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CONSUMPTION OF SUGAR ADDED DRINKS AMONG STUDENTS IN MALAYSIA

[1]Hui Lee Tong, [1]Yong Kang Cheah

[1]School of Economics, Finance and Banking, College of Business, Universiti Utara Malaysia, Kedah, Malaysia.

[1]Corresponding author: yong@uum.edu.my

ABSTRACT

Sugar added drinks are harmful to health. People are likely to suffer from chronic diseases if they consume sugar added drinks regularly. The objective of this study is to investigate the relationships between consumption of sugar added drinks and demographic, lifestyle and parental factors among university students in Malaysia. To the best of our knowledge, there is still a lack of in-depth studies that focus on this topic in Malaysia. Primary data used in this study were obtained from a cross-sectional survey. A total of 400 students from the Universiti Utara Malaysia were surveyed. A negative binomial regression model was applied to generate important findings. Findings from this study showed that students' monthly consumption of sugar added drinks had significant associations with numerous demographic, lifestyle and parental factors. In particular, students were more likely to consume sugar added drinks if they were younger, were Malays, had less-educated parents, used e-cigarettes and were less physically active. In conclusion, age, ethnicity, use of e-cigarettes, physical activity and parental education levels play an important role in determining added sugar intake in the student population. These findings can assist policymakers in formulating a more effective measure directed towards reducing sugar added drink intake among university students.

Keywords: Consumption, demographic factors, parents, sugar added drinks, students.

INTRODUCTION

Continued increase in the prevalence of diabetes due to excessive consumption of sugar added drinks is a popular public health issue across the globe. According to the findings from a national survey, about 3.6 million adults were diagnosed with diabetes in 2019 (Akhtar et al., 2022). The International Diabetes Federation estimated that the prevalence of diabetes will reach 643 million by 2030 (Bernama, 2022). Nowadays, diabetes is no longer seen as a disease in the elderly as many people suffer from diabetes at a young age. A study shows that students who are stressed tend to alter their eating habits by including foods and beverages with high calories and taste in their diet (Cheng & Wong, 2021). As a result, excessive consumption of sugar added drinks among students has been growing steadily.

The spike in consumption of sweetened beverages is worrying. According to the World Health Organization, an adult should not consume more than 10 teaspoons of sugar per day (World Health Organization, 2020). However, the Malaysian Adult Nutrition Survey 2019/2020 found that on average, a Malaysian adult consumed about 11–19 teaspoons of sugar per day (Lee et al., 2020). This may be one of the factors contributing to the large numbers of diabetic patients in Malaysia. As evidenced in the National Health and Morbidity Survey 2019, one in every five adults in Malaysia had diabetes (Lai, 2022). Each year, at least 5% of young adults are diagnosed with diabetes (Raphael, 2022).

The worrying facts of sugar intake motivate the present study to investigate factors affecting sugar consumption within a sample of university students in Malaysia. Obtaining an in-depth understanding of students' consumption of sugar added can help policymakers formulate a more effective intervention measure. Gender, age, household income, ethnicity, and education are common factors that affect consumption of sugar added drinks (Cheah et al., 2018; Cheah et al., 2023b). For example, Paraje (2016) found that income was positively associated with consumption of sugar added drinks with students of higher income groups being more likely to consume sugar added drinks than those with lower incomes.

Due to the scarcity of data and in-depth studies related to sugar consumption among Malaysian university students, gaining knowledge of factors determining the decisions of university students to consume sugar added drinks remains challenging. The present study attempts to contribute to the existing literature by paying attention to sugar added drink intake within a sample of students in the Universiti Utara Malaysia (UUM), that is, a large public university in Malaysia with students of various demographic characteristics. In the present study, we attempt to answer two research questions: (i) What are the relationships between students' consumption of sugar added drinks and their demographic factors? and (ii) How do lifestyle and parental factors affect consumption of sugar added drinks among students?

Theoritical Bases

The theoretical underpinning for the present study is the Grossman's demand for health model (Grossman, 1972). The theory focuses on discussing the demand for health and health investment, as well as their correlates. It can be applied to explore various consumer health behaviours, including consumption of sugar added drinks, and unhealthy lifestyles. Based on Grossman's argument, we expect that younger students tend to consume more sugar added drinks compared to older students because older students are more concerned about their health. Grossman also claims that there is a significant association between education and health behaviours as education improves health awareness. With this assertion, we hypothesise that better educated students are less likely to consume sugar added drinks than the less educated ones.

Another theory that can be applied in the present study is the consumer theory, which emphasises budget constraint and utility maximisation. A person's budget constraint imposes restrictions on their consumption, yet utility maximisation is the objective that consumers want to achieve (Besanko et al., 2014). Therefore, an increase in income will result in a rise in the quantity of products purchased. The utility maximisation and budget constraint equations can be expressed as follows:

Objective: max U(x, y)
Subject to: $P_x x + P_y y \leq$ I…… (1)

where I is income, P_x is price of good x, P_y is price of good y, x is quantity of good x consumed and y is the quantity of good y consumed. Consumers maximise their utility based on the following equation:

$$\frac{MU_x}{MU_y} = \frac{P_x}{P_y} \ldots (2)$$

where MU_x is marginal utility of good x and MU_y is marginal utility of good y. According to Equation 2, when the indifference curve, that is, the curve that shows the set of products that gives consumers the same satisfaction, is tangent to the budget line, the consumers' utility is maximised.

The consumer theory is used in the present study as it is suitable for explaining the relationship between income and consumption of sugar added drinks. Assuming sugar added drinks are normal goods, increases in students' income will elevate the demand for sugar added drinks. This is simply because the students' budget line will shift to the right, leading to higher consumption of sugar added drinks. Therefore, the present study anticipates that higher income students consume more sugar added drinks compared to lower income students.

Insights From The Literature

There were studies showing that age affected consumption of sugar added drinks (Cheah et al., 2023a; Cheng and Lau, 2022; Al-Hanawi et al., 2022; Otaibi, 2017). For example, Cheng and Lau (2022) found significant age differences in added sugar intake, with older students consuming less sugar-sweetened beverages than younger students. Al-Hanawi et al. (2022) found older individuals to have lower odds of drinking sugar-sweetened beverages in a week compared to younger ones. Taste preferences, dietary habits, lifestyles, and health awareness were cited as the contributing factors (Winpenny et al., 2017). These findings were also shared by Otaibi (2017), who observed that older students were less likely than younger students to consume sugar-sweetened beverages because they had better knowledge about nutrition. In contrast, Hwang et al. (2020) found that older individuals were more probable to consume sugary beverages than younger individuals.

The relationship between gender and added sugar intake was evidenced by Gao et al. (2007). Specifically, males consumed more sugary drinks compared with females. Since physical activities or sports were more popular among males than females, males tended to consume more energy drinks and sports drinks, which consisted of an enormous amount of sugar (Bipasha et al., 2017). In the study by Bipasha et al. (2017), 85.4% of male students reported consuming sugary beverages on a regular basis compared to 14.5% of female students. A reason was that in general, females were more health conscious and aware of the negative effects of consuming added sugar than males. Using survey data collected in Saudi Arabia, Al-Hanawi et al. (2022) likewise found that males were more likely to consume sugar-sweetened beverages than females. Similar findings were also observed by Fontes et al. (2020), who made use of a large dataset in Brazil.

The association between ethnicity and consumption of sugar added drinks was noteworthy. An empirical study showed that Chinese students consumed less sugar added drinks than Malays and those of other ethnic groups because of sociocultural differences in dietary lifestyles (Abdullah et al., 2016; Cheah et al., 2023a). Iqbal et al. (2020) conducted a study related to the dietary habits among different ethnic groups of individuals with metabolic syndrome. They observed that the frequency of metabolic syndrome was influenced by ethnicity, with Chinese being less likely to suffer from metabolic syndrome compared with Malays and Indians. This was due to the fact Chinese had better health awareness and were more likely to engage in healthy lifestyles, such as being physically active and adopting a healthy diet than other ethnicities (Iqbal et al., 2020).

Findings of the study by Zuraida et al. (2016) indicated a strong correlation between spending behaviour and personal income. Their explanation was that students who earned higher incomes spent more on goods than students who received lower income. Similar findings were evidenced by Qazzafi (2020). In the studies by Guo et al. (2021) and Al-Hanawi et al. (2022), income was found to be positively associated with added sugar intake. Specifically, higher income people exhibited higher odds of consuming sugar-sweetened beverages compared to lower income people. On the other hand, there was a study showing a negative relationship between personal income and consumption of sugar added drinks (Zagorsky & Smith, 2020). Respondents who reported never drinking sugar added drinks had the highest income and net worth, while the ones with frequent consumption of sugar added drinks had the lowest income.

Parental education was one of the factors that influenced sugar added drink consumption. As pointed out by Totland et al. (2013), consumption of sugar added drinks was negatively associated with parental education levels. Likewise, the study by Tasevska et al. (2017) showed low parental education levels to increase the consumption of sugar added drinks among students. The explanation was straightforward. Higher educated parents tended to have better access to health information than less educated parents and consequently knew more about the negative consequences of added sugar intake (Jiang et al., 2020). As a result, they were likely to advise their kids to adopt a healthy dietary lifestyle. Based on Chinese data, Guo et al. (2021) suggested otherwise. In particular, the authors found that parental education was not correlated with consumption of sugar-sweetened beverages.

Parental income levels had a significant impact on consumption of sugar added drinks (Tasevska et al., 2017). The study by Chang et al. (2019) showed that students tended to spend more on added sugar if they received more pocket money from their parents. In addition, Liu et al. (2022) found an "inverted U-shape" relationship between consumption of sugary beverages and income levels. In other words, the demand for beverages with added sugar increased as income rose but subsequently reduced. However, Jiang et al. (2017) found that compared to people with high incomes, those having lower and middle incomes were more likely to consume sugar added drinks. This may be because high income was associated with high education, thereby reducing consumption of added sugar.

According to Malik et al. (2011), a positive relationship existed between body mass index (BMI) and consumption of sugar added drinks. The fact of the matter was that obese or overweight people tended to eat more high-calorie foods, including sugar added drinks than the normal weight ones, and consuming excessive amounts of calories further elevated BMI. Similar findings were observed by Aida et al. (2020), who found a strong correlation between BMI and added sugar intake, as well as Fontes et al. (2020), who observed that excess body weight was positively associated with demand for sugar-sweetened beverage.

Stress was associated with consumption of sugar added drinks (Pettit & DeBarr, 2011). In the study by Choi (2020), the 10-item Perceived Stress Scale (PSS-10) was used to quantify perceived stress, and its scores were used as a comparison between high- and low-perceived stress groups. Results showed that the high-stress group consumed fast food, ready-prepared meals, and snacks, such as cakes, sweets, and soft drinks more frequently than the low-stress group. According to Pettit and DeBarr (2011), students' stress level was mainly induced by their academic worries, and they are inclined to consume sugar added drinks with the aim of seeking comfort and boosting moods. Evidence showed that drinking sugary drinks could help improve moods and reduce stress (Knüppel et al., 2017).

Theoretical Framework

Based on the demand for health theory developed by Grossman (1972) as well as the empirical findings from past studies, the theoretical framework developed for the present study can be expressed as:

$$sugar = f(age, income, education, gender, ethnicity, lifestyle)\dots(3)$$

where consumption of sugar added drinks is a function of age, income, education, gender, ethnicity, lifestyle and stress factors.

As we age, our risk of various diseases increases significantly (Grossman, 1972). In other words, older people are more likely to suffer from illnesses when compared to their younger peers due to worsened health condition. Therefore, in general, older people are motivated to make more health investment. With this argument, the present study anticipates that older people are less likely to consume sugar added drinks than younger people.

Having more time to work is a return on health investment (Grossman, 1972). Since higher income earners can make more money per hour of work than their lower income counterparts, they tend to reap higher return on health investment and face greater opportunity of costs of being absent from work. This means that individuals who earn higher incomes are likely to make more efforts to improve their health so that their risk of absenteeism can be minimised. Given that sugar added drinks are harmful to health, higher income individuals are expected to consume less than their lower income peers. However, if sugar added drinks are normal goods, higher income individuals may consume more.

Education improves health through the augmentation of allocative and productive efficiencies (Grossman, 1972). Comprehensive skills and health knowledge, for instance, tend to get better as we receive more education. Education also lowers the rate of time preference, making people to be more rational. This indicates that better educated people are more concerned about their future than less educated people. Therefore, better educated people are expected to invest more in health and be more likely to avoid consumption of sugar added drinks than their less educated counterparts.

Previous studies consistently found gender differences in demand for added sugar (Gao et al., 2007; Bipasha et al., 2017). In particular, men consumed more sugary beverages than women because they had less health awareness. Therefore, the present study hypothesises that demand for sugar added drinks is greater among men than women.

Ethnic variations in added sugar intake were evidenced in previous studies that focused on the Malaysian population with Malays consuming more sugar added beverages than non-Malays (Abdullah et al., 2016; Cheah et al., 2023a). The authors claimed that cultural factors were responsible for these ethnic variations. Hence, the present study expects significant relationship exists between ethnicity and demand for sugar added drinks.

Findings from past studies showed a significant association between stress and consumption of sugar added beverages (Pettit & DeBarr, 2011; Choi, 2020). Specifically, stress caused one to indulge in high sugar eating behaviour. This was simply because people had the tendency to use sugar as a method to release stress and enhance moods. Thereby, the present study anticipates that stress is positively associated with demand for sugar added drinks.

The association between lifestyle and added sugar intake was seldom examined in the past, except BMI. As pointed out by Malik et al. (2011) and Aida et al. (2020), overweight people were more likely to consume sugar added drinks than normal weigh people. Considering this finding, the present study expects that high BMI and unhealthy lifestyle can lead to consumption of sugar added drinks.

METHODOLOGY

Data

Primary survey data were used in the present study to conduct quantitative cross-sectional analysis. Respondents' data and information on lifestyle, demographic and parental profiles were collected directly using piloted structured questionnaires. The questionnaires consisted of both ordinal polytomous and dichotomous close-ended questions. For instance, the dichotomy was applied to questions about gender – male or female. The questionnaires were also formatted based on five-point Likert scales. The respondents were asked to report whether they strongly disagree, disagree, neutral, agree, or strongly agree with the statements asked in the questionnaires.

Self-administered questionnaires (Google Forms) were distributed through online platforms, such as WhatsApp and Facebook. Due to budget and time constraints, the present study used convenient sampling to collect data. Although the collected data may not be representative, they were appropriate to research. The inclusion criteria were undergraduates and post-graduates students in the Universiti Utara Malaysia (UUM). Since UUM consisted of students of various ethnic groups and genders across all the states in Malaysia, the collected sample could be generalised to a wider population. Students from other universities were excluded from the survey. The survey period was between 28 November 2023 and 18 January 2024. A total of 400 respondents were surveyed. While the sample size was not large, it could provide statistical inferences and generate important findings (Kibuacha, 2021).

Selected Variables

The dependent variable of the present study was monthly consumption of sugar added drinks. The respondents were requested to report the servings of sugar added drinks that they consumed in the past 30 days. The independent variables consisted of demographic (age, gender, ethnicity and personal income), lifestyle (BMI, physical activity, alcohol consumption, smoking, e-cigarette use and stress level), as well as parental factors (parental education levels and household income). They were selected based on the findings from previous studies (Bipasha et al., 2017; Cheah et al., 2023a; Cheng and Lau, 2022; Gadah et al., 2013; Iqbal et al., 2020; Jiang et al., 2020; Otaibi, 2017 Tasevska et al., 2017).

Respondents' age was categorised into seven groups: <20, 20, 21, 22, 23, 24 and >24 years. The respondents' ethnic groups consisted of Malay, Chinese, Indian, Bumiputera and other ethnicities. Respondents' monthly income was categorised into five categories: RM ≤100, RM 101–200, RM 201–300, RM 301–400, and RM ≥401. Parental education levels were segmented into *Ujian Pencapaian Sekolah Rendah* (UPSR) (primary school), *Penilaian Menengah Rendah* (PMR) (lower-secondary school), *Sijil Tinggi Pendidikan Malaysia* (SPM) (upper-secondary school), *Sijil Tinggi Pendidikan Malaysia* (STPM) (pre-university), and undergraduate degree/master degree/PhD. Monthly household income was categorised based on the B40 (RM <4851), M40 (RM 4851–10960), and T20 (RM >10960). BMI was categorised as underweight (<18.5), normal weight (18.5–24.9), overweight (25.0–29.9) and obesity (≥30.0).

Physical activity was measured by the days of being physically active for at least 30 minutes per week: 0, 1–2, 3–4 and 5–7 days. In addition to physical activity, several questions pertaining to respondents' lifestyles were asked. The first question was related to alcohol consumption, the second and third questions asked about smoking and e-cigarette use behaviours, respectively. The respondents answered "Yes" or "No" for these questions. Respondents' stress level was measured using 10-item Perceived Stress Scale (PSS-10). Each statement was measured using five items with Likert scales. Each response was given the values of 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) or 5 (strongly agree). These values were summed and categorised into three levels: low (10–20 points), medium (21–30 points) and high (31–50 points). The details of the items are presented in Table 2.

Table 1

Summary Statistics of the Independent Variables (n=400)

Variables	Frequency	Percent
Age (years)		
<20	20	5.0
20	33	8.3
21	36	9.0
22	65	16.3
23	201	50.3
24	31	7.8
>24	14	3.5
Gender		
Female	204	51.0
Male	196	49.0
Ethnicity		
Malay	132	33.0
Chinese	178	44.5
Indian	68	17.0
Others	22	5.5
Monthly personal income (RM)		
≤100	52	13.0
101–200	49	12.3
201–300	77	19.3
301–400	72	18.0
≥401	150	37.5
Father's education level		
UPSR	64	16.0
PMR	62	15.5
SPM	165	41.3
STPM	55	13.8
Undergraduate Degree/Master/PhD	54	13.5

Mother's education level		
UPSR	55	13.8
PMR	72	18.0
SPM	152	38.0
STPM	58	14.5
Undergraduate Degree/Master/PhD	63	15.8
Monthly household income		
B40	244	61.0
M40	138	34.5
T20	18	4.5
Body mass index (BMI)		
Underweight	55	13.8
Normal weight	244	61.0
Overweight	71	17.8
Obesity	30	7.5
Alcohol consumption		
Yes	94	23.5
No	306	76.5
Smoking		
Yes	27	6.8
No	373	93.3
Use of e-cigarettes		
Yes	40	10
No	360	90
Physical activity (days)		
0	83	20.8
1–2	143	14.3
3–4	136	23.0
5–7	38	5.3
Stress level		
Low	109	27.3
Medium	112	28.0
High	179	44.8

Source: Author's own survey

Table 2

The Influences of Stress on Consumption of Sugar Added Drinks (n=400)

Statements	Mean	Std. dev.	Min	Max
Students consumed sugar added drinks when they felt anxious about something that happened unexpectedly	2.82	1.264	1	5
Students consumed sugar added drinks when they felt unable to control the important things in their life	3.07	1.275	1	5
Students consumed sugar added drinks when they felt nervous and stressed	2.81	1.243	1	5
Students consumed sugar added drinks when they found that they could not cope with all the things that they had to do	2.72	1.280	1	5
Students consumed sugar added drinks when they angered because of things that were outside of their control	2.86	1.280	1	5
Students consumed sugar added drinks when they felt difficulties were piling up so high that they could not overcome	2.86	1.280	1	5
Students consumed sugar added drinks when they felt unconfident about their ability to handle their personal problems	2.85	1.281	1	5
Students consumed sugar added drinks when they felt that things were not going their way	2.83	1.257	1	5
Students consumed sugar added drinks when they were unable to control irritations in their life	2.77	1.269	1	5
Students consumed sugar added drinks when they felt that they were not on top of things	2.75	1.250	1	5
Cronbach's Alpha	0.959			

Source: Author's own survey

Statistical Analysis

Summary statistics of variables were provided. For categorical variables, frequencies and percentages were estimated, while means and standard deviations were calculated for continuous variables. In terms of multivariate analysis, negative binomial regression was used to analyse factors affecting sugar added drink consumption. Estimated coefficients, robust standard errors (RSE), incidence rate ratios (IRRs) and 95% confidence intervals (CIs) were presented. There were two main reasons explaining why negative binomial regression was more suitable than linear regression. Firstly, the nature of the dependent variable. Count models are explicitly designed to handle dependent variables that represent counts of events or occurrences, such as the servings of sugar added drinks, which take on non-negative integer values. Secondly, negative binomial regression ensures that the predicted values are always positive, aligning with the nature of count outcomes. In the present study, multicollinearity was diagnosed using variance inflation factors (VIFs). A VIF of greater than 10 suggests a high correlation between variables. The significance level of $p < 0.05$ was selected. Stata statistical software was used to perform all the statistical analyses (StataCorp, 2019).

Characteristics of Survey Respondents

Descriptive statistics for all the independent variables are presented in Table 1. Most of the respondents were 23 years old (50.5%). The majority of the respondents were females (51%). About 44.5% of the respondents were Chinese, followed by Malays (33%), Indians (17%) and other ethnicities (5.5%). Slightly more than one-third of the respondents had monthly incomes of RM 401 and above (37.5%). Approximately 41.3% and 38% of the respondents' fathers and mothers had obtained SPM, respectively. More than half of the respondents were in the B40 income group (61%). A large proportion of the respondents had normal body weight (61%). Only the minorities consumed alcohol (23.5%), smoked (6.8%), and used e-cigarettes (10%). About 20.8% of the respondents did not participate in physical activity, whilst 35.8% spent one to two days per week in physical activity.

Table 2 shows the influences of stress on consumption of sugar added drinks. The highest mean among the stress-related statement was 3.07, that is, consuming sugar added drinks when feeling unable to control the important things in life. However, the statement that students consumed sugar added drinks when they found that they could not cope with all the things that they had to do possessed the lowest mean (2.72). Other statements had the mean values of between 2.75 and 2.86. The Cronbach's alpha value of the statements was 0.959, indicating a high degree of reliability.

RESULTS & DISCUSSIONS

Table 3 shows the factors associated with student's monthly consumption of sugar added drinks. Multicollinearity was not an issue because all the VIFs were less than 10. There was a significant relationship between age and consumption of sugar added drinks. Compared to the youngest age group, all the other age groups had IRRs of less than one, indicating that students' consumption of sugar added drinks decreased with increasing age. This result is consistent with the hypothesis as well as the findings from the studies by Cheng and Lau (2022), Al-Hanawi et al. (2022) and Otaibi (2017) that age was negatively related to added sugar intake. This is due to the fact that older students have better nutrition knowledge compared to their younger peers (Otaibi, 2017). Another plausible reason is that older students tend to place a higher value on future events and consequently put more efforts into improving their health by adopting a healthy dietary lifestyle (Santerre & Neun, 2010). However, the finding of Hwang et al. (2020) that age was positively associated with sugar beverage intake was not supported by the present study.

Table 3

Factors Associated with Monthly Consumption of Sugar Added Drinks (n = 400)

Variables	Estimates	RSE	IRR	95% CI	p-value
Constant	7.476	1.457	–	–	<0.001
Age (years)					
<20	Ref.	Ref.	Ref.	Ref.	Ref.
20	-2.754	1.313	0.607	0.471, 0.782	0.037
21	-2.903	1.292	0.609	0.469, 0.790	0.025
22	-3.049	1.280	0.586	0.462, 0.743	0.018
23	-3.554	1.214	0.505	0.404, 0.630	0.004
24	-3.336	1.267	0.543	0.417, 0.706	0.009
>24	-3.161	1.298	0.565	0.401, 0.796	0.015
Gender					
Female	Ref.	Ref.	Ref.	Ref.	Ref.
Male	0.227	0.267	1.067	0.962, 1.184	0.396
Ethnicity					
Malay	Ref.	Ref.	Ref.	Ref.	Ref.
Chinese	-1.116	0.363	0.731	0.635, 0.843	0.002
Indian	-0.098	0.433	0.979	0.823, 1.164	0.821
Others	1.707	0.910	1.344	1.089, 1.660	0.061
Monthly personal income (RM)					
≤100	Ref.	Ref.	Ref.	Ref.	Ref.
101–200	-0.599	0.560	0.877	0.714, 1.078	0.285
201–300	-0.81	0.575	0.832	0.689, 1.005	0.160
301–400	-0.462	0.699	0.879	0.718, 1.076	0.509
≥401	-0.423	0.576	0.921	0.775, 1.095	0.463
Father's education level					
UPSR	1.393	0.610	1.452	1.147, 1.837	0.023
PMR	1.276	0.626	1.411	1.112, 1.789	0.042
SPM	0.858	0.487	1.256	1.031, 1.531	0.079
STPM	1.217	0.676	1.329	1.077, 1.641	0.073
Undergraduate Degree/ Master/PhD	Ref.	Ref.	Ref.	Ref.	Ref.
Mother's education level					
UPSR	Ref.	Ref.	Ref.	Ref.	Ref.
PMR	-1.158	0.573	0.750	0.620, 0.907	0.044
SPM	-0.962	0.578	0.774	0.643, 0.932	0.097
STPM	-1.565	0.593	0.655	0.520, 0.824	0.009
Undergraduate Degree/ Master/PhD	0.695	0.716	1.148	0.905, 1.457	0.332

Monthly household income					
B40	Ref.	Ref.	Ref.	Ref.	Ref.
M40	-0.404	0.332	0.874	0.761, 1.002	0.225
T20	-0.982	0.680	0.789	0.587, 1.062	0.150
Body mass index (BMI)					
Underweight	0.562	0.599	1.149	0.898, 1.470	0.349
Normal weight	0.498	0.529	1.123	0.908, 1.388	0.347
Overweight	-0.679	0.596	1.191	0.943, 1.506	0.255
Obesity	Ref.	Ref.	Ref.	Ref.	Ref.
Stress level					
Low	Ref.	Ref.	Ref.	Ref.	Ref.
Medium	0.321	0.399	1.085	0.942, 1.249	0.422
High	0.103	0.350	1.020	0.895, 1.162	0.768
Alcohol consumption					
Yes	-0.096	0.390	0.970	0.840, 1.120	0.806
No	Ref.	Ref.	Ref.	Ref.	Ref.
Smoking					
Yes	-0.548	0.731	0.952	0.752, 1.204	0.454
No	Ref.	Ref.	Ref.	Ref.	Ref.
Use of e-cigarettes					
Yes	1.324	0.514	1.329	1.105, 1.597	0.010
No	Ref.	Ref.	Ref.	Ref.	Ref.
Physical activity (days)					
0	-0.552	0.397	0.863	0.742, 1.004	0.165
1–2	-0.657	0.314	0.838	0.737, 0.953	0.037
3–4	Ref.	Ref.	Ref.	Ref.	Ref.
5–7	-0.239	0.401	0.964	0.803, 1.157	0.552
Maximum VIF	7.376				

Source: Author's own survey

Ethnicity was associated with consumption of sugar added drinks with Chinese consuming less sugar added drinks than Malays. This may be due to sociocultural differences in dietary lifestyles (Cheah et al., 2023a). For instance, a local study examining the eating habits of various ethnic groups revealed that Malay students consumed less healthy foods when compared with Chinese (Cheah et al., 2023a; Abdullah et al., 2016). Chinese students may also have higher health awareness and are more likely to practise a healthy lifestyle (Iqbal et al., 2020). It was interesting to highlight the findings of Cheah et al. (2022) that Malays were also more likely to consume other types of unhealthy foods, such as high-sodium foods compared to Chinese.

Findings from the present study showed a significant relationship between father's education level and student's consumption of sugar added drinks. In particular, students consumed more sugar added drinks if their fathers were less educated. Similarly, mother's education level was negatively associated with consumption of sugar added drinks. These findings contradict those of Guo et al. (2021), who found that parental educational backgrounds were not a significant determining factor of the decisions of children to consume sugar-sweetened beverages. According to the health economic theory, parental education level plays an important role in improving children's health and lifestyles (Santerre & Neun, 2010). This is attributable to the fact that well-educated parents are likely to oversee their kids' dietary behaviours and educate their kids about nutrition (Horst et al., 2006; Jiang et al., 2020).

In terms of e-cigarette use, students who used e-cigarettes were more likely to consume sugar added drinks than those who did not. This is perhaps owing to impulsive and emotional seeking behaviours (Bold et al., 2017). More specifically, individuals who are prone to act on impulse or are constantly looking for new experiences may use e-cigarettes and consume sugar added drinks more frequently (Bold et al., 2017). While the role of e-cigarette use was not examined in the past, the association between smoking and sugar consumption was explored by Zhu et al. (2022). The authors claimed that stress was the third variable that explained why smoking and sugar consumption were positively correlated. Specifically, students who suffered from stress had a high tendency to indulge in unhealthy behaviours, such as smoking and frequent consumption of sugar added drinks in order to improve their mood.

In the present study, although the relationship between physical activity and demand for sugar added drinks was not strong, it was noteworthy. Compared to those who spent 5–7 days on physical activity per week, being physically active for 1–2 days per week was associated with lower consumption of sugar added drinks. The explanation for this finding has not been verified, but one can assume that students who participate in sports regularly tend to consume more energy and sport drinks than those who do not as they need more energy to perform and recover from exercises. In contrast, an insignificant relationship between physical activity and demand for sugar added beverages was evidenced by Al-Hanawi et al. (2022) and Guo et al. (2021), but the authors did not provide any explanation for their findings.

Based on the present study's findings, several policies directed toward reducing the prevalence of added sugar intake are recommended. Firstly, the university authorities can make an effort to limit the availability of sugar added drinks in every cafe. Making healthier beverages such as mineral water, milk, and unsweetened beverages more available throughout the universities is worthy of consideration. In addition, universities have to warrant that students have easy access to free water dispensers and water fountains.

Next, in view of the evidence that ethnicity has significant impacts on consumption of sugar added drinks, the government is urged to implement the policies that target specifically on the Malay students because students with high consumption of sugar added drinks are more likely to be Malays. For example, the government can organise various university-based health awareness programmes and invite Malay health professionals to give seminars and talks surrounding the adverse effects of sugar added drinks on health and how ones can incorporate healthy eating behaviours in their hectic lifestyle.

University authorities can also collaborate with students' parents on providing students with more education about nutrition. The purpose is to encourage students to reduce their consumption of sugar added drinks. The universities should take the responsibility to ensure that students' parents have adequate nutrition knowledge. Furthermore, the Ministry of Health Malaysia and universities can work together in safeguarding students from excessive added sugar consumption. They can jointly organise health related campaigns with the aim of advertising the health risks associated with sugar added drinks and promoting healthy food choices.

Last but not least, since e-cigarette use may lead to high consumption of sugar added drinks, the government should strengthen the regulations, such as fully ban on e-cigarette products in the market. Increasing taxes on e-cigarettes may yield promising outcomes as well. Similar to ordinary cigarettes, high taxes may discourage students from using e-cigarettes. This measure makes perfect sense as students' incomes are limited, and their consumption is sensitive to price changes.

Though the present study generated interesting findings, it is not without limitations. First, the sample used in the present study may not be representative as it was collected using non-probabilistic sampling and focused on one university. Second, the cross-sectional data did not allow for causalities. Third, due to social desirability bias, reporting errors may occur. Students may have the tendency to under-report their consumption of sugar added drinks. Despite these limitations, the present study yields findings that are useful for research and policy formulation. Novelty of the population is also one of the strengths of the present study as there is a lack of comprehensive studies focusing on factors associated with consumption of sugar added drinks among university students in Malaysia.

CONCLUSION

In light of the alarming facts and figures about excessive added sugar intake, the present study using a rigorous statistical approach examined factors associated with consumption of sugar added drinks within a sample of university students in Malaysia. Results from the present study showed that students were more likely to consume sugar added drinks if they were younger, were Malays, had less-educated parents, used e-cigarettes and were less physically active. These findings serve as important information for policy development if the goal of lowering the prevalence of sugar added drink consumption in the student population is to be achieved. To generate more insightful findings, a future quantitative study can conduct face-to-face interviews. This will undoubtedly gain more information about students' sugar added drink consumption behaviours, and the decisions of students to consume sugar added drink will be better understood.

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