

Promoting Fruit and Vegetable consumption – Intervention based study on Adolescents

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ABSTRACT

Fruit and vegetables are power houses for vitamins, minerals and plant chemicals. Eating diet rich in fruit and vegetables protect against cancer, diabetes and heart diseases. Consumption of five kinds of vegetables and two kinds of fruit every day leads to healthiness. Fruit and vegetables should be an important part of an individual's daily diet. A well balanced regular diet and a healthy active lifestyle with high intake of fruit and vegetables is more beneficial.

In the present study effort was made to understand the fruit and vegetable consumption pattern among adolescents. Further to create awareness on importance of fruit and vegetable and promote consumption an educational intervention was conducted and found that there was improvement in the awareness of fruit and vegetable and daily consumption.

Keywords: *Adolescents, fruits, vegetables, consumption, physical activity, Intervention*

INTRODUCTION

A diet rich in fruits and vegetables reduces the risk of developing many chronic diseases, including hypertension (Fung et al., 2008) coronary heart disease (Hu, 2003), stroke (He et al., 2006) diabetes (Montonen et al., 2004) and cancer (Key et al., 2002) and also helps in weight management (Rolls et al., 2004). Requirement of high nutrition is essential during childhood and adolescence for rapid growth and development. Several studies have shown the food preference and diet pattern during childhood and adolescence tend to be maintained well into adulthood (Kelder et al., 1994; Lytle et al., 2000; Craigie et al., 2002; Craigie et al, 2011; Mikkila et al, 2004, 2005).

Unfortunately, there is a decrease in the overall quality of diet from childhood to adolescence and young adulthood (Demory-Luce et al., 2004; Larson et al., 2007). The change is more notable in the consumption of fruit and vegetables during adolescence (Larson et al., 2007). Studies with college and school going students suggest that, approximately only 20-30% of adolescents consume fruits and vegetables as per RDA (Huang et al., 2003; Kolodinsky et al., 2007). Diets have evolved over time and are potentially influenced by several factors as family income, prices, habits, culture and tradition, individual preferences, and as well the environmental, social and economic factors.

Presentday India is under rapid nutritional transition. Modern societies seem to be converging on high in saturated fats, sugar and refined foods that are mostly low in fibre - and often termed – “Western diet”. There are evidences that children and adolescents living in urban societies are increasingly becoming overweight/obese in recent times, that possibly could be due to their dietary habits. Along with it there is this shift toward increased obesity and non-communicable diseases (NCDs) which in turn is further aggravated by lifestyles characterised by lower levels of activity (Popkin and Gordon-Larsen, 2004). Consequently, there have been calls for dietary interventions for children, adolescents, and adults (e.g., Adamson & Mathers, 2004; Demory-Luce et al., 2004; Larson et al., 2007).

This paper examines the evolving Fruit and Vegetable (F&V) consumption pattern among the adolescents of Tirupati, Chittoor district, AP, India. The investigator assessed the influence of dietary intervention and education over a period of 3 months on the dietary patterns with special focus on fruit and vegetable consumption that is largely affected by globalization, increasing urbanization and changing lifestyle of people.

METHODOLOGY:

Experimental design

The study was undertaken to assess the dietary patterns and the influence of nutritional intervention among the rural students as the prime objective of study was to include adolescent age group. The students in the age group of years studying in class 8th, 9th and 10th were the subjects in the age group of 12-15 years in the schools of Tirupati urban. Prior permission and consent was obtained from the school authorities, students and the parents and they were completely made aware of the study.

Selection of students

A total of 189 students were selected for the study using random purposive stratified sampling method of them 103 was boys and 86 girls.

Data collection techniques

A questionnaire was given to each student and were allotted a period of 30 to 45 minutes to complete. The questionnaire contained questions about the initial dietary habits, F&V consumption patterns of the students. Couple of days after complete assessment about their life style, general preferences, food habits and patterns, the students attended classes on nutrition for about three hours in a week for 3 months. The classes on nutrition highlighted the importance of fruits and vegetables, nutritive value and health benefits and medicinal value of fruits and vegetables, facts about junk food and importance of physical activity were also highlighted in nutritional intervention programme. The students were also given activity based study to collect information on 2 fruits and vegetables and also to find different recipes on the selected fruits and vegetables.

The students were asked to get any fruit and vegetable to eat over the day during break hours every day for a period of 3 months.. The parents were also requested to send F&V along with their lunch. Three months after nutrition intervention, the students were handed the questionnaire and were allowed to answer in about 30-45 minutes. The data was collected and assessed.

Statistical Analysis

The data were analysed by SPSS version 22.0. Values at $p < 0.05$ as obtained by 't' test were considered significant.

RESULTS

Consumption of fruits and vegetables

Students were questioned about the consumption of fruits and vegetables. Initial assessment revealed that more than 50% of students consumed less than 4 servings, with 22.14% consuming just 1 serving a day on an average (Table 1). Further the intake of green leafy vegetables among the students was observed to be also very low, with just about 3.25% of students consuming greens 4 times per week and 0.62% consuming 5 times. Also, we found that 39.26% do not have greens at least once in a week.

Interestingly, following nutrition intervention and education, we observed a significant ($p<0.05$) improvement on the intake of fruits and vegetables. 77.9% of students took 5 servings of fruits and vegetables as against 15.89% observed before nutritional intervention and education. Further, we also noticed a marked improvement in the consumption of greens. The percentage of students who consume greens at least thrice a week increased from 12.72% to 39.96%. This remarkable increase in consumption of fruits and vegetables and greens would be due to nutritional intervention programme.

Table 1 Consumption of Fruits, vegetables and greens

	Initial Assessment		Assessment 3 months following nutrition intervention and education	
No. of servings	Fruits and vegetables consumed by students per day (in %)	Green leafy vegetables Consumed by students per week (in %)	Fruits and vegetables consumed by students per day (in %)	Green leafy vegetables Consumed by students per week (in %)
1	22.14	20.00	-	10 [#]
2	19.75	24.15	-	20.43
3	27.23	12.72	13.09 [#]	39.96 [#]
4	20.15	3.25	9.01 [#]	17.39 [#]
5	15.89	0.62	77.90 [#]	12.04 [#]

represents values at $p<0.05$ as determined by students "t" test; where p = initial assessment vs after 3 weeks following nutritional intervention. Values are represented as mean.

Consumption of carbonated beverages and water

Recent days there is an increased consumption of carbonated beverages and sugar rich fruit drinks. This trend largely affects diet pattern. In this study the consumption of carbonated beverages as coke, pepsi, sprite etc., among the students per week were assessed. The observations revealed that invariably all students did consume the beverages at least once a week with an alarming percentage of 39.88% drinking the beverages atleast 4 days in a week and 11.80% having in more than 5 days of a week (Table 2). Water consumption was found to be lesser with just 65.24% drinking more than 5 glasses of water a day. However following nutrition education, there was a marked decline in consumption of carbonated beverages and interestingly noticed a significant ($p<0.05$) improvement in drinking of water. 99.49% of students had increased water consumption to more than 5 glasses a day.

Table 2 Consumption of Carbonated beverages and water

	Initial Assessment		Assessment 3 months following nutrition intervention and education	
No. of glasses of water & beverages /day	Consumption of carbonated bevarages by students per week (in %)	Glasses of water had by students per day (in %)	Consumption of carbonated bevarages by students per week (in %)	Glasses of water had by students per day (in %)
1	7.39	-	28.46 [#]	-
2	19.71	-	57.12 [#]	-
3	21.22	-	10.08 [#]	-
4	39.88	34.76	1.07 [#]	0.51 [#]
≥ 5	11.80	65.24	0.52 [#]	99.49 [#]

Rest 2.75% didn't consume

represents values at $p < 0.05$ as determined by students "t" test; where p = initial assessment vs after 3 weeks following nutritional intervention. Values are represented as mean.

Consumption of packaged snacks and outside food

The students were questioned about consumption of packaged food as lays chips, chips, snacks, biscuits, kurkure etc., and also about the frequency of having food outside other than home .More than 50% of Students have packaged snacks more than five days in a week and invariably all students eat these snacks at least one day in a week. Students also eat outside food other than home cooked food at least one meal on at least one day in a week. While 30.43% students reported having outside food at a restaurant or bakery shops on an average of 4 days in a week. When questioned about their preference towards fast food, pizza etc, majority of students liked the flavour even while they were aware about the empty calories from the food. Nutrition intervention and classes gave a marked change in the behaviour of the students with regard to their consumption of packaged food and snacks and also having outside food. Significant ($p < 0.05$) reduction in the percentage of students having packaged food and frequency of consuming outside food was noticed. Further interestingly, a noticeable change was observed among the food preferred by the students while dining outside (**Fig 1**). Percentage of students who preferred pizza and other fast food decreased

from 53% to 48.75%, while percentage of those who preferred bakery products as puff, cakes etc., reduced from 20.56% to 16.50%. A considerable increase from 1% to 8.25% was seen in the percentage of students taking soups and sandwich. The results suggest a favourable increase towards the healthy side.

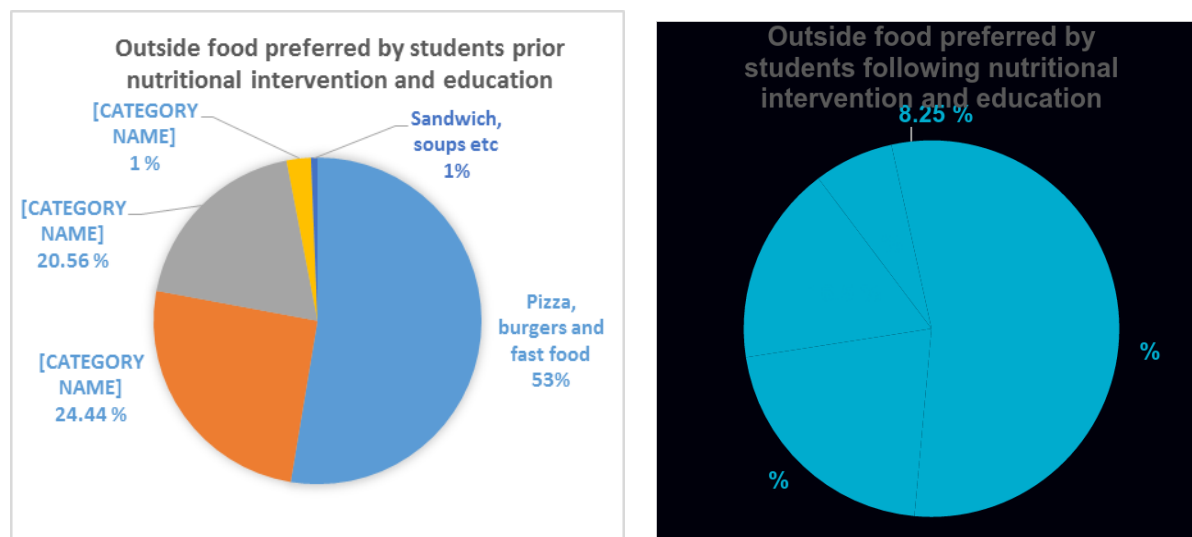


Fig 1. Outside food preferred by students prior nutritional intervention

Table 3 Frequency of eating outside food and consumption of packaged food

	Initial Assessment		Assessment 3 weeks following nutrition intervention and education	
No. of times	Having food outside home by students per week (in %)	Consuming packaged food by students per week (in %)	Having food outside home by students per week (in %)	Consuming packaged food by students per week (in %)
1	25.11	-	29.88	43.21 [#]
2	13.25	2.02	55.02 [#]	29.00 [#]
3	10.22	7.30	14.09 [#]	8.40 [#]
4	30.43	31.35	1.01 [#]	19.39 [#]
≥ 5	22.90	59.33	-	-

represents values at $p < 0.05$ as determined by students "t" test; where p = initial assessment vs after 3 weeks following nutritional intervention. Values are represented as mean.

Time spent on physical activities by students

Physical activities are essential for good health and is highly recommended by doctors. Here we assessed the amount of time that students spent on physical activity as cycling, walking, exercising or some kind of sport. Surprisingly we found 20.21% of the students do not get much involved in any after school physical activities, apart from a little domestic help, traveling to school or for shopping etc., (Table 4) Following education on nutrition highlighting the importance of physical activity and risk of developing health complications

we found a remarkable increase in the percentage of students getting involved in physical exercise. 41.34 % of students spent at least 4-5 hours on physical activity per week as against 21.80 % prior nutritional intervention and education. Further all the students got engaged in physical activity as against 20.21% who were not much involved prior. Also marked ($p<0.05$) decrease in the time spent on watching TV or playing video games were observed (Table 9). Initial assessment revealed that nearly 65% of students spent 3-4 h a day on watching TV and/or on video games. This percentage drastically fell to 10.54% following nutritional intervention and education.

Table 4 Time spent by the students in doing physical activity or any sport per week(in%)

Time spent in hours	Initial Assessment	Assessment 3 weeks following nutrition intervention and education
2-3	17.19	4.90 [#]
3-4	14.62	4.31 [#]
4-5	21.80	41.34 [#]
5-6	15.28	30.35 [#]
≥ 7	10.90	19.10

Remaining 20.21% are not much involved in physical activity

Table 5 Time spent by the students watching TV and/ or playing video games perday (in%)

Time spent in hours	Initial Assessment	Assessment 3 weeks following nutrition intervention and education
1-2	9.10	28.10 [#]
2-3	10.62	61.36 [#]
3-4	65.00	10.54 [#]
4-5	15.28	-
≥ 5	-	-

represents values at $p<0.05$ as determined by students "t" test; where p = initial assessment vs after 3 weeks following nutritional intervention. Values are represented as mean.

DISCUSSION

Globally, our diet is becoming increasingly energy-dense and is loaded with less fibre. Also, there is an increase in consumption of soft drinks and sugared fruit drinks which is a critical concern in the shift in dietary pattern (Guthrie and Morton, 2000; Ludwig, 2002). Recently, several health concerns have been raised due to the high consumption of energy dense food

been linked with obesity and as well other serious health conditions as diabetes etc.,. The present research examined the effectiveness of implementation of nutritional intervention and education to the adolescent students between ages 12 – 15 for promoting fruit and vegetable consumption as a function of healthier status.

In adolescents, fat accumulation the accumulation has been identified as a risk factor for the occurrence of cardiovascular and metabolic diseases as type 2 diabetes mellitus, dyslipidaemia, non-alcoholic steatohepatitis and obstructive sleep apnoea, orthopaedic and psychosocial problems (Wright et al., 2001) In the study, BMI assessment among the students revealed that nearly 80% of students had a BMI falling under overweight and obese categories indicating alarming health risks.

Further authours observed high consumption of soft drinks and fast food, bakery products, sweets and a low intake of fruits and vegetables among students. Almost all students had packaged snacks as chips, biscuits etc., at least thrice a week, with over 59.33% students having almost every day in a week. These dietary patterns are associated with higher abdominal fat accumulation among adolescents (Francis et al., 2009). Moreover energy balance is influenced by behavioural factors related to diet, activity and sedentary patterns, and also sleep behaviours (Hill and Peters, 1998).

Lack of physical activity was also noticed among students. Majority of the students spent more time sedentary watching TV or playing video games etc than getting involved in some kind of exercising or playing games. Surprisingly nearly one-fifth of the students spent less than 2 hours a week in playing after school hours. Physical activity is a must for maintaining good physical health and as well mental well-being. This is influenced by lot of factors as choices of programs to be watched on TV, parents feel safe when children are at home during evening hours especially girls etc.,.

Considering all the above factors and dietary patterns, nutritional intervention and education was given to students after informed consent to the school authorities, students and their parents. The students were asked to take 3-4 servings of fruits and vegetables every day for 3months . The students also attended classes on nutrition thrice in a week for one hour for a period of 3 months. Following 3 months after intervention, the students were assessed again.

Interestingly, students were found to be more aware of the benefits of eating more fruits and vegetables. The daily consumption was increased. Almost 78% of students ate 5 or more servings of fruits and vegetables. Further, the frequency of having fast food, carbonated

beverages and packaged snacks reduced remarkably. Students were found to have less outside food and also had more water. Nutritional education had also influenced the food they preferred eating out. More students opted for healthy food as soups, sandwiches, rotis etc.,. The healthy choices could be definitely due to the awareness on the benefits of having healthy food and avoiding unhealthy snacks, drinks etc.,

The change in the dietary pattern of the students had definitely influenced their life style. More students got involved in some physical activity or sport after school hours, that made them more physical active and mentally alert. They also spent less hours watching TV As per parents feedback this would show a positive influence on their academic performance. Over all the observations of the study suggest. There was change in the dietary pattern and lifestyle behaviour of adolescents due to influence of nutritional intervention programme.

CONCLUSION:

Many studies revealed that adequate intake of fruit and vegetables are necessary for maintaining good health for any age group. Optimal intake protect against the main non-communicable diseases. A diet rich in fruit and vegetable is recommended for adolescents. But low level of fruit and vegetable consumption among adolescents during school times is common because of their exposure to junk food of peer influence and media influences. Traditional foods are substituted by modern foods like fast foods, ready to eat and other junk foods. So schools can have a separate council that monitors the diet and physical health of the students. Parents also should be made aware of the risks involved in frequent consumption of fast food, packaged snacks, bakery products and carbonated beverages. Parents should also equally contribute on monitoring diet of their children. Parent – teacher meetings should highlight the child's dietary and physical activity pattern along with academic issues.

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