

Association between frequency of processed and ultra-processed food consumption with lifestyle habits score for cancer prevention among adults in Malaysia

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ABSTRACT

Introduction: Cancer is the second leading cause of mortality globally. Processed and ultra-processed foods are reported to be high in energy, sugar, and unhealthy fats, while low in fibre, vitamins and minerals, that can increase the risk of cancer. **Methods:** A cross-sectional study involving adults aged 18-59 years was conducted in Peninsular Malaysia ($n=122$). Sociodemographic data were obtained through a questionnaire and lifestyle habits score for cancer prevention was assessed using *MyGenomSihat*[®]. The food frequency questionnaire used had four groups (i.e., unprocessed or minimally processed foods, processed culinary ingredients, processed foods, and ultra-processed foods) containing 53 food items to evaluate the frequency of food consumption. All data obtained were self-reported by the participants. **Results:** Mean age was 27.6 ± 8.1 years with a majority (76.2%) having household income of less than <RM4,850. The results from *MyGenomSihat*[®] demonstrated that majority (53.3%) of subjects had average scores between 41-85, which is considered to be satisfactory lifestyle habits. Most Malaysian adults ate ultra-processed foods (32.9%) compared to processed foods (4.9%). However, there were no significant correlations between consumption of both processed and ultra-processed food groups and lifestyle habits score for cancer prevention ($r=-0.072$, $p=0.089$ and $r=-0.008$, $p=0.992$, respectively). **Conclusion:** Most subjects had satisfactory lifestyle habits scores for cancer prevention. Interventions are needed to improve lifestyle habits among the targeted population for cancer prevention.

Keywords: adult, cancer, *MyGenomSihat*[®], NOVA, ultra-processed food

INTRODUCTION

Cancer is the second leading cause of mortality globally (WHO, 2020). By 2040, the incidence of cancer is expected to exceed 27 million cases, which is 50% more than that estimated in 2018 (18.1 million cases) worldwide (WHO, 2020). This rising figure is a growing health concern, and researchers, particularly public health researchers, must pay

more attention. Meanwhile, according to statistics from the Malaysia National Cancer Registry Report (2012 – 2016) (National Cancer Institute of Malaysia, 2019), the number of cancers reported increased by 11,731 cases in 5 years from 2012 to 2016 as compared to the number of cases reported from 2007 to 2011 (Azizah *et al.*, 2019). Among the ten common cancers reported, colorectal

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cancer was said to be the second leading cancer in Malaysia after breast cancer, followed by lung cancer, lymphoma, nasopharynx, leukaemia, prostate cancer, liver cancer, cervix cancer, and ovary cancer (Azizah *et al.*, 2019).

The adoption of a healthy lifestyle is known to be associated with a lower incidence of cancer and mortality (Moore *et al.*, 2016). Numerous studies have provided evidence of an association between lifestyle factors and cancer risk. Based on a past research by Roos, Lahti & Rahkonen (2018), there are joint associations between cancer risk and four lifestyle practices – diet, smoking, alcohol consumption, and physical activity; cancer risk is higher when smoking co-occurs with an unhealthy diet or inactive lifestyle. Meanwhile, a study in Malaysia found that most adults have unfavourable lifestyle-related risk factors for cancer, such as being obese, physically inactive, consuming less than five servings of fruits and vegetables per day, and consuming red meat at least once a day or more (Schliemann *et al.*, 2020). Thus, the World Cancer Research Fund (WCRF/AICR) 2018 recommends maintaining a healthy weight and increasing physical activity, especially for those who smoke and drink alcohol. WCRF 2018 also highlighted that a diet high in whole grains, vegetables, fruits, and legumes, but low in fast foods, processed foods, red meat, and alcoholic beverages, is the best dietary strategy for preventing and managing cancer.

Apart from that, many studies have been conducted to examine the relationship between nutritional factors and lifestyle practices for cancer prevention. Consistent results have been obtained, whereby the intake of processed and ultra-processed foods have been shown to increase the risk of getting cancer (Fiolet *et al.*, 2018; Monteiro *et al.*, 2018; Steck & Murphy, 2020). Processed food is a simple product

with added sugar, oil, salt, or other ingredients. In contrast, ultra-processed food is a food product manufactured through industrial formulations using five or more components (Monteiro *et al.*, 2019). Thus, to evaluate the impact of ultra-processed food products on many levels, the NOVA system was developed to classify ultra-processed foods according to the purpose and extent of physical, biological, and chemical methods used during the food manufacturing process (Monteiro *et al.*, 2019).

According to a study conducted by Fiolet *et al.* (2018) in France, an increase in processed food intake was directly proportional to the overall risk of cancer and breast cancer for postmenopausal women. The study found a 12% increased risk for all types of cancer and 11% for breast cancer. This applied to 10% of the individual's total diet belonging to processed or ultra-processed food groups, which might be due to dietary changes in people living in urban areas. Diets that include more processed food products tend to be richer in energy, sodium, fat, and sugar, but poor in fibre and various micronutrients (Luiten *et al.*, 2016); thus are associated with increased body mass index (BMI), waist circumference, and the odds of being obese (Rauber *et al.*, 2020). Fazzino *et al.* (2021) also found a more significant weight gain in non-obese individuals after they increased their consumption of ultra-processed foods in a buffet meal for the past twelve months. There is an association between higher consumption of ultra-processed foods and overweight/obesity, a known risk factor for endometrial cancer (Da Silva *et al.*, 2021). Furthermore, most ultra-processed foods, such as dehydrated soups, processed meats, biscuits, and sauces, also have a high salt content. Foods preserved with salt are associated with an increased risk of gastric cancer (Mendonca *et al.*, 2016).

The growth of the food and beverages industry in Asian countries, such as Malaysia, Thailand, the Philippines, and India, have contributed to increased access to processed and ultra-processed foods in these countries (Baker & Friel 2016). According to Habib *et al.* (2011), the Malaysian population is seen to slowly adapt to a Westernised diet, characterised by its high calories, highly processed and refined foods with high sugar, fat, and salt content, but low in fruits and vegetables. This is an unhealthy transition as a Westernised diet contributes to obesity-related diseases and co-morbidities such as cardiovascular diseases and cancer (Rakhra *et al.*, 2020). Hence, this study aimed to determine the association between the frequency of processed and ultra-processed food consumption and lifestyle habits score using *MyGenomSihat*[®] for cancer prevention among adults in Malaysia.

MATERIALS & METHODS

Study design and sampling

This cross-sectional study was conducted from July 2020 to March 2021 in Peninsular Malaysia, mainly in the states of Perak, Selangor, and Kuala Lumpur Federal Territory. A convenience sampling technique was used to select samples from the community in these locations, representing the urban and suburban areas. The inclusion criteria were individuals aged 18-59 years old who had Internet access and no history of being diagnosed with any cancer. Subjects with chronic health problems, such as diabetes, high blood pressure, hyperlipidemia, cancer, or kidney disease, were excluded from this study. Questionnaires were given via an online platform to eligible subjects. Sample size was calculated using the Cochran formula (1963) with an expected proportion of 0.404 (Ali *et al.*, 2019) and

a precision of 0.1. The estimated sample size was 116 subjects. This study was reviewed and approved by the Universiti Kebangsaan Malaysia Medical Research Ethics Committee (JEP-2020-534). The subjects were recruited for the study after obtaining written informed consent.

Study instrument

Data were obtained via a self-administered online questionnaire. Sociodemographic data included name, age, residence, phone number, email address, gender, marital status, ethnicity, education level, occupation, and monthly household income. Monthly household income was classified based on the country's income threshold of the Bottom 40% (B40), Middle 40% (M40), and Top 20% (T20) (DOSM 2020). Self-reported weight (kg) and height (m) were used in the study and are considered reasonably accurate (Qin *et al.*, 2018). The classification of BMI was based on WHO (1998) cut-offs of <18.5kg/m² (underweight), 18.5-24.9kg/m² (normal), 25.0-29.9kg/m² (overweight), and ≥30.0kg/m² (obesity).

The score for lifestyle habits was collected using a questionnaire named *MyGenomSihat*[®], which has been validated for use in Malaysia. It was initially adapted from the assessment of lifestyle habits for cancer prevention that had been widely used worldwide to provide health information and encourage the public to change towards healthy lifestyle habits (Nur Shafiqah, 2019). This questionnaire consisted of 9 domains: fruits and vegetables intake, unhealthy food intake, physical activity, cervical cancer examination, breast/testicular self-examination, hepatitis B virus (HBV) and human papillomavirus (HPV) vaccination, BMI, and tobacco intake. The total score was 125; categorised into three groups – good lifestyle habits (0-40), satisfactory lifestyle habits (41-85), and bad lifestyle habits (86-125).

Food frequency questionnaire (FFQ)

Fifty-three food items included in the questionnaire were based on the comparison between the NOVA food classification system by Monterio *et al.* (2016) and past studies in Malaysia (Ali *et al.* 2019; Kasim *et al.* 2018; Shyam *et al.* 2020). The NOVA classifies foods into four distinct groups - Group 1 (unprocessed food) is natural or minimally processed food where the inedible parts are removed and there are no added substances; Group 2 (processed culinary ingredients) is foods that are preserved by additives and usually have to undergo processes like pressing and refining; Group 3 (processed food) includes various preservation and cooking by adding processed culinary ingredients to increase its durability; and Group 4 (ultra-processed food) usually contains more than five added substances and is formulated industrially, which is hyper-palatable and ready to eat/drink/heat.

Twelve selected subjects were asked to pre-test the questionnaire. For each item, respondents needed to tick boxes on how many times they consumed the food per serving in a day, week, or month, and the frequency was presented in row percentages. This pre-test process aimed to test the suitability of food items added and the understanding and acceptance of study subjects towards the FFQ. We also explained aspects to look out for during the pre-test. For example, during the pre-test session, a subject expressed that he did not understand the difference between alcoholic beverages under Groups 3 and 4. So, the researchers took those comments into account and noted three examples of alcoholic beverages for each group in the FFQ so that subjects can choose and distinguish them more easily. Researchers also provided knowledge and information on why alcoholic beverages in Group 3 differed from

Group 4. There were study subjects who provided recommendations to include foods like *bihun*, *kuey teow*, *laksa*, and *yee mee*, along with yellow noodles, as most Malaysians often consume these foods. Similarly, other food items, such as chocolate drinks, biscuits, as well as health and beauty supplements also created some confusion among the study subjects. As a solution, examples of food brands often found in Malaysia were mentioned to facilitate the process of answering this questionnaire.

Statistical analysis

All statistical analysis was conducted using IBM SPSS Statistics for Windows version 25.0 (IBM Corp, Armonk, New York, USA). The variable of food groups was categorised using the NOVA food classification system by Monterio *et al.* (2016). The total score for lifestyle habits was categorised into three groups, followed by univariate analysis. Normality of the data was assessed by referring to the Kolmogorov-Smirnov test. Descriptive tests were used to analyse all variables such as sociodemographic data, lifestyle habits scores for cancer prevention (*MyGenomSihat*TM), and food intake frequency. Chi-square test was used to compare the frequency between lifestyle habits scores for cancer prevention. Besides, Spearman's rho correlation test was also conducted to determine the correlation between lifestyle habits score and food intake frequency.

RESULTS**Sociodemographic background**

Table 1 presents the sociodemographic data of the subjects. A total of 122 adults aged 18-59 years from various states in Malaysia were included in this study. Participants' average age was 27.6±8.1 years with 25.4% ($n=31$) males

and 74.6% (n=91) females. The majority of the subjects were single (68.9%), Malays (79.5%), had a Bachelor's degree (60.7%), and a household income of not more than RM4,850, belonging to the B40 household income group. One-third of the subjects lived in Perak (36.9%), Selangor and Kuala Lumpur (32%), and other cities (31.1%), respectively.

Evaluation of lifestyle habits score for cancer prevention (MyGenomSihat®)

Table 2 shows the lifestyle habits score levels for cancer prevention using MyGenomSihat®. It was shown that more than half of the subjects (53.3%, n=65) were at a satisfactory level of risk (moderate), followed by low level of risk (45.9%) and high level of risk (0.8%).

Table 1. Participants' sociodemographic characteristics

Characteristic	n	%	Mean±SD
Age (year)			27.6±8.1
Gender			
Men	31	25.4	
Women	91	74.6	
Status			
Single	84	68.9	
Married	38	31.1	
Ethnicity			
Malay	97	79.5	
Chinese	16	13.1	
Indian	6	4.9	
Others	3	2.5	
Religion			
Islam	100	82.0	
Buddha	14	11.5	
Hindu	5	4.1	
Christian	3	2.5	
State			
Perak	45	36.9	
Selangor	29	23.8	
Wilayah Persekutuan	10	8.2	
Others	38	31.1	
Education level			
Secondary level	21	17.2	
Diploma	10	8.2	
Degree	74	60.7	
Doctor of Philosophy	9	7.4	
Others	8	6.6	
Occupation			
Government employment	13	10.7	
Private	24	19.7	
Businessman	7	5.7	
Student	65	53.3	
Does not work	13	10.7	
Household income [†]			
B40 (<RM 4,850)	93	76.2	
M40 (RM 4,850 – RM 10,959)	26	21.3	
T20 (>RM 10,959)	3	2.5	

[†]Bottom 40% (B40), middle 40% (M40), and top 20% (T20) based on DOSM (2020)

Table 2. Evaluation of lifestyle habits score for cancer prevention (*MyGenomSihat*TM)

<i>Lifestyle habits score for cancer prevention (MyGenomSihatTM)</i>	<i>Mean score</i>	<i>% (n)</i>
Low (0 - 40)	29.6	45.9 (56)
Medium (41 - 85)	46.8	53.3 (65)
High (86 - 125)	92.0	0.8 (1)

Frequency of intake of food items from Group 3 (processed foods) and Group 4 (ultra-processed foods)

Table 3 shows the frequency of food intake from Group 3 (processed foods) and Group 4 (ultra-processed foods) among Malaysian adults. Food items from Groups 3 and 4 were analysed as evidence suggested that these groups may increase cancer risk via their carcinogenic compounds or obesogenic properties (Fiolet *et al.*, 2018; Kliemann *et al.*, 2022). For Group 3 items, 68% of respondents rarely/never consumed salted, dried, cured, or smoked meat/fish/poultry, followed by salted or sugared nuts and seeds (62.3%), canned fruits and vegetables (58.2%), cheese (45.1%), canned food (43.4%), and lastly unpackaged fresh bread (39.3%). Meanwhile, the most frequently consumed food item from Group 3 was unpackaged fresh bread, with 24 subjects (19.7%) consuming it 2-3 times a week and seven subjects (5.7%) consuming it 4-6 times a week. This was followed by other items such as cheese, canned food, salted or sugared nuts and seeds, canned fruits and vegetables, and smoked meat. Most respondents never consumed or only consumed processed foods 1-4 times a month.

For Group 4 (ultra-processed food) items, it was shown that majority (83.6%) of respondents rarely or never consumed health and slimming products. Other things that were rarely or never consumed by most of the respondents included candies (50.8%), margarine and other spreads (40.2%), energy bars or drinks (77%), flavoured milk drinks

(40.2%), fruit drinks (41.0%), pasta (50.0%), pizza (45.1%), sausages or hotdogs (45.1%), and breakfast cereals (41.8%). This study also showed a high consumption frequency of cocoa drinks and packaged bread and buns among Malaysian adults, whereby 31.1% and 42.6% consumed them 2-3 times weekly, respectively.

Association between lifestyle habits score for cancer prevention and frequency of processed and ultra-processed food intake

The determination of the association between food groups and lifestyle habits score for cancer prevention is shown in Table 4. Based on the findings, there were no significant correlations ($p < 0.050$) obtained from the Spearman's rho correlation test for lifestyle habits score with both food groups (processed and ultra-processed foods).

DISCUSSION

Our study was the first to explore the association between the frequency of processed and ultra-processed food consumption and lifestyle habits score for cancer prevention among Malaysian adults. This study found that Malaysian adults had medium/satisfactory lifestyle practice scores and a significant difference between lifestyle habits for cervical cancer screening, breast self-examination, and HPV vaccination. This might be due to the study subjects being predominantly females. Although there was a high prevalence of breast self-examination among Malaysian women,

Table 3. Frequency of intake of food items from Group 3 and Group 4

Items	Frequency of intake, n (%)				
	> 1 time a day	4-6 times a week	2-3 times a week	1-4 times a month	Rarely/ Never
Group 3 (Processed food items)					
Canned fruits and vegetables	1 (0.8)	2 (1.6)	9 (7.4)	29 (32.0)	71 (58.2)
Salted or sugared nuts and seeds	1 (0.8)	3 (2.5)	13 (10.7)	29 (23.8)	76 (62.3)
Salted, dried, cured, or smoked meat / fish / poultry	2 (1.6)	3 (2.5)	5 (4.1)	29 (23.8)	83 (68.0)
Canned food (sardine, tuna and others)	1 (0.8)	1 (0.8)	6 (4.9)	61 (50.0)	53 (43.4)
Cheese	1 (0.8)	1 (0.8)	10 (8.2)	55 (45.1)	55 (45.1)
Unpackaged fresh breads	2 (1.6)	7 (5.7)	24 (19.7)	41 (33.6)	48 (39.3)
Group 4 (Ultra-processed food items)					
Sweet or savoury packaged snacks	0 (0.0)	3 (2.5)	22 (18.0)	55 (45.1)	42 (34.4)
Ice-cream	0 (0.0)	3 (2.5)	21 (17.2)	66 (54.1)	32 (26.2)
Chocolate	0 (0.0)	2 (1.6)	15 (12.3)	65 (53.3)	40 (32.8)
Candies	1 (0.8)	3 (2.5)	15 (12.3)	41 (33.6)	62 (50.8)
Carbonated soft drinks	0 (0.0)	1 (0.8)	11 (9.0)	56 (45.9)	54 (44.3)
Packaged breads and buns	4 (3.3)	11 (9.0)	52 (42.6)	38 (31.1)	17 (13.9)
Margarines and other spreads	4 (3.3)	5 (4.1)	21 (17.2)	43 (35.2)	49 (40.2)
Cookies (biscuits)	2 (1.6)	11 (9.0)	41 (33.6)	44 (36.1)	24 (19.7)
Pastries or cakes	1 (0.8)	0 (0.0)	12 (9.8)	68 (55.7)	41 (33.6)
Energy bars or drinks	1 (0.8)	3 (2.5)	5 (4.1)	19 (15.6)	94 (77.0)
Flavoured milk drinks	2 (1.6)	2 (1.6)	22 (18.0)	47 (38.5)	49 (40.2)
Cocoa drinks	5 (4.1)	9 (7.4)	38 (31.1)	37 (30.3)	33 (27.0)
Fruit drinks	4 (3.3)	3 (2.5)	18 (14.8)	47 (38.5)	50 (41.0)
Fries	1 (0.8)	2 (1.6)	18 (14.8)	72 (59.0)	29 (23.8)
Yellow noodles/ <i>laksa</i> / <i>kuey teow</i> / <i>yee mee</i>	1 (0.8)	3 (2.5)	48 (39.3)	55 (45.1)	15 (12.3)
Pasta	1 (0.8)	1 (0.8)	7 (5.7)	52 (42.6)	61 (50.0)
Fish ball and fish cakes	1 (0.8)	3 (2.5)	29 (23.8)	60 (49.2)	29 (23.8)
Instant noodles	1 (0.8)	7 (5.7)	23 (18.9)	60 (49.2)	31 (25.4)
Desserts	1 (0.8)	3 (2.5)	23 (18.9)	48 (39.3)	47 (38.5)
Pizza	1 (0.8)	1 (0.8)	5 (4.1)	53 (44.3)	55 (45.1)
Sausages/hotdogs	1 (0.8)		12 (9.8)	45 (44.3)	55 (45.1)
Burgers	1 (0.8)	1 (0.8)	12 (9.8)	71 (58.2)	37 (30.3)
Poultry/meat nuggets	1 (0.8)	2 (1.6)	15 (12.3)	73 (59.8)	31 (25.4)
Vegetable/meat/poultry stocks or cube	5 (4.1)	4 (3.3)	18 (14.8)	54 (44.3)	41 (33.6)
Breakfast cereals	1 (0.8)	2 (1.6)	20 (16.4)	48 (39.3)	51 (41.8)
Health and slimming products	8 (6.6)	1 (0.8)	7 (5.7)	4 (3.3)	102 (83.6)

Table 4. Determination of the association between food groups and lifestyle habits score for cancer prevention

Food group	Lifestyle habits score for cancer prevention	
	Correlation coefficient, r_s	p -value [†]
Group 3 (processed food)	-0.072	0.892
Group 4 (ultra-processed food)	-0.089	0.992

[†]No significant value ($p < 0.050$) with Spearman's Rho correlation test

Both variables were treated as ordinal data to qualify for Spearman's test. The frequency of food intake levels were in ordinal form (never/rarely, occasionally, often, frequently, always) in replacement of rarely/never, 1-4 times a month, 2-3 times a week, 4-6 times a week, and >1 time a day, respectively. For lifestyle levels, the ordinal form were good, medium/satisfactory, and bad lifestyle habits

there is still a need to encourage breast self-examination among women because breast cancer is one of the most common cancer sites (34.1%) suffered by women (Malaysia National Cancer Registration Report 2012-2016). Furthermore, a previous study has shown the opposite result where most female subjects did not practise breast self-examination despite most of them having heard about it (Paruchuri *et al.*, 2021).

Regarding HPV vaccination, a study from Lei *et al.* (2020) showed that the cumulative incidence of cervical cancer was higher (94 cases per 100,000 persons) among those who had not been vaccinated as compared to those who had been vaccinated (47 cases per 100,000 persons). Besides, HBV is the first example of a cancer-preventive vaccine in humans that can prevent hepatocellular carcinoma (HCC) from childhood to early adulthood. However, our findings were like the previous study, whereby the uptake of HBV vaccination was low (Omotowo *et al.*, 2018).

Our findings were consistent with a previous study conducted in Kuala Nerus, Terengganu (Ali *et al.*, 2019), where ultra-processed foods (Group 4) had the second highest food intake frequency among Malaysian adults. Malaysians are prone to eating unhealthy diets containing high calories, fat, sugar, and salt. Besides, this study found that the five most consumed ultra-processed

foods were packaged bread and buns, biscuits, cocoa drinks, instant noodles, and yellow noodles, *laksa*, *kuey teow* or *yee mee*. Our results were in line with previous studies for noodles, cream crackers, and white bread as the most consumed food items (Ali *et al.*, 2019). In addition, our findings also supported the results from the Malaysian Adult Nutrition Survey (2014) (IPH, 2014), which reported that chocolate or malt drinks were one of the most frequently consumed food items among Malaysian adults (Kasim *et al.*, 2018). Meanwhile, this study demonstrated that breakfast cereals were a less popular item, which is inconsistent with previous studies showing that breakfast cereals were the most frequently consumed food item among adults and university students in Malaysia (Shyam *et al.*, 2020).

We found no significant correlations ($p < 0.050$) between lifestyle habits score for cancer prevention and both food groups (processed and ultra-processed foods). This finding was inconsistent with a previous study by Fiolet *et al.* (2018), in which ultra-processed food intake was associated with higher overall cancer risk. For every 10% increment in the proportion of ultra-processed foods in the diet, there was a 12% higher risk for prevalent cancer and an 11% increased risk for breast cancer (Fiolet *et al.*, 2018). Another study also reported that higher consumption of

ultra-processed foods was strongly associated with an increased risk of all-cause mortality, including cancer (Rico-Campà *et al.*, 2019). This study is essential in collecting information on which food groups, according to the NOVA classification system, are most often consumed in Malaysia and encourages the implementation of this system in observing the frequency of food intake, focusing on processed and ultra-processed foods.

However, this study has its limitations. The cross-sectional design was only carried out at one point in time and thus, is unsuitable for studying temporal relationships. Besides, the food frequency questionnaire did not allow the explanation of energy intake or grams of food weight or nutritional status of individuals. This study may not be generalised to all Malaysians due to the small sample size and limited coverage areas in Malaysia. Most studies on the consumption of ultra-processed foods are mainly concerned with the product's calories, macronutrients, micronutrients, fibre, and added salt and sugar contents (Ali *et al.*, 2019; WCRF/AICR, 2018). Therefore, more research is needed in the future to identify the association between processed and ultra-processed food intake with lifestyle habits score for cancer prevention.

CONCLUSION

In conclusion, most subjects had a satisfactory level lifestyle habits score for cancer prevention (*MyGenomSihat*®). Fruits and vegetables intake, breast (women)/testicular (men) self-examination, HBV and HPV vaccination, and tobacco intake were found to have significant differences on lifestyle habits score for cancer prevention (*MyGenomSihat*®). Most Malaysian adults regularly consumed ultra-processed foods (Group 4), followed by

processed foods (Group 3). Although ultra-processed food was categorised as the most frequent food consumed by subjects compared to processed food, this study showed no correlations between lifestyle habits scores for cancer prevention in both food groups (processed and ultra-processed). Further studies are needed to confirm these results in larger populations and to clarify whether high consumption of ultra-processed foods will affect health.

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Authors' contributions

Sharif R, led the conception and initial design of the study, conducted the analysis and interpretation of data, drafted the manuscript, and revised content based on feedback; Ramli NR and Mohammad NMA, assisted with data collection, data analysis, writing and revising of the manuscript; and all authors: read and approved the final manuscript.

Conflict of interest

None declared.

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