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Original Research Article

A cross sectional study to find the association between junk food, obesity and peak expiratory flow rate in medical students of age group 18 to 25 years

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ABSTRACT

Objective: To find association between junk food, obesity and Lung Function Test in medical students of age group 18 to 25 years.
Materials and Methods: This cross sectional study was conducted in Dept. of Physiology of Jawaharlal Nehru Medical College, Belagavi for the period of two months. After obtaining institutional ethical clearance and informed consent, total of 270 medical students between the age group of 18-25 were enrolled. Obesity was evaluated by BMI, Waist Hip Ratio & skinfold thickness. PEFR was measured using the electronic spirometer, model-RMS Helios-702. Junk food consumption was evaluated by 24hr dietary recall method.
Results and Conclusion: The main results of our study showed that there was significant increase in BMI with increasing junk food consumption. The obese subjects had lower Peak Expiratory Flow Rate. ($p < 0.005$)

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1. Introduction

One of the most challenging public health problems of 21st century both in developed and developing countries is obesity. The prevalence of the obesity is escalating at an alarming rate around the world. It imposes a substantial burden at individual, familial and societal level and causes a great negative impact on financial commitments.[1]

The reports from World Health Organization (WHO) have testified that the prevalence of obesity has doubled globally since last three decades.[2] More than 1.9 billion adults of age group 18 years & above were reported overweight as mentioned in factsheet released by WHO in 2014. Nowadays, unhealthy, pre packaged, canned and processed foods are easily available at lower costs.[3]

Junk food is defined as pre-prepared or packaged food mixed with chemical additives and has very less nutritional value. It is basically low-priced and high carciogenic sustenance's. The consumption of these types of junk food is becoming a fashion and trend in both developed and developing countries. This has become more evident by looking at increased number of junk food restaurant over last two decades.[4]

There is a growing concern that junk food availability in colleges is one among contributing factors towards epidemic of adolescent obesity along with sedentary lifestyle. Because of higher content of sugar and fat junk food leads to obesity. The young generation after taking admission in professional courses or colleges change their lifestyle dramatically mainly their food habits, especially if the students are away from their home town. This matter is actually a huge concern to the society.[5–7]

Recently University Grants Commission (UGC) has also issued a notice to all the universities stating the ban of sale and availability of junk food in higher educational institutions. This measure was taken in view of increasing rate of obesity among adults.[8]

Studies have reported that obesity causes increased body fat percentage which in turn has hazardous effect

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on respiratory system besides other medical complications. One association of obesity with respiratory system is that the deposition of extra fat in abdomen leads to compression of visceral organs which redistributes the blood to thoracic compartment leading to decreased vital capacity. The deposition of fat in epicardium may also lead to decreased vital capacity. Another important association is that, moreover maximum voluntary ventilation has negative correlation with body fat percentage. Also obesity may cause episodes of shortness of breath with little exertion. Obesity may also play a role in the development of sleep apnea. There is a high risk of development of asthma and rhinitis in people who eat junk food three times in a week.[9,10]

Medical students are expected to be more physically fit and dynamic with healthy lifestyles compared to the other student population as they are the future health care providers of the society.

The rigors of education are stressful for many medical students, and common maladaptive responses to stress include physical inactivity and poor nutrition. This is in turn can produce deleterious effects on physical well-being and mental health. The deleterious effects of consumption of junk food in medical students leading to weight gain, insulin resistance and high blood pressure are widely studied by the various researchers.[11]

As there is lesser availability of published articles on the direct association of junk food on the lung function test, therefore this study was undertaken to find out the association between junk food, obesity and lung function tests in medical students.

We hypothesized that the increased consumption of junk food leads to increase in BMI and body fat % and further decrease in lung function in study population.

2. Materials and Methods

The study was conducted in Research Laboratory, Department of Physiology, J.N. Medical College, Belagavi from July 2017 till August 2017. Medical students were enrolled after obtaining written Informed Consent. Ethical approval was obtained from institutional ethical committee prior conduct of the study. (Ref: MDC/DOME-154 on 18/4/2017)

Medical Students who were willing to participate in this study were included and Students with Respiratory Problems like asthma were excluded from the study. The Sample size was calculated using the formula n = 4PQ/ d2, from which we got the sample size to be 270.

2.1. Parameters assessed

2.1.1. Obesity indices

1. **Height and weight** were measured by Commercial stadiometer and Digital scale respectively.
2. **Body Mass Index** BMI was calculated using Quetelet's equation.
3. **Skinfold thickness** (mm) was measured by Herpenden skin fold calipers (from Anand agencies, Pune) at three different sites i.e upper arm, Abdomen region, and suprailiac region. Three reading of each site was obtained and the Mean of 3 measurements was considered.

2.1.2. Junk food data

Junk food data was obtained by using a modified 24 Hours Dietary Recall Method. This measures 24 hour dietary intake of regional food habits and junk food consumption. Each student was given a 24hr dietary recall sheet and was asked to mention a complete list of food eaten during breakfast, lunch, snacks, dinner and also about food consumed in between the meals. The 24hr dietary recall sheet consisted of 6 rows and 4 columns. Rows consisted of a time of food consumed, place of preparation, name of food, description (eg. brand name if any chips packet etc.), cooking method (raw, boiled, fried or grilled) and amount of food eaten. Columns consisted of breakfast, lunch, snacks and dinner. Following food items were considered junk items according to Food Safety and Standards Authority of India (FSSAI).[12]

According to FSSAI, almost all processed foods come under the ambit of the proposed additional tax. The product list include: chips, samosa, vada, pakoras, deep fried Indian snacks, French fries, many types of sweet, fatty or salty snack products; ice cream, chocolates, candies (confectionery); burgers and hot dogs; poultry and fish nuggets‘ or sticks‘ (fingers‘); mass-manufactured breads, buns, cookies (biscuits); breakfast cereals; pastries, cakes, cake mixes; energy bars; preserves (jams), margarines; desserts; canned, bottled, dehydrated, packaged soups, noodles; sauces; meat, yeast extracts; soft, carbonated, cola, energy drinks; sugared, sweetened milk drinks, condensed milk, sweetened including fruit yoghurts; fruit and fruit nectar drinks; instant coffee, cocoa drinks; no-alcohol wine or beer; pre-prepared meat, fish, vegetable, cheese, pizza, pasta dishes; infant formulas, follow-on milks, other baby products; health, slimming products such as powdered or fortified meal and dish substitutes.[12]

2.1.3. Peak Expiratory Flow Rate (PEFR)

PEFR was measured by using electronic Spirometer, model-RMS Helios-702.

Data entry and statistical analysis were done using SPSS Statistics 23.0. The results were expressed in Mean + SD. Pearson coefficient was done to find out any correlation. P value less than 0.05 was considered significant.

3. Results

The primary findings of this study are:

1. Among our study population about 53.3% were consuming junk food more than two times a day.
2. There was significant relationship found between junk food consumption and body fat %.
3. Increased levels of BMI were associated with increased consumption of junk food.
4. Negative relationship was found between obesity indices and PEFR.

Total of 270 medical students were enrolled for the study, among them 97 were males and 173 were females

Out of 270 medical students, 53.33% reported consumption of junk food more than 2 times in a day, compared to only 4.81% who do not consume junk food.

As per WHO Classification of BMI, 23.70% of medical students were in overweight categeory.

The significant association is found in students between junk food consumption with high BMI score i.e more than 25. These students have shown the consumption of junk food more than two times in a day. The more junk food consumption in a day increases the prevalence of obesity and this association was significant statistically for $p<0.05$ in our study.

There was significant association found in between body fat % and Junk food consumption per day

There is negative correlation between junk food consumption and PEFR, that is with increase in Junk food intake PEFR decreases.

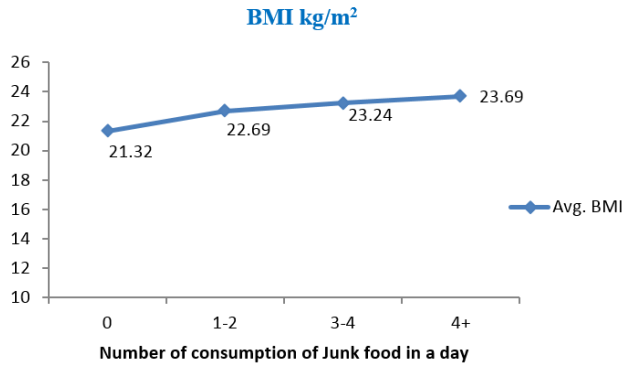

Fig. 1: Association of BMI and No. of Junk Food Consumption in Day More the number of junk food consumed, the higher is the BMI among study participants

4. Discussion

We conducted the study involving 270 medical students. Their obesity indices and PEFR was measured. 24hr dietary recall was taken to know the amount of junk food consumption. After complete data collection different parameters were correlated and their relationship was measured.

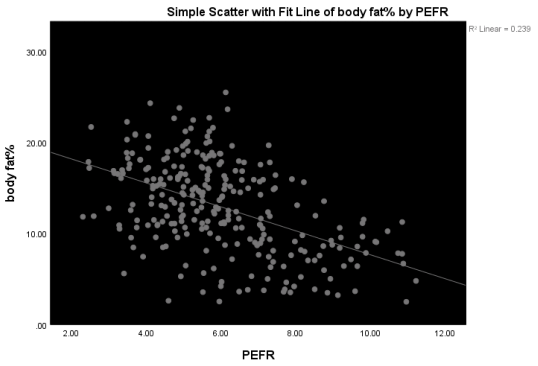

Fig. 2: Association between body fat% and PEFR P= 0.0001 r= -0.489
There is negative relation between Body fat % and PEFR. As the body fat% increases the PEFR decreases.

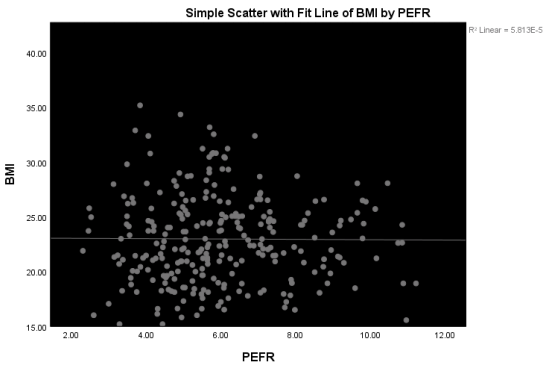

Fig. 3: Association between BMI and PEFR P=0.901 R= -0.008
There is negative relation between BMI and PEFR. As BMI increases, PEFR decreases.

There was significant association observed between junk food consumption, obesity and PEFR. As the BMI and body fat % increased with increase in junk food consumption, there was decline in PEFR. One of the earlier study in Indian population have also reported decrease in PEFR in obese subjects.[13] It can be postulated that increased junk food consumption lead to obesity and further alters normal lung functions. Previous study has reported the strong relation between obesity and decrease lung functions.[14]

We considered two parameters for obesity-BMI (general obesity) and body fat%. from Tables 4 and 5 we can see that with more no. of consumption of junk food per day there is increase in BMI and Body fat %. These findings are consistent with many studies that have been done in past on young adults and have reported relationship between Fast Food consumption on Obesity and Weight Gain.[15–19]

However there are also few studies documented that show no relationship between junk food consumption and obesity. A study done in Cornell University where researchers found that consumption of soda, candy and fast

Table 1: Profile of study participants (n=270)

S. No.	Variables	Range	Mean ± SD
1	Age (in years)	18-25	19.61±1.30
2	Weight (in Kg)	37-97	61.85±12.62
3	Height (in meter)	1.46-1.95	1.63±0.09

Table 2: Distribution of medical students based on the number of times of junk food consumption in a day by Dietary Recall Method

S. No.	Number of medical students	Junk meals consumed in a day/times
1	13(4.81%)	0
2	113(41.85%)	1-2
3	144((53.33%)	>2

Table 3: Distribution of medical students based on their body mass index

S. no.	BMI		Number of medical students
1	<18.5	Underweight	38(14.04%)
2	18.5-24.99	Normal	154(57.03%)
3	25 -29.99	Overweight	64 (23.70%)
4	>30	Obese	14 (0.51%)

Table 4: Association between junk food and body mass index in medical students

S. no	Junk meals consumption/times in a day	BMI			
		<18.5	18.5-25	>25	Grand Total
1	0	3(1.11%)	8(2.96%)	2(0.74%)	13(100.00)
2	1-2	15(5.55%)	69(25.55%)	29(10.74%)	113(100.00)
3	>2	20(7.40%)	77(28.51%)	47(17.40%)	144(100.00)
	Grand Total	38(14.07%)	154(57.03%)	78(28.88%)	270(100.00)

P=0.023 r = 0.138

Table 5: Association between numbers of junk food in a day with body fat % in medical students

No. of Junk food consumed/day	<10	11-20	21-30	Grand Total
0	9	4		13
1-2	46	61	6	113
>2	41	96	7	144
Grand Total	96	161	13	270

P= 0.001 r= 0.210

Table 6: Association between junk food and PEFR

Junk Food	PEFR (Unit) L/seconds		
	<10	11-20	21-30
0	9	4	
1-2	46	61	6
>2	41	96	7

P= 0.276 r = -0.067

food was not linked to weight gain for 95 percent of the population. The total sample size taken was 5000 adults.[20] Also the study done in 160 undergraduates students of British. and Scottish population suggested no relationships between BMI and snacking.[21 22–24] The findings of these studies are contradicting the results which we have found in our study. Further, we also found that there was significant decrease in PEFR with increasing BMI. The earlier studies have reported PEFR as good indicator of bronchial hyper reactivity. Few studies have also reported that values of PEFR changes depending upon sex, body surface area, obesity and physical activity of an individual.

The studies have reported decreased FEV1 and PEFR among obese subject with high BMI level and body fat % in Indian population. The study has also documented body fat % classification as a better index to find lung

functions impairments as compared to BMI classification among of obese subjects.[25–27] Our study has also showed decrease in PEFR values with increased Body fat% and BMI Classification. This statement is concurrent with the previous studies which have been conducted to relate obesity with lung function test

Other studies have shown direct relation between obesity and lung function which is also consistent with our study as seen from Figures 2 and 3. From Figures 2 and 3 it is seen with increase in BMI and body fat% there is decrease in lung function. Also from Table 6 we can see that there is negative relation between junk food consumption and PEFR. This result directly relates lung function and junk food consumption.

5. Conclusions

1. It is concluded that our study population i.e. medical students have increased obesity indices with more consumption of junk food.
2. There is decrease in Lung function Parameters i.e. PEFR with increase in obesity indices like BMI and Body Fat %

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7. Conflict of interest

None.

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