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A STUDY ON EFFECT OF CONSUMPTION OF CARBONATED BEVERAGES ON NUTRITIONAL STATUS AND ACADEMIC PERFORMANCE AMONG SCHOOL GOING CHILDREN (13-17 YEARS)

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ABSTRACT

Soft drink consumption in past two decades has increased enormously by 300%. Studies shows 56–85% children in school consume at least one soft drink daily, each additional can or glass of sugar-sweetened drink consumed makes them 1.6 times more obese. Carbonated beverages consumption on regular basis is associated with many health problems such as type-2 diabetes, tooth decay, nutrition depletion, obesity and heart disease. High doses of caffeine cause irritability restlessness, tension. Insomnia, high blood pressure, gastrointestinal disturbance, irregular heart beat. The objective of this study was to assess the frequency and factors contributing to consumption of carbonated beverages among school going children (13-17yrs), also its effect on their nutritional status and academic performance was analyzed. The samples were selected 100 in number and divided into two equal groups consumers and non- consumers each group consists of equal number of boys and girls. The result showed that boys were consuming more carbonated beverages (>2000ml in a week) as compared to girls. Also there was a significant association at level ($p<0.05$) between BMI percentile and frequency of consumption as more consumers were found to be overweight and obese as compared to its counterpart. A significant association was also seen ($p<0.05$) between annual academic performance of consumers when compared to non- consumers. Although no significant association ($p<0.05$) was seen between school attendance and frequency of intake. On comparing the dietary intake of consumers and non-consumers there was a significant difference at level $p<0.05$ in energy, fat and carbohydrates intake which was higher in consumers and calcium, iron and protein intake was found to be significantly lower at level $p<0.05$ in consumers when compared to counterpart.

Keywords: Drinks, Insomnia, Blood Pressure, Gastrointestinal, Heart Beat.

INTRODUCTION

A carbonated beverage is a beverage that contains the characteristic of carbonation. Carbonation creates bubbles and fizzing in a carbonated beverage due to the presence of the carbon dioxide gas. Carbonation occurs both naturally and artificially. Carbonated beverages include spring water, beer and soda, or "pop."

These drinks taste good and give a feeling of being refreshed. Instead of occasionally having these drinks, people these days have started using it as an alternative for water and other natural drinks. Carbonated drinks are usually referred to as a sugary drink. Carbonated drinks are often carbonated and commonly consumed while chilled or at room temperature.

Carbonated beverages contain little to no vitamins or other essential nutrients. However, it contains caffeine, carbonation, simple sugar or worse sugar substitutes and often food additives such as artificial coloring, flavoring, and preservatives. There has been a remarkable rise in the

consumption of the soft drinks. Majority of the people are not aware that too much of soft drinks can cause severe health problems from which one can hardly recover.

A lot of research has found that consumption of soft drinks in high quantity, especially by children, is responsible for many health problems that included:

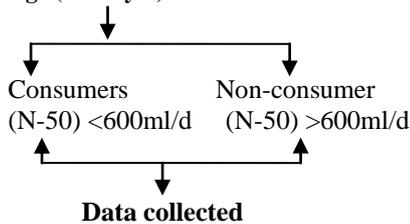
- Tooth Decay,
- Nutritional Depletion
- Obesity
- Type-2 diabetes
- Heart disease
- Mental distress

MATERIAL AND METHODS

The present study was aimed to assess the effect of consumption of carbonated beverages on nutritional status and academic performance among school going children (13-17 years).

Total sample (N=100)

Age (13- 17yrs)



- Demographic profile of subjects
- Frequency of soft drink consumption
- Factors influencing consumption of soft drinks
- Academic record of consumers and non-consumers
- Nutritional status of school going students

Development of tools and techniques -- Questionnaires for the collection of general information, anthropometry measurement, biochemical parameters, clinical symptoms, dietary recall and academic performance.

RESULTS AND DISCUSSION

Table: 1 Distribution of subjects according to the type of family

Type of family	Consumers (N-50)
Nuclear	37(74%)
Joint	13(26%)

The value in parenthesis represents percentage (%).

The above table reveals that distribution of subjects according to the type of family i.e. nuclear and joint family. 74% consumer belongs to nuclear family whereas 26% consumer belongs to joint family. This shows a majority of consumer were belonging to nuclear family.

Table 2 Association between family income of consumers and non- consumers

Family Income/ Month	Consumers (N- 50)	Non- Consumers (N- 50)	Chi-Square Test
Less than 10,000	9(18%)	10(20%)	1.00 ^{NS}
10,000-15,000	19(38%)	19(38%)	
Above 15,000	22(44%)	21(42%)	

^{NS} at level $p < 0.05$

The value in parenthesis represents percentage (%)

The above table showed that 44% consumer and 42% non consumers belongs to >15,000 income whereas 18% consumer and 20% non-consumers belongs to < 10000 income. Thus the 38% of both groups equally belong to 10,000-15,000. This represent that there is no association between family income and consumption pattern of

carbonated beverages. As the family income increases the number of consumer in a particular group also increases.

Table: 3. volume of intake of carbonated beverages among consumer

Volume/Week	<1000ml	1000ml-2000ml	>2000ml
Boys (25)	5(20%)	8(32%)	12(48%)
Girls (25)	8(32%)	7(28%)	10(40%)

The value in parenthesis represents percentage (%)

The above table shows that the consumers are equally divided into two groups i.e. boys and girls, shows the volume of consuming carbonated beverages is high in boys as compared to girls. 48% of boys consume > 2000 ml in a week, 32% of boys consume 1000-2000ml and 20% of boys consume < 1000ml carbonated beverages whereas 40% girls consuming > 2000 ml in a week, 28% of girls consume 1000-2000ml and 32% of girls consume <1000ml in a week. Thus showing girls consume lower amount of carbonated beverages.

Table 4 Factors influencing the consumption of carbonated beverages

Factors	Consumer (N-50)
Likes taste	32(64%)
Celebration	12(24%)
Peer pressure	2(4%)
Thirst	4(8%)

The value in parenthesis represents percentage (%)

The above table depicts that taste of carbonated beverages is the major influencing factors due to which 64% subjects were consume carbonated beverages this may be due to the presence of caffeine in the drink because of which subjects might be addicted to its consumption. Similarly 24% subjects consume carbonated beverages during celebration and 4% of consumers carbonated beverages because of peer pressure, they also consume soft drinks as their friends offer them or during a party and 8% subject were consume soft drinks in place of water to quench their thirst.

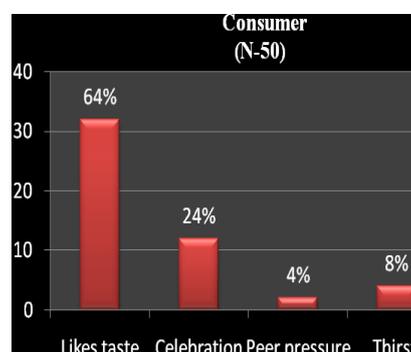


Figure: 1 Factors influencing the consumption of carbonated beverages

Table: 4 Mean ± SD of anthropometric measurement of consumers and non- consumers of carbonated beverages

Category	Consumers (n-50)	Non-Consumers (n-50)	T-test
Height(cm)	147.5±10.47	154.3±12.03	3.090*
Weight(kg)	49.2±11.46	36.9±8.5	6.11*
BMI(kg/m ²)	23.1±3.4	15.8±2.8	11.77*
Waist/Hip ratio	0.94±0.097	0.77±0.11	1.7*
MUAC(cm)	34.2±18.8	23±4.6	4.102*

*P<0.05

The above table shows the anthropometric measurements of consumer and non consumers. The present data reveals that the mean height of consumer and non-consumer was 147.5 cm and 154.3 cm respectively and significantly proved at p<0.05. The mean weight of non-consumer was less as compared to consumer i.e. 36.9 Kg and 49.2 Kg which shows a significant difference at p<0.05. The BMI of consumer was 23.1 and in non-consumer was 15.8 which was also significant at p<0.05. There was significant difference between waist hip ratio of

consumer and non-consumer and the mean was 0.94 and 0.77. The MUAC was observed 23 cm and 34.2 cm in non-consumer and consumer respectively and shows a significant difference among two groups. A study showed strong relationship between soft drink consumption and body weight that for each additional soda consumed, the risk of obesity increased 1.6 times. According to the researchers reducing consumption of sugar-sweetened beverages helped reduce weight in the heavy teenager.⁽²⁰⁾

Table: 5 Association between hemoglobin and consumption of carbonated beverages

Hemoglobin level (g/dl)	Consumer	Non-consumer	T-test
Mean ± SD	8.5±1.48	11.2±1.54	8.7*

*p<0.05

The above table shows that there is a significant difference between hemoglobin level and consumption of carbonated beverages. The mean value of hemoglobin in consumers is 8.5(g/dl) and for non- consumers it is 11.2(g/dl). This showed that those consuming more carbonated beverages were more anemic as compared to its counterpart.

Table No.-6 Comparative data on daily nutrient intake of consumers and non- consumers (13-15 year)

Nutrient		RDA	Non-consumers (N-25)	Consumers (N-25)	T-Test
Energy (kcal/d)	Boys	2750	1545.24 ±347.49	1980±220.53	3.73*
	Girls	2330	1536.34 ±260.24	1874.1±346.56	2.54*
Protein (g/d)	Boys	54.3	54.88 ±6.51	43.8 ±8.8	3.11*
	Girls	51.9	50.2 ±7.36	41.44±4.72	3.37*
Fat (g/d)	Boys	45	45.1 ±9.33	58.73±15.08	2.82*
	Girls	40	39.25 ±12.38	55.1±11.82	3.06*
Carbohydrate (g/d)	Boys	412.5	253.21 ±53.49	302.68±38.35	2.66*
	Girls	349.5	177.11 ±36	283.64±49.6	5.62*
Calcium (mg/d)	Boys	800	600.5±70.7	449.46±67.9	5.53*
	Girls	800	589.85±81.7	448.14±70.4	4.3*
Iron (mg/d)	Boys	32	14.55±1.94	10.93±2.41	4.30*
	Girls	27	15.18±2.3	10.63±1.74	5.68*

*p<0.05

ENERGY

It is seen from the above data that intake of energy is significantly higher at P<0.05 among the consumer group of both girls and boys i.e. (18% and 21% respectively) in the age group of 13-15 years whereas in the age group of 16-17 years boys (27%) and girls (9%). There is clear evidence suggesting secular increases in soft drink consumption. Study shows that intake of energy is more than non consumers specifically by the boys that increase in 31 calories. This type of shift in beverage

consumption patterns has been shown to affect diet quality and total caloric intake in children and adolescents.⁽²⁸⁾

PROTEIN

The above tables shows that intake of protein is significantly less at P<0.05 among the consumer group in both age (13-15 yr, 16-17 yr) specifically in boys. The protein intake is significantly less in boys i.e. is 20% and also in girl's i.e.17% of age group 13-15 yr. The above table depicts that 44.3% energy intake in boys and 16.3% in girls of age group 16-17 yr is less in consumer group when compared to their counterparts i.e. non consumers.

Table No.-7 Comparative data on daily nutrient intake of consumers and non- consumers (16-17 year)

Nutrient	Gender	RDA	Non-consumers (N-25)	Consumers (N-25)	T-Test
Energy (kcal/d)	Boys	3020	1596.42±253.1	2209.5±153.0	7.29*
	Girls	2330	1536.34±260.2	1874.14±346.5	2.54*
Protein (g/d)	Boys	61.5	55.39±8.66	39.76±11.39	3.73*
	Girls	51.9	50.2±7.36	41.44±4.72	3.37*
Fat (g/d)	Boys	50	44.05±11.39	56.64±6.75	3.18*
	Girls	40	39.25±12.38	55.1±11.82	3.06*
Carbohydrate (g/d)	Boys	453	182.46±32.10	263.89±57.13	4.19*
	Girls	349.5	177.11±36.87	283.64±49.6	5.62*
Calcium (mg/d)	Boys	800	624.24±52.6	466.27±166.0	3.36*
	Girls	800	589.85±81.7	448.14±70.4	4.3*
Iron (mg/d)	Boys	28	12.97±3.81	10.64±2.45	6.61*
	Girls	27	15.18±2.3	10.63±1.74	5.68*

*p<0.05

soft drink consumption is associated with consumption of milk, fruit juice, and the nutrients concentrated in these beverages showed that those in the highest soft drink consumption category consumed less milk and fruit juice compared with those in the lowest consumption category (non-consumers).

FAT

The above data shows that intake of fat is more in the consumer group. The mean value for fat intake in consumer and non consumer group are statistically significant at P<0.0005. The intake of fat in the age group of (13-15 yr) is 23% higher in boys & 28% in girls whereas in (16-17 yr) age group 22% in boys & 23% in girls.

CARBOHYDARTE

The intake of carbohydrates is higher in both boys and girls of all age group. The above table shows that intake of carbohydrate more in consumers group i.e. 16% in boys and 37% in girls in the age group of (13-14 yr) whereas 30% in boys and 28% in girls higher in age group of (16-17 yr) as compared to non consumers. The mean

value of carbohydrate intake in consumer and non consumers group is statistically significant at p<0.005.

CALCIUM

The above table shows that calcium intake among the consumer group is less as compared to the intake of non consumers. It shows that there is 25% less intake in boys and 24% in girls in the age group of (13-14 yr) whereas 33% in boys and 22% in girls in the age of (16-27 yr). The means values of calcium for consumer and non consumers groups are statistically significant at P<0.005.

IRON

Consumption of iron rich foods was found to be less in both the groups when compared with the recommended dietary allowance. This showed that the diet of the subjects was not adequate enough in iron content. The table depicts that there was lesser intake of iron i.e 24% in both girls and boys of age group (13-14 yr) whereas 44% in 21% boys and 31% in the (16-17 yr).

Table: 8 Association between annual academic performance and consumption of carbonated beverages among school going children

Result (%)	20-40%	40-60%	60-80%	80-100%	Chi square
Consumer (N-50)	19(38%)	21(42%)	9(18%)	1(2%)	9.3*
Non-consumer (N-50)	6(12%)	27(54%)	15(30%)	2(4%)	

*p<0.05

The values in parenthesis represent percentage (%). The above table shows that there is a significant association at level p<0.05 between an academic performance and consumption of the carbonated beverages where in 2% of the consumer showed good academic result in contrast to 42% showed average academic performance (40-60%) whereas non- consumer shows a higher percentage (54%) of the subjects having average result also in 60-80% category include 30% of non-

consumers and 18% of consumers. Similar studies conducted by a researcher suggest a strong relationship between high carbohydrate intake and low academic performance as is seen in present study. The above said was reported by Nazni *et.al.*, (2011) in her study that academic performance was increased significantly at 1% level.

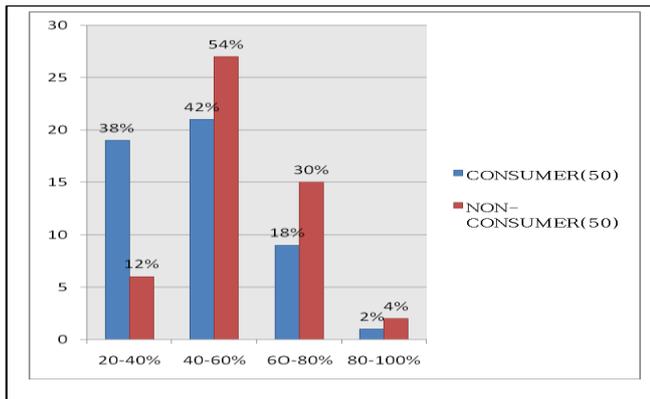


Figure: 2 Association between annual academic performance and consumption of carbonated beverages among school going children

CONCLUSION

The present study concluded that the consumption of carbonated beverages was higher among boys in the age group of 16 – 17 years. It also show that 48% of boys consume >2000 ml in a week. A Significant result was observed when BMI percentile of consumer and non consumer was compared where in mean of BMI percentile of consumer is 23.1(kg/m²). The Dietary pattern indicates a significantly higher energy intake and prevalence of anemia was observed among consumer of carbonated beverages. Majority of the subjects in consumer group skip their meal regularly the consumption of milk and green leafy vegetables was less among consumers when compared to its counterpart. This shows that overweight and obesity are associated with poorer levels of academic performance.

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