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Junk Food Consumption, Physical Activity and Nutritional Status of Adolescent School Children: A Case Study in Ratnapura District of Sri Lanka

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ABSTRACT

Junk food is rich in fats, sugar, salt and calories. Excess consumption of junk food leads to various health and nutritional disorders. The association between junk food consumption at breakfast of adolescent school children, their physical activity level and BMI status was determined in the current study. A cross-sectional study involving 300 male and female students of the age range 12-14 years from four randomly selected schools in Ratnapura district was conducted in 2019. Information regarding physical activity, breakfast practices and energy expenditure was obtained using a pre-tested questionnaire filled by the students. The criteria recommended by the International Obesity Task Force (IOTF) were used to define obesity and overweight, sex and age-specific body mass index (BMI). The study showed, although 72% of the students were aware of the unhealthiness of the junk food habit and more than 85% of the parents were aware and students were knowledgeable about the nutrient facts, 72.7% consumed it due to the taste and the rest due to its convenience. The frequent junk food consumers at breakfast were more obese (p = 0.002) and overweight (p =0.003) compared to occasional junk food eaters most of whom were in the normal BMI range. A negative correlation was observed between BMI and energy expenditure (Pearson correlation = -0.49) where a higher BMI was observed with inactive (p < 0.001) or minimally active (p < 0.002) students. A nutritional transition from underweight to overweight and obesity related to junk food consumption is evident from the above data in Ratnapura district of Sri Lanka.

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INTRODUCTION

In the past, overweight and obesity were considered as a health issue mainly associated with high-income countries. However, recently, the incidences of overweight and obesity have been dramatically risen in low- and middle-income countries (World Health Organization, 2014). The nutritional transition in developing countries has shifted people from their traditional diet based on cereals, legumes, vegetable and fruits, to an energy-dense diet rich in saturated fatty acids, salt and sugar. This is associated with the changes in the socioeconomic status of the society, which has created significant changes in the lifestyle of adults as well as in children.

In addition to changing the dietary patterns, increased time spent in sedentary activities has become a major factor in causing childhood obesity (World Health Organization, 2014). The overweight and obesity have a close relationship with non-communicable diseases such as diabetes, blood pressure, asthma, low back pain and depression, which are rising concerns all over the world (Kearns *et al.,* 2014). The lack of physical activity such as prolonged television viewing, playing computer games, as well as nutritional factors such as consumption of junk food and calorie-dense food and a family history of obesity are the main causes of overweight and obesity among the young individuals (Mistry and Puthussery, 2015). Junk food contains a high energy content that causes a reduction in appetite. Free availability of junk food in the market, low price, attractive advertisements and packaging and the lack of parental awareness are the main causes of children's tendency to consume them(Behzad *et al.,* 2015).

Sri Lanka is a developing country in South Asia with a lower-middle-income status. Jayawardena *et al.* (2016) reported that the prevalence of overweight and obesity among the adult population in Sri Lanka was 25.2% and 9.2% respectively. A study conducted in the urban areas of Colombo, Sri Lanka showed that after the application of Asian BMI cut-offs, the respective prevalence of underweight, normal weight, overweight and obesity were 7.7%, 26.8%, 34.3% and 31.2%, respectively (Somasundaram *et al.,* 2019). It was predicted that overweight will account for 18-40% of diet-related chronic diseases and 20.9% of all deaths by 2025 (Popkin *et al.,* 2001). According to the Food and Nutrition Policy of Sri Lanka (2004-2010), the majority of national public health programs and research on children have focused on under nutrition status (Ministry of Healthcare and Nutrition, 2010) while over nutrition problem has not been adequately addressed. Ratnapura district in Sri Lanka consists of wealthy communities compared to many other parts of the country. However, both over nutrition and under nutrition are seen among adolescent school children.

Among the meals consumed during the day, breakfast is an important meal, which supplies an optimum intake of nutrients. Contents of breakfast also have shown a strong relation to the prevalence of overweight and obesity (Fernández Morales *et al.,* 2011). Adolescent school children of 12-14 years of age have shown an increase in overweight and obesity compared to the primary school children (Waters *et al.,* 2008)**.** Furthermore, adolescents can be considered to have a better understanding and are relatively independent on food selection compared to primary children. During the pretesting of the questionnaire, it was found that the study sample consumed junk food mostly during breakfast than in other main meals, the most common reason being the lack of time for parents to prepare breakfast at home. Therefore, the objective of the present research study was to investigate the association of junk food consumption at breakfast and their correlation with the nutritional status and the level of physical activity, of adolescent school children.

METHODOLOGY

Study design, population and sample

A cross-sectional study was conducted in September 2019 with students of four mixed schools in the Ratnapura district. They showed a fair representation of all social levels. All students whose ages were in the range of 12-14 years and who were present at the school on the day of the survey were considered as eligible subjects. A total number of 425 students participated in the study. The students were well informed about the purpose of the study and their written consent was obtained prior to the study. A self-guided questionnaire (adapted from Boylan *et al.,* 2017) was requested to be filled by students, which contained questions on behaviour, breakfast and socioeconomic factors. Prior to the preparation of the final questionnaire, an exploratory survey was conducted as a pre-test with randomly selected 25 students to identify different types of junk food consumed and the factors that are likely to influence the consumption of junk food.

Assessment of nutritional status

The height of the student was measured using a standard scale (Seca 213 Portable stadiometer) to the nearest 0.1 cm and the weight was measured using an electronic weighing scale (Constant –

model: 14192-016A) to the nearest 100 g. The students were positioned with heels, buttocks, back of the chest and back of the head touching the vertical plane of the stadiometer and the head held in the horizontal plane. Calibration was checked with a standard weight after every 25 measurements. The NCHS/CDC (2000) references were used to define nutritional indices (Robert *et al.,* 2002). The criteria recommended by the International Obesity Task Force (IOTF) were used to define obesity and overweight, sex and age-specific body mass index (Hajian-Tilaki and Heidari, 2013; World Health Organization., 2013). Sex-specific BMI-for-age references were used to define categories of nutritional status as underweight <5th percentile, overweight >85th to <95th percentile and obesity >95th percentile.

Assessment of physical activity

Lifestyle practices were assessed using a pre-tested questionnaire adapted from standard PAQ-C and PAQ-A manual (Kowalski *et al.,* 2004). This questionnaire covered all domains of physical activity including transport, household, fitness and sports, representing light-, moderate- and vigorous-intensity physical activities.

Moderate-intensity physical activities included were the activities such as normal pace walking, brisk walking, recreational swimming, household activities and recreational sports such as volleyball and badminton. Vigorous-intensity physical activities were activities such as stair climbing, jogging, running, cycling and active sports such as basketball. Energy expenditure of physical activities was assigned MET (Metabolic Equivalent for Task) values based on the compendium of physical activity for youth (Ridley *et al.,* 2008; Ainsworth *et al.,* 2011). Moderate-intensity recreational sports were assigned an average MET value equivalent to 4 METs. Vigorous-intensity sports were assigned an average MET value equivalent to 8 METs. Slow walking, normal pace walking and brisk walking was assigned MET values of 2.8, 3.5 and 4.5, respectively, based on modified MET values from the compendium of physical activity for youth (Bauman *et al.,* 2009). The questionnaire allowed the calculation of total energy expenditure per week based on metabolic equivalent (MET-min) values of all types of physical activities reported by each participant. To measure the participant's level of physical activity, the total MET-min/ week was used. The classifications adapted for activity levels in this study were based on two cut-off points of 30 and 60 minutes per day of at least a moderate level of physical activity. The daily 60 minutes of at least a moderate level of physical activity was based on

the 2010 physical activity recommendations by the WHO (World Health Organization 2010). This was then converted into three activity categories based on total MET minute /week as follows: Active >1680 MET-min per week (60 minutes × 7 days × 4 METs). Minimally active category was assigned, if the MET-min /week ranged between 840 (30 minutes × 7 days × 4 METs) and 1680, whereas inactive category was assigned if < 840 MET-min /week (Kesäniemi *et al.,* 2010).

Junk food consumption

The term Junk food was used to describe food and drinks low in nutrients (e.g. protein vitamins, minerals and fibre) and high in energy, saturated fat, added sugar and/or added salt with or without other additives. Junk foods contribute to a nutritionally imbalanced diet and regular consumption is known to cause non-communicable diseases in the long run.

According to the results of the pre-tested questionnaire, extensively consumed junk food by the students in the study area included a variety of short eats (e.g. rolls, cutlets, *wade*, *samosa etc.*), candies, French fries, different types of sweets and cookies, ice cream, chips and deep-fried street foods like bite mixtures.

The parents' awareness of junk food consumption by their children was obtained from the responses given by student participants.

Data analysis

Using weight, height and age of children, BMI-for-age z scores were computed to describe underweight, overweight and obesity (de Wilde *et al.,* 2015). A detailed analysis of data was conducted using IBM SPSS Statistics 20 software. Descriptive data were summarized using standard deviations or percentage and group differences in categorical variables were tested using Pearson's Chi-square test and a p value of <0.05 was considered significant. The relationship between BMI and energy expenditure was analysed using the Pearson correlation coefficient.

RESULTS AND DISCUSSION

General characteristics of the study sample

Of the 425 students recruited to the study, only 300 students completed the questionnaire. Table 1 illustrates the descriptive data on age, anthropometry and energy expenditure according to gender.

A significant difference in weight, height and BMI between boys and girls (*p*>0.05) was not observed in the study sample. Furthermore, a significant difference in the energy expenditure was also not observed between boys and girls (*p*>0.05).

Nutritional status

According to the BMI status of students, more than half of the students were in the normal BMI range (55%). Although nearly half of adolescent school children suffered from nutritional issues, obese and overweight conditions were slightly higher (24%) than underweight condition (21%). A study conducted in an urban area of Colombo using grade 6-7 school children Wickramasinge *et al.* (2010) reported that they suffered from obesity or overweight conditions because they were addicted to an inactive lifestyle.

Junk food consumption

From the pre-test of the survey it was revealed that most students consumed junk food for their breakfast rather than for lunch or dinner. Therefore, the habit of junk food consumption for breakfast was studied in the proper questionnaire.

Consumption of junk food for breakfast

When students were asked to respond to junk food consumption as an alternative to their breakfast, 22.0% reported that they consumed junk food 5-6 times per week while the majority (44.7%) reported that they consumed junk food sometimes (2-3 times per week). The rest of the students (33.3%) didn't consume junk food as their breakfast. There were two main reasons for consuming junk food by the respondents; firstly, facing a tight schedule with their studies during the day, hence not having enough time to eat a proper meal and secondly, when their parents didn't wake up early enough in the morning to prepare breakfast. Those who did not consume junk food stated that their parents were strictly against the consumption of junk food and hence parents prepared the breakfast for children. According to the literature, a common reason for motivating junk food consumption by students was that most students receive money from their parents to take the morning meal from the cafeteria (Montoye *et al.,* 2013).

The factors affecting the consumption of junk food among adolescent school children were described in Figure 1. The majority of participants who consumed junk food believed that junk food provides them with a pleasant feeling due to their deliciousness. When the students were asked to select the factor that influenced them in selecting the type of junk food, 73% opted for taste, 13.7% for saving time, 7.7% for the low price and 6.0% for other reasons. According to literature, taste is the most critically influencing factor because students get addicted to the artificial taste of junk food (Askari Majabadi *et al.*, 2016). Breakfast skipping was associated with gaining weight, obesity and addiction to unhealthy dietary habits including more frequent junk foods (Tin *et al.,* 2011). The students also considered convenience of junk food as an attraction to them: they were relatively affordable and quick and easy to consume. Furthermore, participants mentioned that the variety of flavours and colours of junk foods are other factors motivating consumption. Additionally, social norms and friendship were also expressed as motivating factors for junk food consumption. Some participants stated that they ate junk food unwillingly, but simply as a measure of social harmony with their friends.

Table 1: Descriptive data on age, anthropometry and energy expenditure of the study sample (n = 300)

Characteristics	Mean (SD)			
	Total	**Gender**		**p**
		Male	**Female**	
No. of children	300	138	162	-
Weight (kg)	40.09 (10.66)	39.67 (10.31)	40.45 (10.97)	0.526
Height (m)	1.38 (0.094)	1.39 (0.095)	1.38 (0.094)	0.381
Age (years)	13.40 (0.94)	13.26 (0.65)	12.85(0.97)	0.372
BMI (kg/m^2)	21.09 (5.44)	20.72 (5.29)	21.40 (5.55)	0.279
MET-min	995.1 (10.7)	992.4(10.4)	985.7(10.8)	0.256

SD: standard deviation, p: probability value of Pearson's Chi-square test

Table 2 illustrates the correlation between junk food consumption for breakfast and the nutritional status of the students.

Majority of obese (76%) and overweight (67%) children consumed junk food (the student's response for the junk food consumption as 'sometimes' and 'yes' are combined together) as the morning meal. There was a statistically significant difference between obese, underweight and overweight status with the consumption of junk food for breakfast (p<0.05) indicating that students who consumed a higher amount of junk food for breakfast have a higher BMI than those who consumed junk food very rarely for breakfast. Thus, there was a clear relationship between the

junk food consumption at breakfast and BMI among the adolescent students.

Parent's awareness about the junk food consumption of children as reported by students

An 87% of the respondents said their parents were aware of their junk food consumption habits. A few students (8%) said that they didn't have an idea regarding their parent's awareness about their junk food consumption. Other respondents (5%) said that their parents were unaware of their junk food consumption implying that they consumed it secretly to their parents.
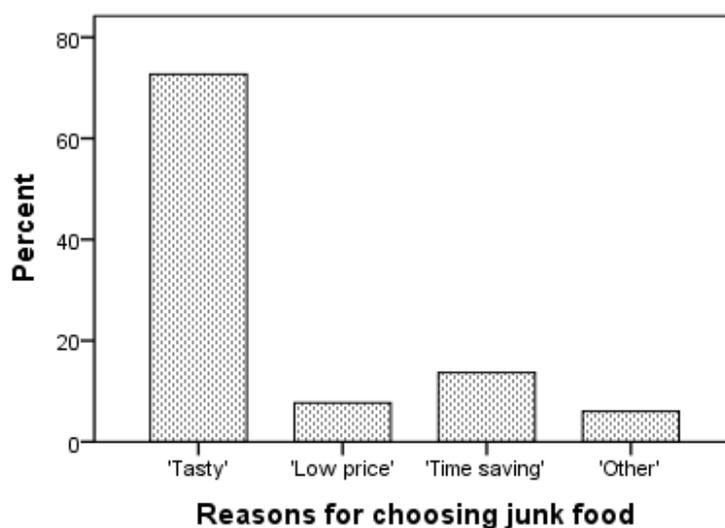

Figure 1: Reasons for choosing junk foods for breakfast by adolescent school children (n = 300)

Table 2: Association between junk food consumption for breakfast and the nutritional status of adolescent school children

Nutritional status*	Junk food consumption for breakfast %		Chi-square	p
	Yes	**No**		
Obese	76.0	24.0	13.5	0.0002
Overweight	66.7	33.3	13.3	0.0003
Normal	36.6	63.4	0.62	0.4327
Underweight	23.2	76.8	11.59	0.0007

*Nutritional status categories were according to Asian BMI cut off values. P: Probability value of Pearson's Chi-square (n = 300)

Students' perception of junk food consumption

Majority of the students (72%) correctly identified as junk food being not healthy. They were aware that junk foods may lead to depression in teenagers, increase in body weight, impair digestion and increase the risk of heart and kidney diseases and cancer. Few students (28%) believed that junk food was healthy food good for body functions. Therefore, the adolescent students in this area had fair knowledge about a healthy and a non-healthy diet.

Students' awareness about nutrient facts in the label

The majority (54.3%) of the students mentioned that they check the label containing nutrient facts because they want to know the contents of the food. Some students (34.7%) only occasionally checked the nutrient fact panel. Due to the fact that they mostly consumed junk food either at school or in the street, a minority of students (11%) said they didn't check the nutrient contents or ingredients in the label at all. Neuhouser *et al.* (1999) reported that individuals with a low intake of fat have an idea about nutrition labels. According to Antony and Bhatti (2015) many teenagers had a general idea that junk food is unhealthy but lacked the specific knowledge about the ingredients, preservatives and chemicals used in junk food and their respective safety levels. However, in the present study, awareness of the participants about the ingredients in the label could be considered as satisfactory. The results revealed that the majority of the students agreed to the fact that they were not eating right but they felt that the diet is not of much importance and that they were too busy to think much about food.

Physical activity

Table 3 indicates that 64.0% and 35.6% of inactive students suffered from obesity and overweight, respectively. A higher percentage of obese students were physically inactive compared to overweight or normal students (p<0.05). Minimally active and inactive groups were combined as "less active" students and accordingly, 40.4% normal children and 67.6% underweight children were less active whereas 96.0% obese and 91.2% overweight children were less active. According to the results shown in Table 3, a clear relationship could be established between BMI of the students and physical activity level (p<0.05). Thus, there was a clear relationship between the level of physical activity of students and their BMI. Literature reported a similar, statistically significant relationship between BMI status and the physical activity level among school children aged 14-15 years in Kalutara district (Godakanda *et al.*, 2018).

The scatter plot in Figure 2 indicates a linear association between energy expenditure and BMI value. As shown, there is a negative correlation between BMI and energy expenditure (r = -0.49, p = 0.000).

Major limitation of this study could be the relatively smaller sample size, the shorter time period used in the assessment of junk food consumption and the qualitative nature of the questionnaire used. Therefore, an in-depth study with quantitative data on lifestyle practices with a larger sample size is warranted to provide a better understanding of the situation existing in the area.

Table 3: Association between physical activity level and nutritional status of adolescent school children

Nutritional status*	Physical Activity level %			Chi-square	p
	Active	Inactive	Minimally active		
Obese	4.0	64.0	32.0	44.71	0.00001
Overweight	8.9	35.6	55.6	21.89	0.00002
Normal	59.5	9.9	30.5	24.96	0.00001
Underweight	32.3	3.0	64.6	19.15	0.00001

* Nutritional status was according to Asian BMI cut-off values p: probability value of Pearson's Chi-square test; n=300.
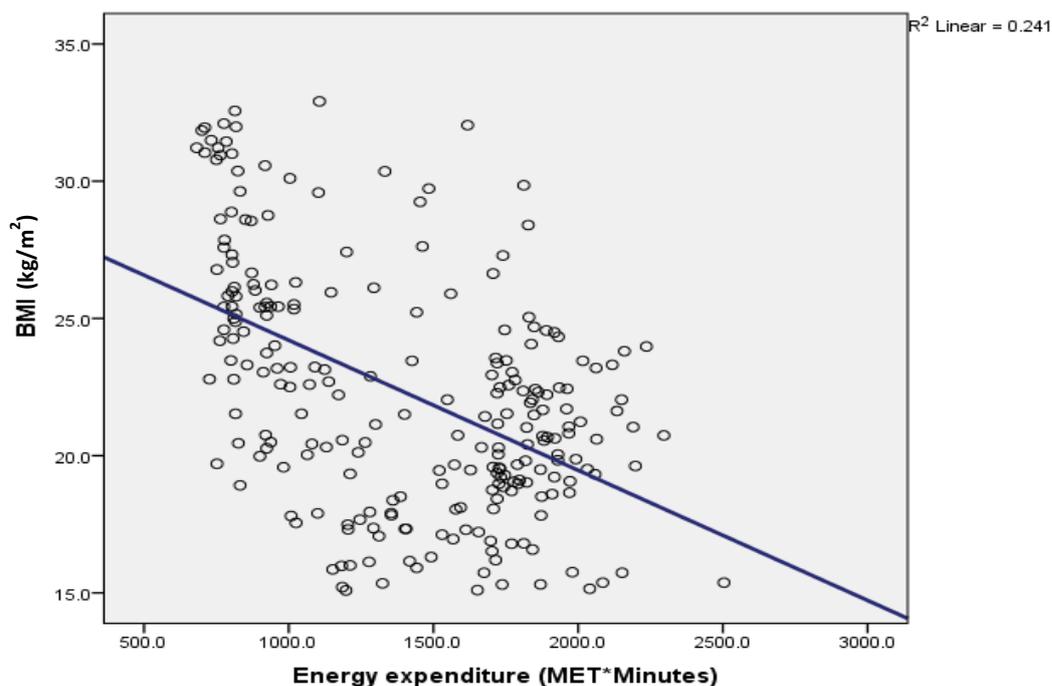
Figure 2: The association between energy expenditure and BMI (n = 300)

CONCLUSIONS

The prevalence of underweight remains a major nutritional problem among adolescent school children in the Ratnapura district, while overweight and obesity are increasing at an alarming rate. There was a negative relationship between the BMI of students and their physical activity. A high percentage of students who consumed junk food as their breakfast suffered from overweight and obesity conditions.

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