CONSUMPTION OF SUGAR-SWEETENED BEVERAGES AMONG INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA (IIUM), KUANTAN STUDENTS

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ABSTRACT

Introduction: Malaysian is one of the highest sugar consumers in the Asia Pacific region. There has been no available report quantifying sugar intake among Malaysian until Malaysian Adult Nutrition Survey (MANS) 2003 study was done. However, data concerning sugar consumption among university students is scarce. *Objective/aim:* This study was conducted to assess sugar sweetened beverages intake among International Islamic University Malaysia (IIUM) Kuantan students. *Methodology:* A total of 42 of IIUM Kuantan students was recruited by convenience sampling method. A questionnaire consisting of 3 days food record was distributed to all participants as a tool for data collection. Food record was analyzed using the Nutritionist Pro software prior to statistical analysis with SPSS version 12.0. P value was set as p<0.05 as statistically significant level. *Results:* The mean energy intake of the students is 1631 ± 466 kcal/day, which is lower than the Recommended Nutrient Intakes (RNI) for Malaysian. The mean energy intake for male is 2197 ± 300 kcal/day and; while 1405 ± 295 kcal/day for female. The mean percentage of sugar intake from sugar-sweetened beverages in this population is 7.18%. A higher sugar-sweetened beverages consumption is found at breakfast, lunch and dinner compared to other meals. *Conclusion and implication:* Sugar intake from sugar sweetened beverages among the IIUM Kuantan students did not exceed the standard guidelines. Hence, this population is not at risk of adverse effects from excessive sugar intake which lead to lower risk of developing non-communicable disease.

KEYWORDS: sugar-sweetened beverages, students, consumption

INTRODUCTION

Obesity prevalence among Malaysian adults age 20 years and older is reported to be the highest among Southeast Asia Countries with a total of 10.4% males and 17.9% females, respectively (WHO, 2013). Findings from the National Health and Morbidity Survey (NHMS) 2015 showed increased prevalence of overweight and obesity among Malaysian compared to the NHMS 2011 results. This epidemic of overweight and obesity are among the consequences of the consumption of sugar sweetened beverages notably carbonated soft drinks as these kinds of beverages have partial compensation for total energy, added sugar content and low satiety (Malik et al., 2006). Malaysian Adult Nutrition Survey (MANS) 2002/2003 indicated that the prevalence of sugar sweetened beverages consumed by average Malaysian adults is about 7 teaspoons of sugar which comprise of 3 teaspoons of sweetened condensed milk in drinks and 4 teaspoons of table sugar.

The National Health and Morbidity Survey (NHMS) 2015 revealed that 1 in 5 adults are diagnosed with diabetes. In Asian region, prevalence of diabetes is predicted to shoot up dramatically by the year 2025 (Cockram, 2000). The increasing trend of type 2 diabetes in young people is up to the extent that prevalence of type 2 diabetes is four folds higher than type 1 diabetes (Cockram, 2000). Diabetes also

leads to numerous complications such as cardiovascular disease, neuropathy, nephropathy and retinopathy

Studies showed the prevalence of obesity among Malaysian university students is approximately 20-30% (Boo et al., 2010, Gopalakrishnan et al., 2012). Excessive weight gain will cause various kinds of comorbidities such as diabetes, hypertension, cardiovascular disease, depression and cancers (Malik et al, 2006). This higher prevalence of overweight and obese among university students has become a concern. Even though obesity has complex interactions with metabolic, genetic, socioeconomic and behavioral factors, it also has a significant association with the consumption of carbohydrates particularly added sugars (Khan and Sievenpiper, 2016).

Therefore, this study aimed to determine intake of sugar sweetened beverages among university students particularly IIUM Kuantan students. This study will also be focusing on the sugar sweetened beverages intake in each meal among the students.

MATERIALS & METHODS

Subjects

A cross sectional study was conducted among students of International Islamic University Malaysia (IIUM), Kuantan, Pahang. Students were recruited regardless of their gender and level of study. The inclusion criteria in the study were Malaysian citizen and students of IIUM Kuantan. On the other hand, the exclusion criteria were those who have any non-communicable or chronic diseases such as diabetes and hypertension.

Data collection

All data had been collected by using a questionnaire. The questionnaire included the 3-day food record. This type of food record was chosen rather than 24-hour diet recall to avoid missing information due to reliance on memory. Prior to completing the 3-day food record, there were two parts of information needed to be collected; which were socio-demographic and anthropometry. Part one included the subjects' name, age, gender, race, marital status and employment. In anthropometric part, height and weight of participants were assessed. Height was measured using a stadiometer (SECA 213; Hamburg, Germany); while the weight was measured using an electronic weighing scale (SECA 803; Hamburg, Germany); and the body mass index (BMI) was calculated based on this information: weight in kilogram divided by height in meter square; BMI = weight (kg)/height (m) ^{2} (World Health Organization, 2004). The standard BMI range accepted worldwide for underweight is < 18.5 kg/m^2, normal is 18.5 – 24.99 kg/m^2, overweight is $\geq$ 25.0 – 29.99 kg/m^2, obese class I is 30.0 – 34.99 kg/m^2, obese class II is 35.0 – 39.99 kg/m^2 and obese class III is $\geq$ 40.0 kg/m^2 (World Health Organization, 2004).

The last part was the assessment of dietary intake. Self-administered 3-day food record was introduced in which two days should be filled on weekdays while the remaining one day should be on a weekend. Furthermore, the information that could be obtained from the food record was time and venue of consumption, quantities of food and beverages consumed and also the description of the food or beverage items such as brand and methods of preparation.

There was also an attachment together with the food record to guide the subjects on how to complete the food record and to determine the portion size which had been illustrated with food photographs (Shahar et al., 2015). The food items were described with kitchen utensils (tea spoon, table spoon, cup, glass, bowl, etc). In addition to that, protein food group such as meat and fish were described in matchbox size while other items such as eggs, biscuits and fruits were described as counts (Zalilah et al., 2006). This was done in order to have a precise evaluation of the amount of food consumed and to avoid under or over-estimation.

Statistical analysis

All statistical analyses were conducted using the Statistical Package for Social Sciences, SPSS software version 12.0. Graphs and tables were used to represent the findings. Firstly, Nutritionist Pro software was being used to calculate percentage of total sugar intake in drinks from total energy intake among the IIUM students. Descriptive statistic was used to describe the mean intake of sugar sweetened beverages from total energy intake in each meal. Apart from that, one sample t-test was also being applied to compare the consumption of sugar intake from sugary drinks among the subjects with WHO guideline; while independent t-test was performed to analyze mean difference of energy intake among gender. P value was set at $p < 0.05$ as statistically significant level.

Participants were required to fill up consent form for their participation in this research and their information was confidential and anonymous. Ethical approval was obtained from IIUM Research Ethics Committee (IREC).

RESULTS

A convenience sample of 50 subjects were recruited among IIUM Kuantan students. Out of these numbers, only 42 subjects (84%) completed and returned the questionnaires while 8 subjects (16%) were excluded due to not meeting the inclusive criteria and non-returnable questionnaires. Among the participants, 28.6% (n=12) were male and 71.4% (n=30) were female.

Based on Table 1, the mean age of the students involved were 21.90 ± 1.17 years old. Out of 42 students, 22% fall under underweight category, 61% of them were normal and the remaining (17%) were beyond the normal range of body mass index.

Energy intake of IIUM Kuantan students

The total mean energy intake of the participants was 1631 ± 466 kcal while the range of energy consumption was from 850 to 2835 calories per day. The mean energy intake for male and female students was 2197 ± 300 and 1405 ± 295 calories per day, respectively as presented in Table 2. There was a significant difference in term of energy intake between the genders among the participants (p= 0.001).

Intake of sugar-sweetened beverages among IIUM Kuantan students
The mean intake of sugar from sugar sweetened beverages of the 42 subjects was 30.90 ± 32.30 g/day; while the range of sugar sweetened beverages intake among the participants was 0.00 until 184.83 g/day. Meanwhile, there was a significant difference in term of percentage of sugar intake from sugar-sweetened beverages with 10% of sugar intake recommended by the World Health Organization (Table 3). The mean percentage of sugar intake from sugar-sweetened beverages was significantly lower with 7.18% only.

Table 1 Mean $\pm$ standard deviation and range for age, height, weight and BMI of participants

Category	Mean $\pm$ SD	Range
Age (year)	21.90 ± 1.17	20 -24
Height (m)	1.58 ± 0.08	1.46 -1.83
Weight (kg)	54.92 ± 12.34	35.4 -100.4
BMI (kg/m²)	21.74 ± 3.62	16.2 -31.3

Table 2 Comparison of energy intake between male and female participants.

Variable	Mean energy intake for male (sd) (n = 12)	Mean energy intake for female (sd) (n = 30)	Mean difference (95% CI)	t-statistics (df)	*p*-value*
Energy (kcal)	2197 (300)	1405 (295)	792.37 (587.48,579.17)	7.816 (40)	0.001

* Independent t-test

Table 3 Comparison of sugar intake from sugar-sweetened beverages with WHO guideline

Variable	Comparative value	Mean (sd) (n = 42)	Mean difference (95% CI)	t-statistics (df)	p-value*
Sugar from SSB (%)	10%	7.18 (5.33)	-2.82 (-4.48, -1.17)	-3.44 (41)	0.001

* one sample t-test

Sugar intake from sugar-sweetened beverages in each meal time

The highest sugar-sweetened beverages intake of the day was during breakfast (2.04%) followed by lunch (2.01%) and dinner (1.45%); whilst intake from other meals were lower than 1% as shown in Figure 1.
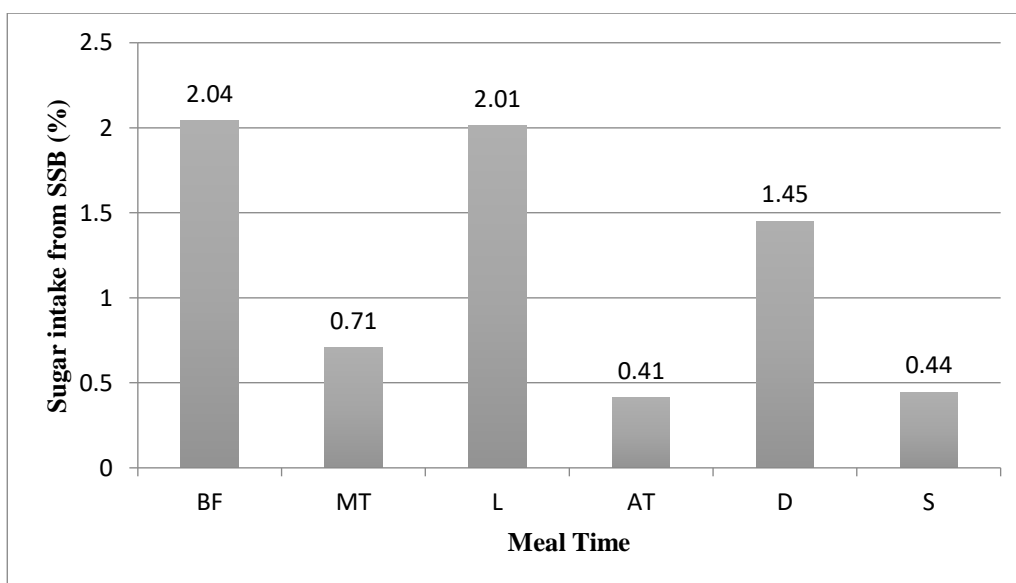

Figure 1 Intake of sugar sweetened beverages (SSB) from total energy intake in each mealtime.

DISCUSSION

An investigation into sugar intake from sugar-sweetened beverages has been conducted among IIUM Kuantan students. Most participants were in the normal BMI category (61%) with the mean BMI of 21.74 $\pm$ 3.62 kg/m^2. This suggests that participants are concerned with their health and body image as they are from health and science-based programs. The mean energy intake for both genders were relatively lower than national recommendation for general population which is 2240 kcal for men and 1840 kcal for women (Ministry of Health, 2017).

The recommendation of sugar intake varies among health organizations with the emphasis on limiting the intake. WHO (2015) recommended that the sugar intake should not be more than 10% of total calories consumed. In other words, if a person consumed 2000 kcal/day, the person should not take more than 50 grams of sugar per day. American Heart Association (AHA) recommendation for sugar intake varies between the gender which should not exceed 100 kcal/day for women and 150 kcal/day for men (Johnson et.al., 2009). Apart from that, the 2015-2020 Dietary Guidelines for Americans is in line with WHO recommendation that the intake of sugar should not exceed 10% of total energy intake. The Malaysian Dietary Guidelines (2010) is also in line with those recommendations through key message 10 with the statement 'Consume foods and beverages low in sugar.

Referring to the WHO guideline of not more than 10% sugar intake from total calorie intake per day, participants in this study should not consume more than 40.8 grams of sugar per day based on their mean energy intake of 1632 kcal/day. The mean sugar intake from sugar-sweetened beverages of the participants was 30.90 ± 32.30 g/day; which did not exceed the recommended value and is equivalent to six teaspoons of sugar. In addition, the mean sugar intake of IIUM Kuantan students who majority were Malays still had a far lower sugar intake from sugar-sweetened beverages compared to the other Malay population which was 54 grams based on a study conducted by Amarra et al., (2016). Our finding also reported a lower sugar intake compared to a report from the Ministry of Health Malaysia database which demonstrated that, on average Malaysian consumed about 3 teaspoons (16 grams sugar) of sweetened condensed milk and 4 teaspoons or 21 grams table sugar per day with a total of 37 grams per day.

Despite of multiracial country, Malaysians are known as the sugar consumers in the Asia Pacific region with 40.7kg/capita/year consumption of sugar and sweeteners in 2007 alone (FAO, 2010). Furthermore, based on the Malaysian Adults Nutrition Survey (MANS) 2003, the average intake of sugar among Malaysian was about 4 teaspoons/day or 21g and this only represents the sugar added into the beverages (Ministry of Health 2008). In other words, if sugars from food like sweet snacks and desserts (traditional Malaysian *kuih*) were taken into consideration, the dietary energy proportion from sugar would be exceeded. These data portrayed that sugar consumption among Malaysians exceeds the recommended sugar intake by WHO which is less than 10% of total energy requirement.

Malik et al., (2006) stated that findings from 15 cross sectional studies showed a positive association between large intakes of sugar sweetened beverages and weight gain and obesity in both children and adults. Moreover, an induction of positive energy balance and weight gain also appeared as a result of consumption of sugar sweetened beverages from a short term feeding trial. At the same time, French et al., (1994) in his findings found that women who consumed 12 oz can soda/week were 0.21 kg heavier than those who did not; while men gained 0.15 kg in 2 years. Another study on sugar sweetened beverages has shown that women who increased their consumption of soda from $\leq$ 1 serving/week to $\geq$ 1 serving/day increased their weight significantly compared to those who maintained their intake (Schulze et al., 2004). In comparison of sucrose and artificial sweeteners, body weight and fat mass increased in sucrose consumers, but decreased in artificial sweetener consumers (Raben et al., 2002).

Apart from that, individuals who had a healthier food pattern were more prone to have non-caloric beverages pattern than those who did not. Those who preferred snacks, high fat food and fast food in their diet were more likely to choose calorie sweetened beverages with little or no nutritional value (Duffey & Popkin, 2006). This also showed the association of obesity and dietary pattern in the population. These results gave insights into possible steps one should take to control obesity by reducing the amount of energy consumed from sweetened beverages in order to reduce overall energy intake.

Based on Koning et al., (2011), the rising risk of type 2 diabetes was directly proportional to the amount of sugar sweetened beverages consumed. The higher the consumption of sugar sweetened beverages, the higher the risk of type 2 diabetes in the population. Furthermore, there is a significant association of sugar sweetened beverages and low quality of the overall diet. Sugar sweetened beverages were also related to higher consumption of energy, carbohydrate, glycemic load, and total fat but lower consumption of protein, vegetable fat, cereal fiber and alcohol (Koning et al. 2011). A 16% increased risk of type 2 diabetes was reported when one serving of sugar sweetened beverages (colas and carbonated

non-colas) were taken per day, whereas there was no significant association between artificially sweetened beverages (fruit juice, low fat milk and tea) and the risk of type 2 diabetes. In contrary, one serving of coffee may reduce 6% risk of type2 diabetes.

The pattern of sugar-sweetened beverages intake among the students is higher in the main meals compared to snacking time. It reflects that the students chose to consume sugar sweetened beverages together with main meals rather than during other meals. It was also discovered that the most chosen sugar sweetened beverages among the students was cordial while less chosen sugary drinks were cocktail, beauty or health-based drinks and bicarbonate drinks. Nevertheless, sweetened condensed milk also widely used to be added into drinks. Norimah et al., (2008) reported that Malaysians drinking habit was quite satisfactory as 99% of Malaysian drink at least 6 glasses of plain water every day, whereas intake of tea, coffee, chocolate-based drinks and cordial syrup among Malaysian adults is 47%, 28%, 23% and 11% respectively. On the other hand, the prevalence of daily consumption of sweetened condensed milk among Malaysian was 35%. It also revealed that Malaysian consumed 3 teaspoons of sweetened condensed milk per day in average.

Limitation and Recommendation

There are three limitations had been encountered while conducting this research. Firstly, short duration for the data collection process. This situation, prevented this study to use a larger sample size in order to have more representative data. Thus, an effective time planning should be implemented for future research. Secondly, low response rate from the students. The problem arose when the students had to bring back the questionnaire to be filled-up for the 3-day food record. It was challenging to collect those questionnaires and several follow up had to be done during the process. Thus, it is suggested that a 24-hour diet recall would be a big help as results can be gained immediately. Thirdly, the presence of misinterpretation and under-reporting among the recruited students. As the questionnaires need to be completed for two weekdays and one weekend, under-reporting might occur with the minimal supervision. Besides, the participants might understood differently from the researchers' guideline even though an attachment had been provided to assist the subjects.

CONCLUSION

As a conclusion, the average intake of sugar from sugar sweetened beverages among IIUM Kuantan students was significantly lower than the recommended value and the usual intake of the rest of Malaysian population. In addition, the mean energy intake of the students was lower than the Recommended Nutrient Intake (RNI) which was 1632 kcal/day. As the beverages consumption pattern has a definite relation to food consumption pattern, it is hoped that the results from the beverages consumption pattern can be useful for further investigations in combatting obesity and non-communicable diseases.

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