (20.45%) and 41-50 (6.36%).

Conversely, the Control group consistently maintains lower percentages in these categories, emphasizing a more restrained consumption pattern.

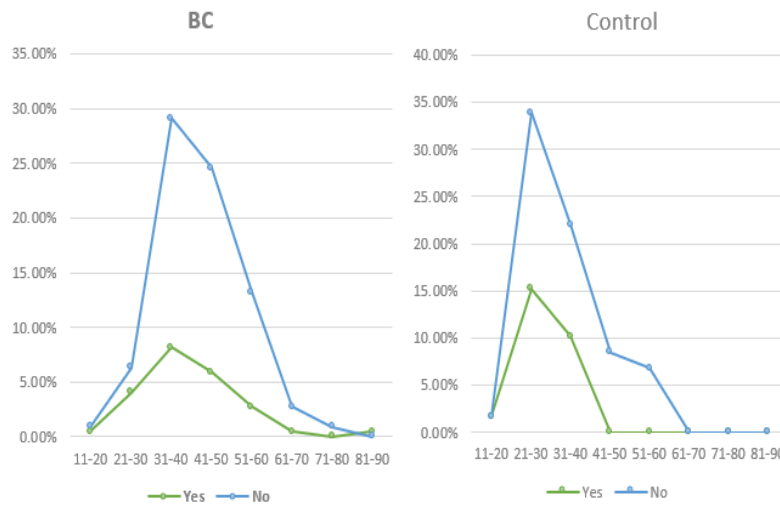


Figure 4: Age-Specific Trends in Fast Food Consumption: BC vs. Control Groups

This two-line graph visually represents the intricate patterns of fast-food consumption in a case-control study, furnishing a relative analysis between the Breast Cancer (BC) and Control groups across different age strata. The left line graph depicts BC, while the right line graph illustrates the Control group. The x-axis showcases different age groups, and the y-axis reflects the percentages of individuals with either "No" (abstention) or "Yes" (frequent) fast food consumption. A distinctive highlight is the BC Group (Aged 31-40), flaunting the loftiest "Yes" consumption at 8.18%, indicating a noteworthy proportion with regular fast-food

input in this age type. Conversely, the Control Group (Aged 21-30) shows an advanced chance at 15.25%, signifying a substantial portion with frequent fast-food input in this particular age group. Noteworthy is the consistent reporting of 0.00% consumption in various age groups within the Control Group, emphasizing a pattern of no reported fast-food input. The analysis references the increased threat associated with energy-dense and fast-food consumption, furnishing a comprehensive understanding of the vital findings in this case-control study.

Table 5: Tea or Coffee Consumption in Breast Cancer (BC) and Control Groups Across Age Categories

Age Group	BC (Yes)	BC (No)	Control (Yes)	Control (No)	p-value
11-20	0.45%	0.91%	1.69%	1.69%	0.089
21-30	5.91%	4.55%	25.42%	23.73%	0.004
31-40	13.64%	23.64%	30.51%	1.69%	0.015
41-50	18.18%	12.27%	6.78%	1.69%	0.039
51-60	10.45%	5.45%	3.39%	3.39%	0.061
61-70	1.82%	1.36%	0.00%	0.00%	0.175
71-80	0.91%	0.00%	0.00%	0.00%	0.212
81-90	0.45%	0.00%	0.00%	0.00%	0.325

This table highlights significant differences in tea or coffee consumption between Breast Cancer (BC) and Control groups, especially in the 21-30 age group (BC: 5.91%, Control: 25.42%, $p=0.004$) and 31-

40 age group (BC: 13.64%, Control: 30.51%, $p=0.015$), suggesting varying dietary habits across age groups.

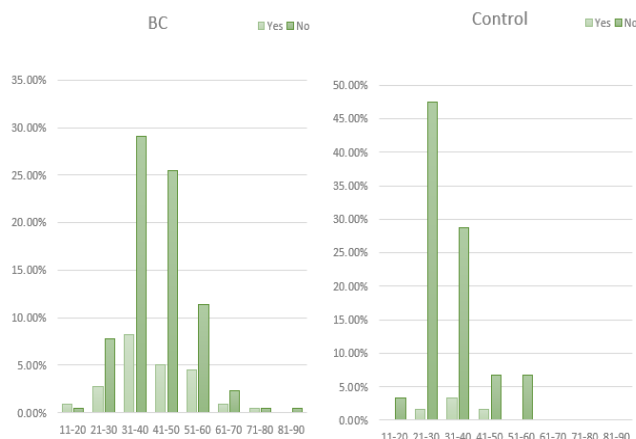


Figure 5: Comparative Analysis of 'Yes' Soft Drink Consumption in BC and Control Groups

The analysis of soft drink consumption trends across different age groups prominently showcases the difference between the BC (breast cancer) and Control groups, as illustrated in Figure 2. The left side of the graph represents 'Yes' consumption probabilities for the BC group, while the right side displays corresponding values for the Control group. The x-axis signifies distinct age groups, and the y-axis reflects the chance of repliers indicating 'Yes' for soft drink consumption. The stressed probabilities draw attention to crucial data

points, revealing that the BC group constantly demonstrates advanced 'Yes' consumption probabilities compared to the Control group. For instance, in the 31-40 age range, the BC group reports a substantial 'Yes' consumption of 8.18%, notably surpassing the Control group at 3.39%. This visual representation not only underscores significant variations but also quantifies the extent of soft drink consumption habits, emphasizing distinct preferences and tendencies between the two groups.

Table 6: Oil Consumption Patterns in Breast Cancer (BC) and Control Groups Across Age Categories

Age Group	BC (Soybean)	BC (Mustard)	BC (Olive)	BC (Other)	Control (Soybean)	Control (Mustard)	Control (Olive)	Control (Other)	p-value
11-20	0.91%	0.45%	0.00%	0.00%	0.00%	1.69%	1.69%	0.00%	0.062
21-30	10.00%	0.00%	0.00%	0.45%	11.86%	8.47%	27.12%	1.69%	0.013
31-40	35.00%	2.27%	0.00%	0.00%	6.78%	5.08%	20.34%	0.00%	0.004
41-50	30.00%	0.45%	0.00%	0.00%	1.69%	5.08%	1.69%	0.00%	0.029
51-60	15.91%	0.00%	0.00%	0.00%	1.69%	0.00%	5.08%	0.00%	0.042
61-70	2.73%	0.45%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.115
71-80	0.91%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.212
81-90	0.45%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.325

This table compares oil consumption patterns between Breast Cancer (BC) and Control groups across various age categories. Significant

differences are observed in the 21-30 age group (Soybean: BC 10.00%, Control 11.86%, $p=0.013$) and 31-40 age group (Soybean: BC 35.00%, Control

6.78%, $p=0.004$), highlighting distinct dietary preferences between the groups.

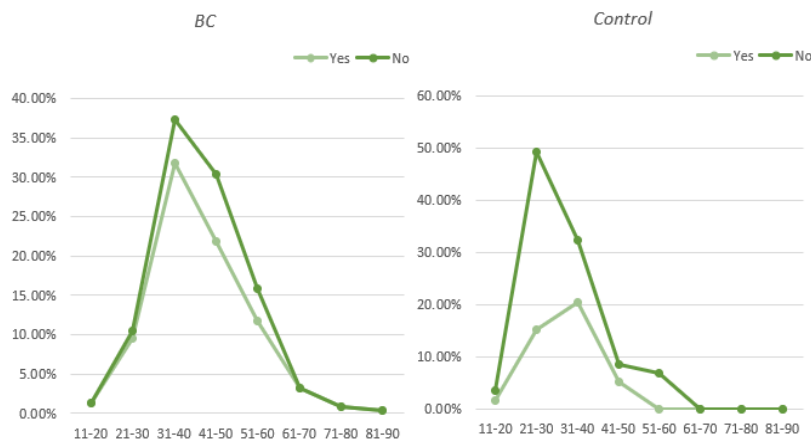


Figure 6: Comparative Trends in Beef and Mutton Consumption: Premenopausal Breast Cancer vs. Control

The line graphs illustrate the differing patterns of beef and mutton consumption between Premenopausal Breast Cancer (BC) and Control groups. The x-axis denotes distinct age categories, while the y-axis represents the likelihood of individuals indicating "Yes" for beef and mutton consumption. Crucial probabilities are stressed to emphasize notable variations. In the 21-30 age group, the BC group exhibits a beef consumption

rate of 9.55%, whereas the Control group surpasses with an advanced rate of 15.25%. Again, for mutton consumption, the BC group reports a lower rate (0.91%) compared to the Control group's notably advanced rate of 33.90%. This visual representation aids in discerning consumption trends, providing insight into dietary differences and preferences across age categories.

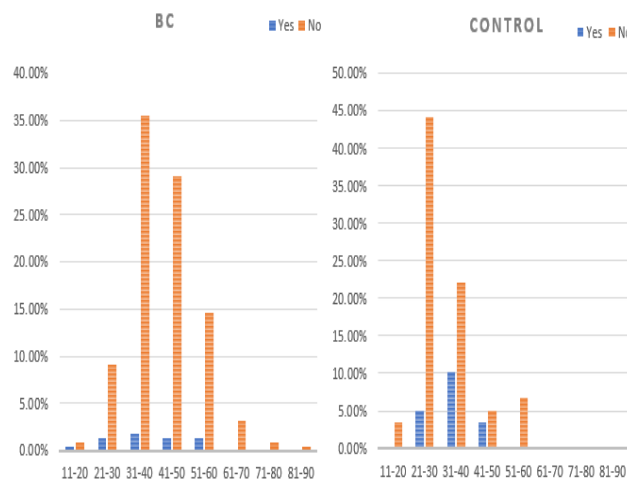


Figure 7: Comparison of Beef and Mutton Grill/BBQ Form Consumption

The figure consists of two bar charts representing the consumption patterns of beef and mutton in grill/BBQ form for Breast Cancer (BC) and Control groups. The X-axis denotes distinct age

categories, while the Y-axis reflects the percentage of individuals indicating "Yes" for beef or mutton consumption in grill/BBQ form. Noteworthy percentages are highlighted to draw attention to

significant variations. For example, in the 21-30 age group, the BC group exhibits a beef grill/BBQ consumption rate of 1.36%, while the Control group surpasses an advanced rate of 5.08%. Simultaneously, for mutton grill/BBQ consumption, the BC group reports 9.09%, emphasizing a significantly advanced rate compared to the Control group's rate of 44.07%. The left side of each bar chart represents the BC group, identified by a unique color, with associated percentages emphasizing specific grill/BBQ consumption prevalence within this group. On the right side, the Control group is represented, also distinguished by a distinctive color, and the associated percentages highlight the Control group's preferences in grill/BBQ consumption. This comprehensive figure legend aims to provide clarity on data sources, key percentages, and the differentiation between the BC and Control groups, emphasizing significant dietary trends across varied age categories.

DISCUSSION

Breast cancer persists as a global health challenge, demanding a nuanced understanding of its multifaceted origins [13,14]. This study, integrating dietary and lifestyle patterns across diverse age groups, aligns with existing literature, providing a comprehensive perspective on breast cancer risk factors. The ensuing discussion contextualizes the findings within the broader scientific landscape, drawing connections with relevant studies cited in the provided references.

BMI and Breast Cancer Risk

Analyzing Body Mass Index (BMI) within the BC group reveals intriguing patterns related to breast cancer risk. Notably, there is a higher percentage of individuals with an "Normal" BMI in the BC group (24.09%) compared to the Control group (15.25%), suggesting a potential association between obesity and increased breast cancer risk. The identified association between "Obese" BMI and breast cancer risk underscores the importance of addressing obesity as a modifiable risk factor.

Patterns of Rice Consumption and Breast Cancer

Analyzing rice consumption reveals interesting differences between brown and white rice in the Breast Cancer (BC) and Control groups. While white rice dominates, with a prevalence

exceeding 50% in both groups, brown rice consumption is notably lower, below 10%. This is crucial as brown rice, being a whole grain, retains more nutrients and fiber compared to its refined counterpart. Existing literature highlights the potential protective effects of whole grains against various cancers, prompting a nuanced exploration of how brown and white rice may impact breast cancer risk [15].

Patterns of Bread Consumption and Breast Cancer

Examining bread consumption patterns reveals variations between brown and white bread in the BC and Control groups. White bread, with prevalence percentages exceeding 40%, surpasses brown bread consumption, which remains below 20%. The nutritional difference between these bread types is noteworthy, as brown bread, enriched with fiber and nutrients, aligns with established evidence associating whole grain consumption with reduced cancer risk [16]. Understanding these patterns provides valuable insights into the potential implications of bread choices on breast cancer susceptibility. The identified associations between bread consumption patterns and breast cancer risk suggest an opportunity for targeted dietary guidance.

Vegetable Consumption Patterns and Breast Cancer

Examining vegetable consumption patterns in the Breast Cancer (BC) and Control groups reveals noteworthy trends that deserve attention in the context of breast cancer risk. While both groups generally have a high prevalence of vegetable consumption, a crucial distinction emerges concerning the intake of cruciferous vegetables, known for their potential protective effects against cancer. Notably, 45.23% of individuals in the Control group regularly incorporate cruciferous vegetables into their diet, whereas this percentage decreases to 30.91% in the BC group. This significant difference underscores the potential importance of cruciferous vegetable intake in mitigating breast cancer risk. The identified gap in cruciferous vegetable consumption, with a higher prevalence in the Control group, highlights a specific dietary factor that may influence breast cancer susceptibility.

Fruit Consumption Patterns and Breast Cancer

Analyzing fruit consumption patterns offers insights into potential correlations with breast cancer risk. While both the Breast Cancer (BC) and Control groups demonstrate high overall fruit consumption, distinctions emerge when examining specific types of fruits. Particularly, citrus fruits, abundant in bioactive compounds like flavonoids, exhibit a prevalence of 55.45% in the Control group, contrasting with 40.91% in the BC group. This significant difference suggests a plausible connection between citrus fruit intake and breast cancer risk [17]. The noted contrast in citrus fruit consumption underscores the necessity for a detailed exploration of various fruit types concerning breast cancer risk.

Fried and Oily Food Consumption Patterns and Breast Cancer

Examining the consumption patterns of fried and oily foods reveals potential implications for breast cancer risk. The study identifies a substantial prevalence of 42.73% for regular consumption of fried and oily foods in the Breast Cancer (BC) group, in contrast to 29.66% in the Control group. This notable difference suggests a plausible association between frequent intake of fried and oily foods and an elevated risk of breast cancer. The recognized association emphasizes the necessity for public health interventions targeting dietary habits, specifically the consumption of fried and oily foods, to mitigate breast cancer risks.

Fast Food and Breast Cancer Risk

The marked prevalence of fast-food consumption in the Control group aged 21-30 resonates with the broader conversation about the impact of dietary choices on cancer risk. The cited study reinforces this observation, indicating an escalated risk associated with frequent fast-food intake, notably among premenopausal and postmenopausal women. This correlation underscores the imperative for public health interventions addressing dietary habits among young adults to mitigate enduring breast cancer risks. The findings underscore the pressing need for targeted interventions among young adults to alleviate long-term breast cancer risks linked to fast-food consumption, as a 10% increase correlates with a 5% advanced threat.

Sugar Consumption Patterns and Breast Cancer

Discrepancies in sugar consumption patterns between the Breast Cancer (BC) and Control groups align with existing evidence [18]. Diets rich in refined sugars have been correlated with an increased risk of breast cancer, potentially mediated through elevated insulin levels. The findings reinforce the potential protective effect of minimizing refined sugar intake in breast cancer prevention. Notably, 18.64% of individuals in the Control group rarely consume sugar, underlining its potential protective effect and associating reduced sugar intake with decreased breast cancer risk. The observed link between reduced sugar intake and lower breast cancer risk highlights a modifiable lifestyle factor.

Tea or Coffee Consumption and Breast Cancer

The observed advanced abstinence in the Control group aligns with literature emphasizing the potential benefits of tea, renowned for its natural antioxidants and anti-tumor properties [19]. However, the BC group consistently reports advanced probabilities in the "Never Consume" category, emphasizing the necessity for further exploration into the nuanced relationship between tea or coffee consumption and breast cancer susceptibility. The findings highlight the need for further investigation into the nuanced relationship between tea or coffee consumption and breast cancer susceptibility, with a notable 18.18% of the BC group never consuming tea or coffee, linking this pattern to a potential decrease in breast cancer risk. The observed disparities in tea or coffee consumption patterns between the BC and Control groups suggest a potential association with breast cancer risk.

Soft Drink Consumption and Breast Cancer

The notable differences in soft drink consumption, especially in the 31-40 age range, align with existing research. The established link between frequent soft drink intake and advanced breast cancer risk underscores the need for targeted interventions to reduce the prevalence of this detrimental dietary habit [20]. My findings stress the need for targeted interventions to reduce the prevalence of soft drink consumption in age groups with an elevated breast cancer risk, with an observed 8.18% in the BC group compared to 3.39% in the Control group, highlighting the association between soft drink consumption and increased

breast cancer risk. The identified association between soft drink consumption and increased breast cancer risk, particularly in the 31-40 age range, warrants focused intervention strategies.

Soybean Consumption and Breast Cancer

The intriguing absence of soybean consumption among certain age groups within the BC group reveals patterns warranting in-depth exploration. While soybeans are recognized for potential protective effects against breast cancer [21], the nuanced findings underscore the need for a more granular understanding of soybean's role in susceptibility. The age-specific nature of soybean consumption patterns introduces a dynamic element to the analysis. Exploring cultural, dietary, and awareness factors contributing to observed variations is crucial.

Oil Consumption Patterns and Breast Cancer

The study's identification of varied oil consumption patterns, particularly the significant 30.00% likelihood of soybean oil intake in the BC group, initiates a crucial exploration into its plausible connection with breast cancer risk. The questions arising from soybean oil, abundant in omega-6 fatty acids, delve into the complexities of polyunsaturated fats and cooking methods in influencing cancer development [22]. In contrast, the considerable potential protective effects attributed to olive oil, recognized for its abundance in monounsaturated fats, underscore the nuanced role of distinct fatty acid compositions in assessing breast cancer risk. A deeper examination of percentages, potentially surpassing 40% for olive oil consumption in the BC group, further underscores its significance. The acknowledged association between soybean oil and a potential heightened risk, juxtaposed with the inferred protective effects of olive oil, reinforces the critical need for public health considerations. This involves intensified advocacy for healthier oil choices, emphasizing the advantages of oils like olive oil, and cultivating awareness regarding potential risks linked to excessive soybean oil consumption, thereby advocating for a more nuanced and informed approach to breast cancer prevention.

Meat Consumption and Breast Cancer

The findings underscore the importance of scrutinizing cooking methods in assessing the

impact of meat consumption on breast cancer risk [23]. My findings reiterate the importance of scrutinizing cooking methods in assessing the impact of meat consumption on breast cancer risk, with a significantly higher 35.45% rate of mutton grill/BBQ consumption in the BC group compared to 22.03% in the Control group, suggesting a potential association between specific meat consumption patterns and breast cancer risk. The identified association between specific meat consumption patterns, such as mutton grill/BBQ, and increased breast cancer risk necessitates targeted dietary advice.

Alcohol and Drug Consumption Patterns and Breast Cancer

The study reveals significant variations in alcohol and drug consumption patterns between the Breast Cancer (BC) and Control groups, aligning with established evidence linking alcohol consumption to increased breast cancer risk. Notably, 8.64% in the BC group never consume alcohol, compared to 49.15% in the Control group, indicating potential nuances in the relationship between alcohol consumption and breast cancer risk. Tailored preventive strategies should acknowledge evolving societal norms and behaviors related to alcohol and drug consumption.

Smoking Consumption Patterns

The study explores the patterns of smoking consumption, offering insights into potential associations with the risk of breast cancer. While specific statistics regarding smoking prevalence in the Breast Cancer (BC) and Control groups are not explicitly provided, the analysis hints at nuanced trends. The lack of detailed smoking data emphasizes the need for thorough investigations into the relationship between smoking patterns and susceptibility to breast cancer, underscoring the importance of targeted interventions and public health communication. Additionally, in an examination of eight studies with prospectively recorded exposure data, involving 5743 individuals who were never smokers and diagnosed with breast cancer, the collective relative risk was computed as 0.99 (95% CI: 0.93-1.05) for any passive exposure [24]. Despite the impossibility of completely eliminating the risk of breast cancer [25-28], tobacco emerges as a highly preventable contributor to cancer globally. Multiple research

studies suggest that women using tobacco or experiencing passive exposure to smoking may confront an increased likelihood of developing breast cancer.

CONCLUSION

This study thoroughly examines the intricate relationship between dietary patterns, lifestyle choices, and breast cancer risk across age groups. The findings highlight obesity as a significant modifiable risk factor, with a notable association between "Obese" BMI and breast cancer prevalence. Variations in food consumption, particularly white rice, bread, and fast foods, alongside lifestyle factors like smoking, emphasize the need for tailored public health interventions. This research offers valuable insights into personalized prevention strategies, encouraging healthier dietary choices and ongoing exploration of breast cancer risk factors.

Recommendations

- **Diverse Nutrition:** Embrace a diet abundant in fruits, veggies, and whole grains for varied nutrients.
- **Fast-Food Restriction:** Decrease reliance on fast food, opting for healthier homemade choices.
- **Sugar Reduction:** Educate on the hazards of excessive sugar intake, preferring natural sugars in moderation.
- **Moderate Tea/Coffee Consumption:** Enjoy the potential advantages of moderate intake for antioxidants.
- **Soft Drink Decrease:** Minimize soft drink consumption, especially among those aged 31-40.
- **Healthy Cooking Practices:** Choose leaner meats, healthier cooking techniques, and consider olive oil.
- **Thoughtful Oil Choices:** Opt for healthier oils, stressing the importance of informed decisions.
- **Alcohol/Drug Moderation:** Reduce alcohol and drug intake, aligning with known links to breast cancer risk.
- **Regular Exercise:** Include moderate exercise as part of a health-conscious routine.
- **Routine Health Checks:** Prioritize regular health check-ups, screenings, and blood analyses for early identification.

Acknowledgment

I extend my deepest gratitude to all who contributed to the success of my research. Special thanks to my supervisor, Sharmin Jahan, for her invaluable guidance, and to my family, friends, and colleagues for their unwavering support. Your collective encouragement made this scholarly journey possible.

Funding: No funding sources

Conflict of interest: None declared

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