1-1-2021

Relationship of BMI with Junk Food, sleep pattern, exam performance and awareness about its ill health effects in healthy teenagers

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Abstract

Objective: To evaluate the relationship of body mass index of healthy teenagers with junk food, sleep pattern, exam performance and awareness about its ill effects.

Methods: The cross-sectional study was conducted from March to June 2017 at University Medical and Dental College, University of Faisalabad, Faisalabad, Pakistan, and comprised subjects aged 13-19. Data was collected using face-to-face interviews, getting the examnation results from respective educational insititutions and calculating the body mass index, Data was analysed using SPSS 22.

Results: Of the 226 subjects, 96(42.5%) were boys with a mean age of 15.68 ±1.83 years, and 130(57.5%) were girls with a mean age of 17.00±1.74 years. Based on body mass index, 35(15.5%) subjects were underweight, 88(39%) were normal, 28(12.4%) overweight, 56(24.7%) pre-obese and 19(8.4%) were obese. The independent predictors of body mass index were higher consumption of soft drinks in males and higher consumption of soft drinks and salt in females ($p<0.05$).

Conclusion: Teenagers were found to be well aware of the ill effects of junk food, but they were found to be happy with their dietary habits and unwilling to change it.

Keywords: Teenagers, BMI, Food habits, Fast food, Soft drinks. (JPMA 71: 59; 2021) **DOI: https://doi.org/10.47391/JPMA.507**

Introduction

Healthy diet is essential in combating non-communicable diseases, like diabetes mellitus (DM) and obesity.[1] Junk food, also known as fast food, has become increasingly popular in Pakistan. Many factors have led to an increase in junk food consumption; one of the important factors is its easy availability to students in school and college cafeterias. It has also been seen that the junk food restaurants have grown rapidly across Pakistan which provide door-to-door delivery of junk food.[2] The increasing trend of consuming junk food has been witnessed all over the world due to easy availability and accessibility of a variety of delicious fast food items at very affordable prices.[3] However, the fact should not be ignored that junk food has a high caloric value which results in serious health problems when consumed excessively, leading to obesity, dental cavities and DM which are few of the diseases whose prevalence is increasing and it can affect the exam performance as well of the students.[4]

A disturbed sleep pattern has been associated with obesity as it results in increased appetite and craving for salty, sweet and fried food, which, when consumed excessively,

has a detrimental effect on the health of teenagers.[5] Studies have shown that a decreased intake of fruits and vegetables along with an increased intake of fast food results in sleep disturbance which has an overall impact on daily routine of the individuals.[6]

A healthy diet exalts exam performance unlike junk food which can lead to poor exam performance.[7,8] The current study was planned to see the relationship of body mass index (BMI) with junk food, sleep pattern, exam performance and awareness about its ill effects on health.

Subjects and Methods

The cross-sectional study was conducted from March to June 2017 at University Medical and Dental College, University of Faisalabad, Faisalabad, Pakistan, and comprised teenaged students. After approval from the institutional ethics review committee, the sample size was calculated using the formula n = NX/ (X+N-1), where X= (Zα/2) ^2 [p (1-p)] /e^2. In the formula, n = sample size, Zα/2 = critical value of normal distribution at α/2, α is 0.05 and critical value is 1.96, while p is the sample proportion and N is the population size). The prevalence of junk food consumption was taken as 11%,[9] errors (e) of 5% and confidence interval (CI) of 95%.

The sample was raised using multistage sampling technique. A list of all private schools in Faisalabad providing secondary education to the students was collected. From the list five schools were selected randomly, and from these five ,schools lists of all students

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enrolled were obtained from their respective managements. Those included were healthy subjects aged 13-19 who were willing to volunteer for the study. Students with any known disease, such as inflammatory bowel disease, cystic fibrosis, coeliac disease, and known food allergy or food intolerance, were excluded, and so were those having any psychiatric eating disorder.

After taking written informed consent from the participants or their guardians, data was collected through face-to-face interviews regarding demographics, dietary and sleeping habits using a specially designed proforma.[10] Test scores of the students were obtained from the respective educational insititutions. BMI was calculated after taking height and weight measurements using standardised equipment and standard procedure. The subjects were divided into various BMI groups using the the Asian classification of the World Health Organization (WHO),[11] labelled as: underweight <18.5, normal 18.5-22.9, overweight 23-24.9, pre-obese 25-29.9, and obese >30.

Data was analysed using SPSS 22. For qualitative variables, data was presented as frequencies and percentages. For quantitative variables, it was presented as mean±standard deviation (SD). Independent sample t test and chi-square tests was used for inter-group comparisons. Analysis of variance (ANOVA) followed by post-hoc analysis was done for multiple comparisons among BMI groups. Pearson's correlation was applied to observe correlation between quantitative variables. Multivariate linear stepwise regression analysis was used to see the predictors of BMI. P≤0.05 was considered statistically significant.

Results

Of the 226 subjects, 96(42.5%) were boys with a mean age of 15.68±1.83 years and mean BMI 22.79±4.31, and 130(57.5%) were girls with a mean age of 17.00±1.74 years and mean BMI 22.43±5.39. Exam performance of girls was significantly higher compared to boys (p<0.05). The reasons given by students for their consumption of junk food and their perception of factors causing obesity or health problems were noted (Table 1).

Based on BMI, 35(15.5%) subjects were underweight, 88(39%) normal, 28(12.4%) overweight, 56(24.7%) pre-obese and 19(8.4%) were obese. Healthy and unhealthy food consumption in various BMI groups were noted and there were significant

Table-1: Comparison of study variables between the groups.

Anthropometric measures	Male (n=96) Mean ± SD	Female (n=130) Mean ± SD	p-value
Age (years)	15.68 ± 1.83	17.00 ± 1.74	<0.05*
Height (meters)	1.55 ± 0.17	1.52 ± 0.13	0.101
Weight (kgs)	54.73 ± 12.72	53.04 ± 9.64	0.258
Body mass index (BMI)	22.79 ± 4.31	22.43 ± 5.39	0.34
Average sleep hours	7.88 ± 1.65	7.70 ± 1.75	0.448
Average scores	73.99 ± 13.34	82.12 ± 10.52	<0.05*
Reasons for the consumption of junk food among teenagers			
	Males n (%)	Females n (%)	p-value
You like it	60 (62.5)	95 (73.1)	0.061
It's easy to find, it's everywhere	29 (30.2)	23 (17.7)	<0.05*
It's convenient and fast	16 (16.7)	22 (16.9)	0.554
It doesn't cost much	16 (16.7)	7 (5.4)	<0.05*
The servings are larger	9 (9.4)	9 (6.9)	0.333
You want to be like others	16 (16.7)	1 (0.8)	<0.05*
Teenagers perception of factors causing obesity or health problems			
	Males n (%)	Females n (%)	p-value
Frequent consumption of soft drinks and sweetened drinks	16 (16.7)	42 (32.3)	<0.05*
Frequent consumption of fast food meals	17 (17.7)	54 (41.5)	<0.05*
Lack of physical activity	38 (39.6)	49 (37.7)	0.440
The influence of marketing of junk food (e.g., advertising, packaging, low prices, etc.)	13 (13.5)	9 (6.9)	0.104
You don't know	6 (6.3)	4 (3.1)	0.206

*p-value ≤ 0.05 is considered statistically significant; Comparison is done using independent sample t test and chi-square test; SD: Standard deviation

differences (Table 2).

The relation of BMI with unhealthy and healthy food consumption, average sleep hours and test scores in college students were explored (Table 3).

Stepwise multiple regression analysis model accounted

Table-2: Comparison of healthy and unhealthy food consumption between various body mass index (BMI) groups using analysis of variance (ANOVA).

Food items#	.BMI groups					
	Underweight n=35	Normal n=88	Overweight n=28	Pre-obese n=56	Obese n=19	p-value
Sweet snacks	5.00 ± 3.21	4.33 ± 3.34	3.50 ± 3.59	4.95 ± 3.65	5.89 ± 4.28	0.150
Salty snacks	3.51 ± 2.46	3.82 ± 2.80	4.57 ± 2.66	4.52 ± 3.28	6.84 ± 6.35	<0.05*
Fruit flavoured drinks	2.69 ± 2.46	2.83 ± 3.27	2.89 ± 3.07	3.02 ± 2.82	3.21 ± 3.06	0.972
Fried foods	2.89 ± 2.21	4.20 ± 2.69	4.07 ± 2.85	4.93 ± 2.44	5.84 ± 2.77	<0.05*
Soft drinks	2.97 ± 3.03	5.14 ± 3.43	4.43 ± 3.59	5.89 ± 4.06	9.68 ± 5.46	<0.05*
Fast food meals	1.26 ± 1.13	2.10 ± 1.85	2.18 ± 2.19	3.52 ± 2.71	2.26 ± 2.86	<0.05*
Sports drinks	0.06 ± 0.23	0.74 ± 1.68	0.57 ± 1.77	1.05 ± 2.22	1.53 ± 2.36	<0.05*
Vitaminised sugary waters	0.37 ± 1.03	0.59 ± 1.33	0.39 ± 1.42	0.55 ± 1.27	1.26 ± 1.96	0.187
Energy drinks	0.46 ± 0.85	0.82 ± 1.61	0.93 ± 1.82	0.79 ± 1.86	2.05 ± 4.77	0.104
Water, bottled or tap	30.11 ± 3.32	30.74 ± 3.22	31.57 ± 3.08	31.23 ± 3.43	30.16 ± 4.35	0.342
Fresh fruits	4.00 ± 2.21	3.24 ± 2.03	2.64 ± 2.34	2.59 ± 2.73	1.63 ± 1.92	<0.05*
Vegetables	3.54 ± 2.34	3.45 ± 1.94	2.64 ± 1.87	2.73 ± 1.98	1.47 ± 1.58	<0.05*
Test scores	85.37 ± 9.57	77.48 ± 14.42	82.21 ± 7.53	76.20 ± 10.40	73.89 ± 13.63	<0.05*
Average sleep hours	7.91 ± 1.80	7.50 ± 1.64	6.89 ± 1.28	8.30 ± 1.69	8.53 ± 1.74	<0.05*

BMI groups = Underweight <18.5, Normal 18.5-22.9, Overweight 23-24.9, Pre-obese 25-29.9, Obese >30;
Consumption frequency per week is assessed for all food items.

Table-3: Relation of body mass index (BMI) with unhealthy, healthy food consumption, average sleep hours and test scores in college students.

Food items	Male (n=96)		Female (n=130)	
	r	p-value	r	p-value
Sweet snacks (e.g., candies, chocolate, cupcakes, etc.)	-0.060	0.560	0.205	<0.05*
Salty snacks (e.g., chips, pretzels, nachos, etc.)	0.171	0.096	0.288	<0.05*
Fruit flavoured drinks (e.g., Fruitopia)	0.075	0.466	0.061	0.487
Fried foods (e.g., fries, fried chicken, etc.)	0.233	<0.05*	0.328	<0.05*
Soft drinks	0.303	<0.05*	0.426	<0.05*
Fast food meals (e.g., McDonald, Pizza Hut, etc.)	0.065	0.531	0.299	<0.05*
Sports drinks (e.g., Gatorade, Powerade, etc.)	0.357	<0.05*	0.133	0.131
Vitaminised sugary waters	0.165	0.109	0.101	0.254
Energy drinks (e.g., Red Bull, Monster, Guru, etc.)	0.074	0.473	0.188	<0.05*
Water, bottled or tap	0.075	0.466	0.072	0.414
Fresh fruits	-0.198	0.054	-0.311	<0.05*
Vegetables	-0.181	0.077	-0.306	<0.05*
Test scores	-0.205	<0.05*	-0.297	<0.05*
Average sleep hours	0.142	0.167	0.174	<0.05*

Table-4: Multivariate linear stepwise analysis showing independent predictors of body mass index (BMI).

	Parameters	β-coefficient	R^2 change	sr^2	p-value
Males	Sports drinks	0.643	0.128	0.074	<0.05*
R^2 =0.166	Soft drinks	0.230	0.038	0.038	<0.05*
Females	Soft drinks	0.275	0.173	0.026	<0.05*
R^2 = 0.297	Fresh fruits	-0.612	0.057	0.064	<0.05*
	Scores	-0.126	0.037	0.053	<0.05*
	Salt consumption	0.322	0.030	0.029	<0.05*

Dependent variable is BMI; sr^2 is the squared semi-partial correlation; p-value ≤ 0.05 is considered statistically significant.
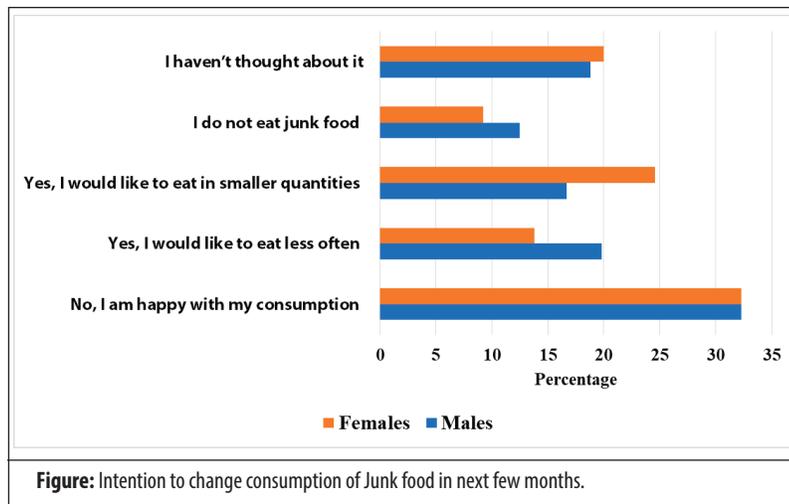
Figure: Intention to change consumption of Junk food in next few months.

showed that independent predictors of BMI in males were higher consumption of sports and soft drinks, while in females, the independent predictors were higher consumption of soft drinks and salt, and low consumption of fresh fruits and low performance in exams (Table 4).

Despite having a significant perception about the ill effects of obesity and related factors, most teenagers regardless of gender were happy with their dietary habits and had no intention to change it for the better (Figure).

Discussion

The study found that the main reason for eating junk food was that the young population liked it and it was easily available. Also, though female students were more aware compared to male counterparts of the ill effects of fast food, like obesity, they were happy consuming such food. Several studies have shown similar liking of teenagers towards fast food.[12-14] Our study also found that consumption of salty snacks, fried food and fast food was significantly higher in the obese group. One of the reasons could be that these snacks are easily available at the school canteen and students are left with no other choice. A study in Brazil also found that food environment in school is one of the major causes of consumption of unhealthy food among teenagers.[15] Soft, sports and energy drinks were significantly consumed in obese groups compared to the others. Teenagers liked energy drinks because it enhanced their physical performance, cognition and concentration level during their studies.[16] A study reported that these energy drinks improved myocardial contractility within one hour of consumption.[17] However, the adverse effects weigh far more than the therapeutic effects of the energy drinks. It was found in a study that students who are on sports drinks have more tendencies towards eating fried and high-sugar foods than those who did not.[18]

Another study found that increased consumption of energy drinks is significantly associated with high BMI.[19] In a study in Mexican females, researchers tried to find food associated with obesity, and it was observed that obese females were taking more soft drinks and fat compared to overweight and normal-weight females.[20] Another study showed a significant association between intakes of soft drinks and type 2 DM.[21] Another study saw that although students knew that sports drinks could cause dental caries and other health-related issues, they liked them because of their taste and were unable to avoid them.[22] Researchers suggested that the reduction in the use of energy drinks and sports drinks is associated with a decreased risk of obesity and type 2 DM.[23]

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Another finding of the current study was that there was less consumption of fruits and vegetables in the obese group compared to other groups. One study found that lower intake of fruits and vegetables were associated with obesity.[24] A prospective cohort of 133,468 United States men and women showed that vegetables high in fibre and low in glycaemic content were associated with weight-loss.[25] Similarly, a study showed that an increased intake of fruits and vegetables in females had a 24% lower risk of becoming obese.[26] Thus, it is important to motivate teenagers to include fruits and vegetables in their diet. Researchers suggested that autonomous motivation results in increased intake of fruits and vegetables both in adolescents and their parents.[27] In contrast to our findings, a study found higher consumption of fruits and vegetables amongst teenagers in their diet.[28]

The current study also observed that students having a higher BMI performed poorly in exams. This result is similar to a study in which obese Japanese adolescents had low grades in their exams.[29] In another cross-sectional study conducted on 893 school-children showed that good fitness level was associated with higher academic performance in males compared to obese boys who showed significantly lower academic performance. This is due to the fact that higher fitness is related to improved cardio-respiratory and improved cognitive function.[30] Another study explained that obesity is one of the most important risk factors of obstructive sleep apnoea which leads to daytime sedation, fatigue, depression and overall poor academic performance.[31] Obese students are also likely to miss school more frequently, especially those with chronic health conditions, such as DM, which also leads to poor academic performance and low grades in exams. Unhealthy lifestyle is one of the major factors in gaining weight, and exercise and dietary modification is necessary among students to manage the issue.[32,33]

The current study found that individuals with more average sleep hours were obese. A study also found that an increase in sleep duration was significantly associated with obesity.[32] However, there are studies showing an inverse relationship between sleep hours and obesity.[34,35]

It was also observed in the current study that although teenagers were well aware of the ill effects of junk food, they were happy with their dietary habits and were not willing to change it. This is a matter of great concern for the policy makers, as obesity prevalence is increasing in Pakistan[36] and junk food consumption is one of the major contributing factors.

Conclusion

Consumption of junk food in teenagers was found to be increasing their BMI, affecting their exam performance and sleep duration. Students were also aware about the ill health effects of junk food, but were unwilling to decrease its consumption.

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