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Factors Associated with Fruits and Vegetables Intake among Breast Cancer Patients in National Cancer Institute

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Abstract

Introduction: Fruits and vegetables (FV) contain bioactive components that can potentially improve breast cancer health outcomes. As significant number of breast cancer patients struggle to meet the World Health Organization's (WHO) recommendation consumption of at least ≥ 400 g/day of FV, this cross-sectional study aimed to investigate the factors associated with sociodemographic status, anthropometric measurement, biochemical data, medical characteristics, and stress level, with the consumption of FV among breast cancer patients at the National Cancer Institute, Putrajaya. **Method:** 32 breast cancer outpatients were recruited using purposive sampling. Food Frequency Questionnaire (adapted from the Malaysian Adult Nutrition Survey) was used to assess FV consumption while Perceived Stress Scale was used to evaluate the participants' perceived stress levels. The inclusion criteria including all breast cancer outpatients, aged 18 years old and above, Malaysian and able to communicate verbally. Patients with chronic disease and fluid retention were excluded in this study. **Results:** The findings revealed that only 50% of the respondents managed to meet the WHO's recommended intake of FV. However, no significant associations observed between sociodemographic status, anthropometric measurement, biochemical data, medical characteristics, stress level, with the FV intake among the participants. **Conclusion:** The proportion of participants consuming an adequate amount remains relatively low. This is a concern that requires attention for future interventions by healthcare providers, especially dietitians, playing a crucial role in treatment efforts in the country and improve breast cancer outcomes.

Keywords: Fruits and Vegetables, Breast Cancer, Adequacy, Stress Level

Introduction

Breast cancer, as described by the Division of Cancer Prevention and Control at the Centers for Disease Control and Prevention is characterized by the uncontrolled proliferation of cells within the breast (Disease Control and Prevention, 2022). It was reported to be one of the most prominent cancer types with one i n eight cancers diagnosed globally (Arnold et al., 2022). In more than onetenth of all women in the world afflicted with breast cancer with 2,088,849 new cases to be diagnosed with breast cancer globally (Ahmad, 2019). According to the Global Observatory Cancer (GLOBOCAN), breast cancer incidence in Asian population reported to have approximately half from the total population and the current total number of incidences reaching up to 2 million worldwide (GLOBOCAN, 2020). New incidence of breast cancer is estimated to increase to more than two fifth by 2040 with an expected mortality of more than half from 2020 (Arnold et al., 2022). Diet, in particular, plays a significant role in the incidence, an outcome, mortality, and progression of breast cancer (Cicco et al., 2019). According to research, a diet rich in fruits and vegetables has been associated with a decreased risk of breast cancer (Farvid et al., 2018). On the other hand, sedentary lifestyle and poor dietary habits can lead to obesity and inflammatory processes, creating an optimal setting for breast cancer growth and progression by consuming high-caloric foods (high in sugar and saturated fats) and inadequate amounts of healthy foods (rich in omega-3 fatty acids, fibre and antioxidants) (Cicco et al., 2019). However, despite the well-documented health benefits of these foods, a considerable proportion of breast cancer patients do not consume sufficient amounts of fruits and vegetables. According to the World Health Organization (2022), an intake of at least 400g of fruits and vegetables daily is recommended. Notably, previous study by Samarin (2020) found that only 7.9% of cancer patients consumed an adequate amount of fruit, while 16.8% consumed an adequate number of vegetables, indicating a need to increase the consumption of fruits and vegetables to at least 400g per day as per the recommendation. Besides, in global setting, research have found that African and American breast cancer patients consume less fruits and vegetables and more fat than non-Hispanic white breast cancer patients (Paxton et al., 2019). Furthermore, a large percentage (80%) of breast cancer survivors fail to achieve the recommended intake of fruits and vegetables (Ramirez et al., 2016, as cited in Paxton et al., 2019). Meanwhile, in the local context study, it was reported that the consumption of fruits and vegetables increased which primarily were made in response to physician and nutritionist guidance, as well as a desire to treat cancer (Shaharudin et al., 2013). Nevertheless, there have been inconsistent findings concerning the consumption of fruits and vegetables among breast cancer patients (Afrett et al., 2017; Lunar et al., 2017; Shaharudin et al., 2013; Steinhilper et al., 2013; Thomson et al., 2002; Yaw et al., 2021; Fassier et al., 2017; Paxton et al., 2019). Further research is necessary to explore the factors associated with fruit and vegetable consumption, particularly considering socioeconomic status (Affret et al., 2018; Cho et al., 2018).

In Malaysia, there exists a significant research gap regarding the connection between breast cancer and the consumption of fruits and vegetables. Although studies in other countries have explored this relationship, there is a lack of research focusing specifically on the Malaysian population. This knowledge gap is particularly noteworthy given that breast cancer stands as a leading cause of cancerrelated deaths among Malaysian women. Consequently, gaining a deeper insight into the potential impact of diet, especially the intake of fruits and vegetables, could hold vital implications for breast cancer prevention and treatment in the country. Therefore, the primary objective of this study is to determine the intake of fruits and

vegetables among breast cancer patients in Malaysia. By investigating the association of anthropometric measurements, biochemical data, medical characteristics, and stress levels with fruits and vegetables consumption, this research aims to fill the existing knowledge gap in this area. Ultimately, a deeper understanding of the factors influencing fruit and vegetable consumption, particularly among breast cancer patients, can contribute to improve awareness and optimizing dietary habits. Identifying the associated factors related to fruits and vegetables intake will be instrumental in promoting optimal intake among breast cancer patients and potentially improving their overall wellbeing.

Materials and Method

A cross-sectional study was conducted in the Oncology Clinic, National Cancer Institute, Putrajaya, Malaysia among breast cancer outpatients. Ethical approval from the Medical Research & Ethics Committee (MREC) and approval permission from Clinical Research Centre, CRC of National Cancer Institute was obtained (NMRR ID-22-00219-FBX) prior to the data collections. Information sheets and consent form was obtained from the participants that agreed to participate in the study. The inclusion criteria including all breast cancer outpatients, aged 18 years old and above, Malaysia and able to communicate verbally. Patients with chronic disease and fluid retention were excluded in this study. Sociodemographic characteristics, anthropometric measurement, biochemical data and medical characteristic information of the participants obtained through researcher administered questionnaire. Meanwhile, 10 – item perceived stress scale (PSS) used to assess participants' perceived stress level and Food Frequency Questionnaires (FFQ) adapted from National Health Morbidity and Survey 2014: Malaysian Adult Nutrition Survey (MANS) used to assess respondent's intake regarding fruits and vegetables. Respondents' anthropometric measurements, including body weight, height, and Body Mass Index (BMI), were collected for anthropometric measurement. Based on the calculated BMI values, the participants were classified into four categories according to the World Health Organization (WHO): underweight, normal weight, overweight, and obese. Respondents' data regarding albumin and haemoglobin level were obtained through the medical record data system of National Cancer Institute. Information regarding participant's medical history were obtained which are cancer treatments (surgery, radiotherapy, chemotherapy), stage of diagnosis (stage I, stage II, stage III, stage IV), and duration of diagnosis. The participant's stress level assessed by using 10 - item perceived stress scale (PSS) questionnaire which consists of ten questions about respondent's feelings and thought for the past one month. The questions use the 4 – Likert range which are 0 – never, 1 – almost never, 3 – fairly often, and 4 – very often. Besides, Food frequency questionnaire (FFQ) used consist with total 165 food items and 13 category of food groups. In this study, only two part that specify type of food which are vegetables items (14 items) and fruits items (26 items). The adequacy status of respondent's fruits and vegetables intake was assessed after the calculation is done. Fruits and vegetables consumption among a breast cancer patients compared with World Health Organization (WHO) requirement which is at least 400g per day. Thus, fruits and vegetables consumption which is less than 400g/day classified as inadequate while at least 400g per day and more classified as adequate.

Data Analysis

IBM SPSS version 28 software were used to conduct the data analysis and the significance level is set to be at $p < 0.05$. The test of normality was assessed to determine parametric or non-parametric tests that suitable. Descriptive data was analysed using univariate analysis,

where categorical variables were presented in frequencies and percentages, while continuous variables were presented as mean and standard deviation. The association between categorical variables was tested using the Chi-square test.

Results

The result indicated that there are no majority outcomes in term of adequacy of fruits and vegetables intake as only 50% of the respondents consume adequate fruits and vegetable. However, the mean intake of fruits and vegetables among respondents were 544.12 ± 358.25 meeting the guideline by WHO of at least 400g intake daily. Besides, there are no significant association between the factors and the consumption of fruits and vegetables noted from current study ($p > 0.05$). However, except for marital status, income level, BMI and breast cancer stage,were reported to have significant association with fruits and vegetables intake from previous study in which inconsistent with the current finding (Cho & Park., 2017; Cheung., 2017)

Descriptive Characteristics Sociodemographic status

The mean age of the respondents was 52.34 ± 8.150 years old. Most of the respondents fell into two age groups, 25 to 54 years old (50%) and 55 to 64 years old (46.9%). In terms of ethnicity, the respondents had diverse backgrounds, with the majority being Malay (84.4%), followed by Chinese (9.4%) and Indian (6.3%). Regarding their educational level, none of the respondents had no formal education, while more than half had received secondary education (53.1%). Additionally, most of the respondents were married (81.3%), unemployed (34.4%), and had a household income of less than RM 2500 (62.5%).

Table 1
Sociodemographic characteristic of respondents (n = 32)

Characteristics	n (%)	
Mean ± SD		
Age		52.34 ± 8.150
25 – 54	16 (50)	
55 – 64	15 (46.9)	
65 and above	1 (3.1)	
Ethnic		
Malay	27 (84.4)	
Chinese	3 (9.4)	
Indian	2 (6.3)	
Educational level		
No formal education	0 (0)	
Primary education	4 (12.5)	
Secondary education	17 (53.1)	
Tertiary education	11 (34.4)	

Marital Status		
Single	1 (3.1)	
Married	26 (81.3)	
Divorced	0 (0)	
Widow	5 (15.6)	
Employment Status		
Government office	4 (12.5)	
Private sector	3 (9.4)	
Businessman	2 (6.3)	
Employed	5 (15.6)	
Unemployed	11 (34.4)	
Retired	1 (3.1)	
Others (Housewife)	6 (18.8)	
Household income		1.47 ± 0.671
< RM 4,850	20 (62.5)	
RM 4850 – RM 10959	9 (28.1)	
>RM 10959	3 (9.4)	

Anthropometric Measurement

The mean weight of the respondents was 67.93 ± 12.146 kg. Most of the respondents' body mass index (kg/m2) were classified as overweight (14%) compared to the other classifications, normal (25%), obese class I (18.8%), and obese class II (12.5%).

Biochemical Data

The mean reading of respondents' haemoglobin level were 12.56 ± 1.045 while albumin was 41.19 ± 2.977. Both haemoglobin and albumin status of the respondents mostly were normal (76.2%) and (100%) respectively.

Medical Characteristics

Almost half of the respondents did not receive any treatment yet due to newly diagnosed and planning for the treatment (43.8%) and majority were follow up patients (56.3%). Besides, more than half of the respondents have completed chemotherapy, surgery and radiotherapy (53.1%) respectively. Almost half of the respondents' (46.9%) current stage of cancer is stage III. The mean duration of diagnosis was
2.27 ± 1.202 and most of the respondents were diagnosed within less than 1 years and less than 5 years, (40.6%) and (34.4%) respectively.

Stress level

The total mean of perceived stress scale of the respondents was 12.89 ± 7.55). Most of the respondents were reported to have low stress (50%) and moderate stress (46.9%) and only 1

out of 32 respondents score was classified as high perceived stress (3.1%). Majority of respondents answered "sometimes" for all items. A large number of respondents answered "never" on items 2,6,9, and 10, which describe "emotions of being incapable to control crucial matters in life," "could not manage with every task that had to be completed," "being frustrated due to things that took place that were outside of your control," and "felt struggles built up to such an extent that you weren't able to overcome them."

Fruits and Vegetables Intake

As shown in table 1, the total mean intake of fruits and vegetables among respondents was 544.12 ± 358.246 g/day, which has achieved the WHO recommendations (≥400g/day). The result indicated that half of the respondents (50%) achieve the adequate intake of the WHO recommendation and the other half (50%) of the respondent's intake were inadequate (<400g/day). This finding is consistent with the previous study that reported inadequate consumption of fruits and vegetables among breast cancer patient is still relatively high (15, 8,7).

Table 1
Fruits and Vegetables Intake of the respondents (n=32)

FV intake	n (%)	Mean ± SD
FV intake, g/day		544.12 ± 358.246
Adequate	16 (50)	
Inadequate	16 (50)	

Discussion

Sociodemographic status with FV intake

Based on the analysis result, there were no significant association between the sociodemopgraphic status and the consumption of fruits and vegetables noted from current study ($p > 0.05$). However, concerning marital status, household income, and employment status, there were discrepancies with the previous study which reported to have significant association with the consumption of fruits and vegetables (Cheung, 2017). From the current study, respondents with household incomes less than RM 4,850 had a higher likelihood of consuming adequate fruits and vegetables compared to those with household incomes above RM 4,850. In contrast, previous study highlighted that respondent with income levels less than $15,000 reported lower consumption of fruits and vegetables compared to those with higher income levels of ≥ $15,000 (Cheung, 2017).

Table 2
Association of sociodemographic characteristic with the consumption of FV (n = 32)

Variables	Consumption of Fruits and Vegetables		X^2	*p*-value
	Adequate (> 400 g) n (%)	Inadequate (< 400 g) n (%)		
Age, years			3.137	0.077
25 – 54	11 (68.8)	5 (31.3)		
55 and above	6 (37.5)	10 (62.5)		
Ethnic			1.719	0.338[a]
Malay	13 (48.1)	14 (51.9)		
Non-Malay	4 (80)	1 (20)		
Educational level			0.014	0.907 [a]
Primary and Secondary education	11 (52.4)	10 (47.6)		
Tertiary education	6 (54.4)	5 (45.5)		
Marital Status			0.112	1.00 [a]
Married	14 (51.9)	13 (48.1)		
Unmarried	3 (60)	2 (40)		
Employment Status			3.348	0.067
Employed	10 (71.4)	4 (28.6)		
Unemployed	7 (38.9)	11 (61.1)		
Household income			0.075	0.784
<RM 4,850	11 (55)	9 (45)		
Above RM 4,850	6 (50)	6 (50)		

[a] Fisher's Exact Test

Anthropometric Measurement with FV Intake

No significant association between weight, height and BMI of the respondents and fruits and vegetables intake (p> 0.05) observe in current study. This current finding is consistent with the previous study that reported BMI of breast cancer patient were not significantly associated with fruits and vegetable intake (Cheung, 2017). Besides, it was noted from current findings that most of the respondents' BMI is higher than normal and the proportion of

respondent that consume adequate fruits and vegetables among the overweight and obese respondents' is higher (62.5%) compared with those with normal BMI (25%) in which differ with previous study (Miller et al., 2012) which reported of greater adherence to higher consumption of fruits and vegetables among the respondents with lower BMI ($p < 0.05$).

Biochemical data with FV intake

There were no significant association noted in current study. This result consistent with the previous study that reported with no significant association were noted between haemoglobin and fruits and vegetables consumption. Majority of the respondents with normal haemoglobin level, consume adequate fruits and vegetables (57.1%).

Medical Characteristics with FV Intake

From the current finding, no significant association were found between medical characteristics with the consumption of fruits and vegetables. Higher proportion of respondents consumed adequate fruits and vegetables observed among respondents with cancer stage III and IV compare with stage I and II (55% and 50% respectively; $p = 0.784$). This finding consistent with previous study by Lei et al (2018) in which reported that the proportion of participants that consume adequate amount according to the guideline is increased with the higher cancer stage ($p<0.001$). Besides, the percentage of the participant with earlier stage (I and II) that meet the recommendation is still less than half (24.5% at TI and 19.3% at T2) From the perspective of duration of diagnosis, higher percentages of respondents that has been diagnosed with breast cancer more than 3 years consumed adequate fruits and vegetable compare to those that has been diagnosed with less than 3 years (61.1% and 42.9% respectively). On the contrary, previous study highlighted that breast cancer patients with 5 years post-diagnosis were more prevalence with nutritional vulnerabilities, and inadequate fruits and vegetables intake (Pisegna et al., 2020)

Stress Level with FV Intake

The results shown that there were no significant associations found in the current study ($p > 0.05$). This finding is consistent with a previous study by Wang et al (2020), which also reported no association between breast cancer and vegetable and fruit consumption in relation to high perceived stress levels. However, among respondents with low stress levels, the proportion of those who consumed adequate fruits and vegetables was the highest, accounting for 56.3% of the group. The overall stress levels were notably low, which could be attributed to the extended duration of time between diagnosis and the present moment of examination.

Limitations of The Study

Overall, the study offers a comprehensive understanding of the factors associated with the consumption of fruits and vegetables among breast cancer patients. This knowledge is crucial in shaping future interventions aimed at promoting and ensuring adequate fruit and vegetable consumption, aligning with the recommendations of the World Health Organization (WHO) for a healthy lifestyle among breast cancer patients. However, there were a few limitations in current study that should be taken into consideration. First of all, current study was a cross-sectional study in which causal relationship of this study cannot be determined. Hence, longitudinal study design is recommended for future research so that the causal between the variables could be determined. Besides, the findings of the current study cannot

be generalized to all breast cancer patients in Malaysia as current study only recruited breast cancer outpatients from National Cancer Institute, Putrajaya. This is because of differences in sociodemographic and lifestyles especially from urban and rural areas might influence the findings in current study. In addition, current findings may not be generalizable to other racial or ethnic groups since the majority of participants were among Malay ethnic. Thus, future studies are recommended to involve breast cancer outpatients from different oncology clinic and variety in ethnicity in order to generalized to all breast cancer outpatients in Malaysia. Other limitations were smaller sample size than the sample size requirement which was 189 respondents after including 20% of non - response rate. Small sample size contributed to non-significant finding as it will resulted not be sufficiently powered to detect a difference between the groups and the study may become falsely negative leading to a type II error. Inability to meet the sample size requirement were because of time limitations, lack of enumerator, and extensive time of interview (~45 minutes per respondent) cause difficulties to obtained more respondents in a day. Thus, future studies are recommended to try difference instruments besides Food Frequency Questionnaire in order to reduce time taken during interview and may recruit enumerators according to the researcher convenience. However, it should be noted that non-significant finding in this study were not solely due to the small sample size only.

Strength of The Study

Aside from that, there were a few strengths in the current study in which data from the respondents were collected using validated questionnaires, specifically the Perceived Stress Scale – 10 (PSS-10) and the Food Frequency Questionnaire (FFQ). The use of the FFQ instrument allowed for a better estimation of the respondents' "usual diet" due to its longer recall period compared to other methods like the 24-hour diet recall. One of the strengths of the current study is the inclusion of a standard medical review of reported breast cancer cases, which involved thorough assessments of anthropometric measurements and biochemical data. Additionally, the study's long duration of follow-up provided valuable insights and enhanced the reliability of the findings.

Recommendations

Increasing fruits and vegetables intake can be accomplished by incorporating some simple yet effective strategies into daily routine. Some to the recommendations such as following the recommended eating habits of '*Suku-suku separuh',* Malaysian healthy plate guideline in which emphasizing the complete and balance nutrient intake in a meal that includes fruits and vegetables in half portion of the plate. Other than that, adhrence towards fibre intake guideline of at least 25-30 g of fibre intake daily may also helps to achieve and increase fruits and vegetables intake by incorporating 3 serving of vegetables and 2 servings of fruits in daily meal. In extend circumstances, physical activity may helps to increase fruits and vegetables intake considering improve appetite and well being in general.

Conclusion

In conclusion, this study found no significant associations between sociodemographic status, anthropometric measurements, biochemical data, medical characteristics, and stress levels with the consumption of fruits and vegetables among breast cancer patients. The inconsistent findings across various studies highlight the importance of conducting further research to better understand the factors influencing fruit and vegetable intake in this population. Such

insights are crucial for developing effective interventions and strategies to promote adequate consumption of fruits and vegetables among breast cancer patients, especially considering that a low number of patients were able to meet the WHO's recommended intake levels. Continued investigation in this area can help improve dietary habits and potentially enhance the overall well-being and health outcomes of breast cancer patients

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