DIETARY INTAKE AND CONSUMPTION OF HIGH FAT, SUGAR AND SALT FOODS (HFSS) AMONGST ADOLESCENTS (10-18 YEARS) IN MUMBAI METROPOLITAN REGION

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ABSTRACT

INTRODUCTION

Adolescents who do not practice appropriate eating habits are more likely to develop noncommunicable diseases as adults. Obesity, which is caused by poor eating habits high in fats, carbohydrates, and salts, can contribute to noncommunicable diseases later in life. The purpose of this study was to focus on the same and to better understand meal patterns as well as fast food intake among adolescents that is high in fats, sugars, and salts.

AIM: To study meal patterns and consumption of high fat, sugar and salt foods amongst adolescents in the Mumbai metropolitan region.

METHODS:

This was a Cross-Sectional descriptive Study, where the data was collected from a total of 150 participants. A self-administered questionnaire was used in the study which included socio-demographics, meal pattern and dietary habits questions, HFSS foods consumption pattern. Macronutrient assessment was done by 24- hour dietary recall. Anthropometric details measured were weight, height and waist circumference, from which BMI and waist to height ratio were derived. Data was analyzed statistically and p value of less than 0.05 was considered significant.

RESULTS:

Mean weight of the male participants was found to be 53.5 kgs whereas 52.81 kgs for females. BMI and waist circumference were found to be higher in the late adolescents (15-18 years) with p values 0.03 and 0.04 respectively. Waist to height ratio were significantly higher for the participants consuming higher energy (p value, 0.028) and fats (p value, 0.02) in their diet. HFSS food consumption was quite frequent with early adolescents (10-14 years) consuming sweetened beverages, sugars, farsans, ghee, butter and mayonnaise more frequently than the late adolescents (15-18 years) which was found statistically significant.

CONCLUSION:

Higher fat and energy intake in the participants was found associated with higher waist to height ratio (>0.5) in this study. Regarding consumption patterns, early adolescents were consuming foods which are refined, high in fats and sugars more than

the late adolescents. Intake of fiber rich foods like fruits, vegetables, sprouts was low in this group.

Keywords: Early Adolescent health, Late adolescent health, HFSS foods, dietary intake, anthropometric parameters.

INTRODUCTION

ADOLESCENTS, often known as puberty, is a stage of life during which the body goes through its second growth spurt (age 10-18 years). Although adolescence is a period of major health progress and changes, it is marked by major death, disease, and damage. Most of which can be prevented or treated. Some of the most notable challenges affecting adolescents today are increasingly poor diets, inactive lifestyles, mental illness, alcohol and cigarette use, and environmental risks such as air pollution. Because of the enormous physical changes that occur throughout this transition from infancy to maturity, it is important to pay extra attention to diet during this time. (Hamad et.al, 2017)

HFSS (High Fat Salt Sugar) foods are foods (packaged or unpackaged) that are low in proteins, vitamins, phytochemicals, minerals, and dietary fiber but high in fat (saturated fatty acids), salt, and sugar, as well as high in energy (calories), all of which are known to harm health if consumed regularly or in large amounts. (Motta et.al, 2021) They have no nutritional value and are frequently rich in fat, salt, sugar, and calories. Salted snack foods, fried fast food, and carbonated beverages are all common junk foods that can be included in the Foods high in sugar, fats or salts. (kamboj et. Al, 2019).

Nutritional problems of adolescents, whether undernutrition or overnutrition related to chronic diseases, are mainly the result of dietary inadequacies. These problems may be linked to a number of physiological, socio-economic and psychosocial factors in adolescents. (Gilany et.al, 2012) The determinants for the consumption of these HFSS foods amongst adolescents is again something that needs to be assessed. The scientific data about the dietary components linked to this relationship is growing, particularly a low meal frequency, missing breakfast, and a high intake of sugar sweetened beverages. (Moreno et.al, 2010)

Fast food requires no introduction in today's age of convenience. It's filling, tasty, and economical, and it's available at any time of day. Teenagers are frequently observed eating fast food, not just because of its taste, but also because of their peer group's behaviors. Some of the most popular fast meals are salted snack foods, candies, most sweet desserts, fried fast food, and carbonated beverages. Most harmful effects of fast food include increased cholesterol levels, cardiac problems, hypertension, obesity, dental caries, cancer and many other threatening health hazards (Saranya et.al, 2016).

Excessive consumption of soft drinks, sweets, and fast food, as well as a low intake of fruit, vegetables, and dairy products, are frequent at this age. This eating pattern is worrisome since it can lead to obesity and an increased risk of non-communicable chronic diseases (NTCDs) later in life, such as diabetes, high blood pressure, and dyslipidemia (Leal and colleagues, 2010). Fast food intake and missing breakfast have both grown throughout the transition period from adolescence to adulthood, and these eating habits have been linked to increased weight gain from adolescence to adulthood (Niemeier et.al, 2006). The consumption of main meals, how often snacks are prepared away from home, and whether energy-dense, nutrient-poor snack items and sugary drinks are regularly consumed all play a role in the relationship between snack behaviors, diet, and obesity in teenagers. (Larson et.al, 2016)

The substitution of ready-to-eat, processed foods for traditional home-cooked meals has raised the incidence of chronic diseases in urban Indians. (Rathi et.al, 2017)

Some researchers discovered a link between meal frequency and the prevalence of overweight and obesity in adults and adolescents, whereas others were unable to find any meaningful links. (Franko et.al, 2017) In developing countries, nutrition transition is a significant issue that might influence food intake. The rate of intake of processed foods (such as fast food) will rise as a result of the nutrition transition.

Adolescents who do not cater to healthy eating are more prone to non-communicable diseases during their adulthood. Faulty dietary habits especially rich in fats, sugars and salts can lead to obesity which in turn can lead to non-communicable diseases in later life. Awareness among adolescents regarding reducing consumption of foods rich in fats, sugars and salts has become essential. (kamboj et. Al, 2022) Hence, it's important to first find out the meal patterns and consumption of these foods amongst adolescents.

AIM

To study meal patterns and consumption of high fat, sugar and salt foods amongst adolescents in the Mumbai metropolitan region.

METHODOLOGY

This was a Cross-Sectional descriptive Study, where the data was collected from a total of 150 participants, including both males and females. The participants were selected by the random convenience sampling method.

INCLUSION CRITERIA

The inclusion criteria for participation in the study was to be :
- An Indian adolescent, both males and females

- Age group of 10 to 18 years old
- Residing in Mumbai metropolitan region

EXCLUSION CRITERIA
Adolescents with severe health issues and genetic disorders were excluded from the study.

A self-administered questionnaire was used in the study. The questionnaire included: (i) demographic characteristics, (ii) meal patterns and dietary habits (iii) intake of high fat foods (iv) intake of high sugar foods, beverage intake questionnaire was used here (v) intake of high salt foods, (vi) anthropometric measurements such as weight, height, waist circumference (vii) food frequency questionnaire of all the foods High in fat, sugar or salt foods. (viii) 24-hour dietary recall.

BEVQ (beverage intake questionnaire) was used to determine the frequency of seven beverages namely plain water, 100% fruit juice, sweetened fruit beverages, full-cream milk, low fat milk, skimmed milk, regular soft drinks, energy and soft drinks, alcoholic drinks, and sports drinks in their daily diet. The frequency ranged from never or less than once a week to daily.
The data was collected by circulating the google forms online via whatsapp and instagram. It was also carried out offline for some participants. Spreadsheet was obtained for Google forms and data entry was done for the participants in the same for whom data was collected offline. The data was coded and statistical analysis was performed for analysis.

STATISTICAL ANALYSIS
The data was analyzed using a statistical package for social sciences (SPSS) software (version20, SPSSinc., chicago, II., USA). All the descriptive data were expressed as mean ± standard deviation (SD) along with 95% confidence intervals (CI). Descriptive statistics such as mea, standard deviation, frequency distribution and range values were computed for quantitative variables. Frequency distributions were carried out to determine the meal patterns and dietary habits of the adolescents. Chi square tests were performed to examine the comparison between the early (10-14 years) and late adolescents (15-18 years). Continuous variables were tested using the kolmogorov-smirnov test for normality assumption of the data. Since the data was normally distributed, the student's t-independent test with equal variance assumed was used to determine whether there was significant difference between groups. Karl Pearson's correlation coefficient was computed to study the association between socio-demographic factors, anthropometric indices dietary intakes. One-way analysis of variance (ANOVA) was carried out to see the difference in the anthropometric parameters, waist circumference and WHtR between age groups and genders. P values less than 0.05 were considered statistically significant.

RESULTS
The study was conducted to understand the meal patterns and to track the consumption of high fat,sugar or salt foods amongst adolescents.

1. Socio Demographics characteristics of participants
Descriptive statistics indicate that a total of 150 participants completed the survey between the ages 10-18 years. Minimum age observed was 11 and maximum observed was 18 years. The average age of the participants was found to be 15.38 years.

Table 1: Socio-Demographic Characteristics Of Participants

Socio-demographic characteristics	Responses	Percentage (n=150)
Gender	Male	52
	Female	48
Religion	Hindu	64
	Muslims	28
	Sikh	1.3
	Jain	6.7

Monthly income of the family	> Rs.50,000	41.3
	Rs. 25-50,000	32.7
	Rs. 19-25,000	12
	Rs. 13-19,000	6.7
	Rs. < 13,000	7.3
Type of family	Nuclear family	68
	Joint family	26.7
	Extended family	5.3

Table 1 shows that 52% participants were males and the remaining 48% were females.

Frequency of religion data showed that maximum participants follow hindu religion which comes up to 64 % (n=96), followed by hindus, 28% participants (n=28) were muslims. Only 2 participants were sikh and 10 participants were jain. Maximum percentage 41.3 % participants belonged to a family with monthly income of >Rs. 50,000 (n=62). 32.7 % participants reported having a family income of Rs.25-50,000 (n=49). Nearly 12% (n=18) and 6.7% (n=10) had the income of Rs.19-25,000 and Rs.13-19,000 respectively. 11 participants had a family income of less than Rs.13,000 (7.3 %). Regarding the type of family, 68% (n=102) belonged to the nuclear family followed by 26.7% (n=40) who belonged to a joint family. Only 8 participants (5.3%) belonged to an extended family.

2. ANTHROPOMETRIC DETAILS

Anthropometric details measured were height and weight. BMI, weight to height ratio were calculated by using formulas.

Table 2: Anthropometric Details Of Participants As Per Genders

Anthropometric indices		Gender		t value	p value
		Males (n=78)	Females (n=72)		
Weight (kg)	Mean ± SD	53.50 ± 12.12	52.81 ± 11.88	0.351	0.726
Height (m)	1.52 ± 0.103	1.56 ± 0.102	1.49 ± 0.103	-2.489	0.07
Waist circumference (inches)	Mean ± SD	30.23 ± 4.10	29.96 ± 3.57	0.432	0.666
BMI	Mean ± SD	21.43 ± 4.19	21.89 ± 4.43	-0.646	0.666
Waist to height ratio	Mean ± SD	0.48 + 0.065	0.49 ± 0.057	-0.344	0.731

Table 2 shows the anthropometric measurements details of the participants. It can be seen that mean weight of the male participants was found to be 53.5 kgs whereas 52.81 kgs for females. Mean for waist circumference of the participants was found

to be 30.23 and 29.96 inches for males and females respectively. Mean BMI showed 21.43 and 21.89 kg/sq.m for males and females respectively. Waist to height ratio mean was found to be 0.48 and 0.49 for males and females respectively. There were no statistical significant differences found between both the genders for any of the measurements.

3. Macronutrient assessment results

Table 3: Macronutrient Intake Of Study Participants As Per Genders

Macronutrients		Gender		t value	p value
		Males (n=78)	Females (n=72)		
Energy (kcal)	Mean ± SD	2034 ± 251.43	1988 ± 269.1	-1.085	0.280
Carbohydrates (g)	Mean ± SD	275.97 ± 41.35	282.81 ± 40	-1.018	0.310
Proteins (g)	Mean ± SD	57.09 ± 12.63	56.66 ± 12.1	0.212	0.832
Fats (g)	Mean ± SD	73.42 ± 17.2	74.43 ± 17.36	-0.356	0.722
Fibers (g)	Mean ± SD	15.33 ± 4.11	15.77 ± 4.5	-0.632	0.528

p value < 0.05 is considered statistically significant

Macronutrient intake and distribution is depicted in table 3. Mean energy intake of the male participants was found to be 2034 kcals whereas for females it was found to be 1988 kcals. Carbohydrate intake was found to be 275.9 g and 282.8 g for males and females respectively. Protein intake was found to be 57.1 g and 56.6 g for males and females respectively. Fats were found to be coming up to 73.42 g and 74.4 g for males and females respectively. Fiber content in the foods came up to 15.33 g and 15.77 g for males and females respectively. By understanding that carbohydrates and proteins provide 4 kcal/g and fats give 9 kcal/g, the percentage of calories from these macronutrients was calculated. It was found that carbohydrates contributed 54.3% and 56.8% of calories for males and females respectively. Protein was found to be contributing on average 11.3% of calories for both genders. Lastly, fat contributed 32.5% and 33.7% of total calories for males and females respectively. Statistics show that there were no significant differences in the macronutrient intake between both the genders.

Macronutrients were compared within the groups with waist to height ratio less and more than 0.5.

Table 4: Waist To Height Ratio And Macronutrients Comparison Of The Participants

Macronutrients		Waist to height ratio		t value	p value
		< 0.5 (n=61)	> 0.5 (n=89)		
Energy (kcals)	Mean ± SD	1953 ± 242.55	2048 ± 267.27	2.22	**0.028****
Carbohydrates (g)	Mean ± SD	273.62 ± 39.08	283.1 ± 42.19	1.39	0.166
Proteins (g)	Mean ± SD	54.84 ± 11.16	58.3 ± 13.02	1.70	0.09
Fats (g)	Mean ± SD	69.98 ± 18.1	76.61 ± 16.22	2.34	**0.02****
Fiber (g)	Mean ± SD	16.02 ± 4.9	15.25 ± 3.79	-1.075	0.284

p value < 0.05 is considered statistically significant

It is evident from table 4 that individuals having higher energy and fat intake are found to have higher waist to height ratio putting them at risk of comorbidities in future. Energy intake is significantly higher in individuals with high waist to height ratio (>0.5), p value 0.02). Similarly, fat intake was significantly higher in groups with higher waist to height ratio (p value 0.02).

5. Dietary patterns and HFSS foods consumption

Table 5: Frequency Of Food Groups Consumption By Participants

Food groups	Age group	Every time in the main diet	At least once a day	3 to 4 times a week	1 time a week	Less than once a week.	Chi square, p value
Fruits	Total % (n=150)	12.7	26.7	46.0	6.7	8.0	10.94, **0.02****
	10-14 years % (n=43)	20.9	18.6	55.8	4.7	0	
	15-18 years % (n=107)	9.4	30.2	42.5	6.6	11.3	
Vegetables	Total % (n=150)	8.0	12.0	24.0	24.7	31.3	7.138, 0.129
	10-14 years % (n=43)	9.3	9.3	30.2	11.6	39.5	
	15-18 years % (n=107)	7.5	13.2	21.7	30.2	27.4	
Sprouted pulses	Total % (n=150)	2.7	9.3	18.7	24.0	45.3	3.689, 0.45
	10-14 years % (n=43)	4.7	9.3	16.3	32.6	37.2	
	15-18 years % (n=107)	1.9	9.4	18.9	20.8	49.1	
Green leafy vegetables	Total % (n=150)	11.3	9.3	33.3	28.7	17.3	3.149, 0.53
	10-14 years % (n=43)	4.7	11.6	37.2	27.9	18.6	
	15-18 years % (n=107)	14.2	8.5	31.1	29.2	17	

It can be seen from the table 5 that all of the above food groups were consumed in the main diet by a very few participants i.e. Fruits (12.7%), vegetables (8.0%), sprouted pulses (2.7%) and green leafy vegetables (11.3%).

Only 26.7% of the participants have fruit at least once a day, a maximum of 46% have it 3 to 4 times a week, 6.7% have it only once a week while 8% go for it less than once a week. Early adolescents consumed fruits more frequently and the difference between two groups was found statistically significant (p value, 0.02).

Only 12 % participants go for vegetables at least once a day, a good 24% go for it 3-4 times a week and 24.7% go for it only once a week whereas a maximum of 31.3% participants have vegetables less than once a week.

In case of sprouted pulses, maximum participants i.e. 45.3% said they have it less than once a week. 24% have it once a week followed by 18.7% who have it 3-4 times a week. Very few participants i.e. only 9.3% go for it at least once daily.

Green vegetables are consumed at least once daily by only 9.3% of the participants. Maximum participants i.e. 33.3% have it 3-4 times a week, 28.7% have it once a week whereas 17.3% participants have it less than once a week.

Table 6. Consumption of HFSS foods amongst participants

Frequency	Age groups	At least once daily	3 to 6 times a week	1 to 2 times a week	2 to 3 times a month	Once a month or less	Chi square, p value
Consumption of deep fried foods in meals	Total % (n=150)	7.3	15.3	40.0	19.3	18.0	8.688, 0.069
	10-14 years % (n=43)	14	9.3	32.6	27.9	16.3	
	15-18 years % (n=107)	4.7	17.9	43.4	15.1	18.9	
Consumption of Fried farsans/ chips in your snack	Total % (n=150)	19.3	30.3	26.7	11.3	12.7	16.248, **0.003**
	10-14 years % (n=43)	34.9	37.2	14	2.3	11.6	
	15-18 years % (n=107)	13.2	27.4	31.1	15.1	13.2	
Consumption of fried foods such as Puri, Parathas, Kachori, Tikki, Bhature, Pakoras, Samosas etc.	Total % (n=150)	4.7	18.7	40.0	21.3	15.3	7.0, 0.136
	10-14 years % (n=43)	7	30.2	37.2	16.3	9.3	
	15-18 years % (n=107)	3.8	14.2	41.5	23.6	17	
Consumption of ghee, butter, cream, mayonnaise, etc.	Total % (n=150)	37.3	26.0	18.7	9.3	8.7	8.863, **0.05**
	10-14 years % (n=43)	41.9	32.6	9.3	2.3	14	
	15-18 years % (n=107)	35.8	23.6	22.6	11.3	6.6	
Consumption of nuts, seeds and oilseeds	Total % (n=150)	16.0	22.0	32.0	8.0	22.0	4.795, 0.309
	10-14 years % (n=43)	23.3	14	37.2	7	18.6	
	15-18 years % (n=107)	13.2	25.5	29.2	8.5	23.6	
Consumption of sweetened beverages like	Total % (n=150)	3.3	14.7	33.3	19.3	29.3	8.416, **0.05**

juices, etc.	10-14 years % (n=43)	4.7	20.9	44.2	9.3	20.9	
	15-18 years % (n=107)	2.8	12.3	29.2	23.6	32.1	
Consumption of sweets such as Laddu, Barfi, Jalebi, Kulfi, Chocolate, Halwa, Rice pudding, etc.	Total % (n=150)	9.3	20.0	30.7	23.3	16.7	5.227, 0.156
	10-14 years % (n=43)	39.5	0	20.9	27.9	11.6	
	15-18 years % (n=107)	25.5	0	34	21.7	18.9	
Consumption of sugar and honey in tea, coffee, curd, lassi, etc	Total % (n=150)	34.0	18.7	21.3	12.0	14.0	10.21, **0.037**
	10-14 years % (n=43)	41.9	23.3	25.6	0	9.3	
	15-18 years % (n=107)	31.1	17	19.8	17	15.1	

Consumption of high salt snacks such as Namkeen,	Total % (n=150)	13.3	20.7	29.3	18.0	18.7	3.132, 0.536
	10-14 years % (n=43)	14	25.6	30.2	9.3	20.9	
Bhujia, Papad etc.	15-18 years % (n=107)	13.2	18.9	29.2	20.8	17.9	
Consumption of pickles, ketchups and chutneys along with meals	Total % (n=150)	12.7	17.3	29.3	13.3	27.3	0.723, 0.948
	10-14 years % (n=43)	14	20.9	27.9	11.6	25.6	
	15-18 years % (n=107)	12.3	16	30.2	14.2	27.4	

It is evident from table 6 that a good 40% of the participants consumed deep fried foods and fried foods such as puri, kachoris, pakoras and samosas 1-2 times a week. More than a quarter, around 30 % consume fried farsans and chips at snack time 3-6 times a week. Amongst all foods mentioned, the ghee, butter and mayonnaise section were chosen under 'at least once daily' by the maximum number of participants (37.3%). Similarly, nuts were selected by maximum participants under 'once a month or less' section (22%). It is evident from the table that early adolescents were consuming fried farsans and saturated fats like ghee, butter and mayonnaise more frequently than the late adolescents which were also statistically significant with p values of 0.003 and 0.05 respectively.

It can be seen from table 6 above that around more than half the percentage of participants have the high salty snacks quite frequently, with 20.7% consuming it 3-6 times a week, 29.3% consuming it 1-2 times a week and 13.3% consuming it daily. Similarly, for pickles, maximum participants i.e 29.3% said they have it 1-2 times a week followed by 27.3% who had it once a

month or less. 17.3% said they have it 3-6 times a week and 12.7% said they have it daily.

Frequency of consumption of sweetened beverages revealed that 33.3% adolescents consumed it 1-2 times a week and 14.7% consumed it 3-6 times a week. Only 3.3% consumed it daily. 19.3% and 29.3% consumed it 2-3 times a month and once a month or less respectively. Early adolescents consumed sweetened beverages more frequently as evident from table 11 than the late adolescents and it was found statistically frequently. Early adolescents were consuming sweetened beverages more frequently than late adolescents and differences between two groups were found significant (p value, 0.05). Regarding sweets such as laddu, barfi, jalebi, etc, 9.3% consume it daily, 20% consume it 3-6 times a week. Maximum of them i.e. 30.7% consumed it 1-2 times a week. 23.3% and 16.7% consumed it 2-3 times a month and once or less than a month respectively. Consumption of sugar or honey in tea, coffee, curd, lassi,etc were reported, maximum participants i.e 34% of them said they consume it daily. 18.7% and 21.3% said they have it 3-6 times a week and 1-2 times a week respectively. 12% and 14% said they consume it 2-3 times a month and once a month or less respectively. Early adolescents were consuming sugars more frequently than late adolescents and differences between two groups were found significant (p value, 0.03).

DISCUSSION

The study was conducted to understand the meal patterns and to track the consumption of high in fat,sugar or salt foods amongst adolescents and also to understand their knowledge regarding these foods.

Total 150 participants completed the survey.

Waist circumference (WC) to height ratio (WC/HT) is used as a measure of central obesity. However, the optimum ratio that will separate populations with high from low cardiovascular risk remains controversial. (Mehta et.al, 2015). WC/HT ratio is more closely linked to childhood morbidity than body mass index (BMI) and it is suggested that it should be used as an additional or alternative measure to BMI in children as well as adults. A simple public health message that is the same for adults and children of both sexes and all ages could be stated as 'keep your waist circumference to less than half your height'. (McCarthy et.al, 2006).

Energy intake is significantly higher in individuals with high waist to height ratio (>0.5), p value 0.02). Similarly, fat intake was significantly higher in groups with higher waist to height ratio (p value 0.02).

HFSS (High Fat Salt Sugar) foods may be defined as foods (any food or drink, packaged or unpackaged) that contain low amounts of proteins, vitamins, phytochemicals, minerals, and dietary fiber but are rich in fat (saturated fatty acids), salt and sugar and high in energy (calories) that are known to harm health if consumed regularly or in high amounts. (Motta et.al, 2021).

It is evident from the study that high in sugars beverages and sweet preparations are consumed very frequently by these age group participants. Sugar-sweetened beverages (SSBs) are defined as beverages with added sugar, and include sports drinks, sugar-sweetened tea and coffee, soft drinks and electrolyte- replacement drinks. The calories contained in SSBs provide little to no nutritional value and less satiety, as compared to solid food. Hence, SSB intake leads to unhealthy weight gain resulting from a high total energy intake, with little nutritional value (Horst et.al, 2007). Given that almost all SSB are high in calories and not dense in nutrients, their consumption has been associated with excess body weight, type 2 diabetes and CVD (Bailey et.al, 2018). Healthy alternatives can be introduced to the children.

Saturated fats have the tendency to cause an increase in cholesterol levels and contribute to higher fat intake in the foods found in ghee, mayonnaise which are consumed extensively by the participants. Deep fried foods, pakoras, samosas, etc contribute to higher trans fat intake. Trans fat, also called trans-unsaturated fatty acids, or trans fatty acids, is a type of unsaturated fat that naturally occurs in small amounts in meat and milk fat. Trans fat is considered the worst type of fat to eat, raising "bad" cholesterol and also lowers "good" cholesterol. A serving of nuts and oilseeds daily can contribute to a very good quality of fats coming in the diet. Nuts are rich in mono-unsaturated fatty acids and some of them like walnuts and flaxseeds are rich in omega - 3-fatty acids both of which possess heart protective effects like anti-inflammatory in nature and lowering down cholesterol. It can be seens that nuts are consumed in very less frequency by the participants than the other unhealthy sources of fats in their diets.

Food high in salts were also consumed very frequently by the participants. But too much sodium in the diet can lead to high blood pressure, heart disease, and stroke. It can also cause calcium losses, some of which may be pulled from bone. Marrero et. al. compared the salt intake in their study subject with the standard sodium intake recommendations suggested for children and adolescents and found that the sodium intake exceeded these criteria. (Marrero et.al, 2014)

All the fiber based nutrient rich food groups are not frequently opted by the adolescents. Nago et al. conducted a study in 2009 found similar results where the adolescents had a high-fat, low-fruit and vegetable diet (about one-fourth of the required 400 g). Adolescents' daily fruit and vegetable intake declined by an average of 0.7 servings throughout the transition from early to middle adolescence, and by

0.6 serves from middle to late adolescence, according to longitudinal trends (Larson et.al, 2006).

CONCLUSION

It can be concluded that the adolescents consumed foods high in sugars, salts and fats quite frequently with low consumption of fiber rich foods like fruits, vegetables, sprouts etc. Specifically, early adolescents were found to be consuming HFSS foods more frequently. High fats and energy consumption was found more in the group with higher waist to height ratio (>0.5). This eating pattern is worrisome since it can lead to obesity and an increased risk of non-communicable chronic diseases (NTCDs) later in life, such as diabetes, high blood pressure, and dyslipidemia.

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