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Assessment of consumption patterns of soft drinks and its impact on nutritional status among young adults of Kolkata

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Abstract

Soft drinks are non-alcoholic beverages that primarily consist of fruit juices and carbonated beverages. Soft drinks and other liquids with added sugar are viewed as unhealthy food items since they are high in calories but low in nutrients. India's populace continues to crave sugary soft drinks even as the rest of the globe is losing interest in these toxic beverages. The purpose of the present study was to determine the association between consumption of soft drinks and its impacts on nutritional status. This cross-sectional study was conducted among 100 younger adults, aged 20-30 years selected randomly from different social media resources based on Kolkata, West Bengal India. Present online survey was conducted on the basis of responses obtained from using pretested standardised questionnaires. The google forms were prepared and shared with the respondents. Social media platforms were used like Facebook, WhatsApp, LinkedIn. In the present study total 2% respondents were underweight,30% were normal and 68% respondents belonged to overweight/obesity.88% of respondents are aware about the unhealthy impact of soft drinks. Whereas considering practice 6% of the respondents drink soft drinks daily and 25% have it on a weekly basis.42% of the respondents prefers regular soft drinks whereas 46% prefers fruit flavoured cold drinks. Again 62% of the respondents prefers coloured soft drinks. Considering attitude of the respondents 12% of them still willing to have soft drinks even after knowing its ill effects on tooth enamel. Further studies using descriptive research designs are needed to better understand the prospective associations among beverage consumption and obesity in the age group of 20 to 30 years, who are the future of our country.

Keywords: Obesity; Soft drink consumption; Health risk; Young adults

1. Introduction

Soft drinks are non-alcoholic beverages that primarily consist of fruit juices and carbonated beverages. Carbonated beverages are made up of a chemical mixture of natural or artificial sweeteners, caffeine, water, colour, flavouring agents, and chemical preservatives that have been injected with CO2 gas [1]. Soft drink demand costs around US $80 million, and its fruit juice market share is worth $12 million. Sugar-sweetened beverages are harmful to both general and oral health [2]. Soft drink consumption is linked to increased body weight and decreased nutritional intake, which can lead to the development of various noncommunicable diseases such as cancer and heart disease [1]. The high prevalence of diabetes, cardiovascular disease (CVD), and premature mortality impose significant economic and health costs on society [3]. Sugar-sweetened carbonated beverages promote weight gain and obesity in adults and adolescents. Soft drink consumption in children and teenagers has been shown in studies to reduce dietary intake of vitamins A and C, calcium, magnesium, and riboflavin [4].

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Soft drinks are distinguished by the presence of carbon dioxide (the gas), citric acid, malic acid, and phosphoric acid, as well as preservatives and colorants, a high sugar content and a high caloric density [5]. 350 mL of soft drink contains 140 to 150 calories and 35.0 to 37.5 grams of sugar on average, making it a high caloric density food [6]. Carbonated beverage consumption has increased dramatically in recent decades, rising from 9.5 gallons per person per year in 1997 to 11.4 gallons per person per year in 2010.Soft drink consumption is associated with an increase in serum triglyceride levels, an increased risk of type 2 diabetes mellitus, dental caries, and metabolic syndrome [7]. Furthermore, several epidemiological studies have found a link between soft drink consumption and obesity [8]. The negative effects of soft drinks on the development of obesity may be due to the high sugar content of these beverages, which is accompanied by a lower power of satiety, as well as the inability to compensate for the consumption of calories from sugars by reducing other foods [9].

Soft drinks and other liquids with added sugar are viewed as unhealthful food items since they are high in calories but low in nutrients [10.11] revealed that despite India's consumption being somewhat lower than the global average, sugar-based drinks nevertheless result in over 10,000 fatalities annually [12]. India's populace continues to crave sugary soft drinks even as the rest of the globe is losing interest in these toxic beverages [12]. Therefore, it is crucial to comprehend what motivates young Indian customers, who are regarded as the country's growth drivers, to consume a lot of soft drinks. [13]. Numerous factors have been put out by researchers as to why the consumption of soft drinks is rising, but more information is required to help with the formulation of successful intervention programmes [14]. In order to encourage people to consume less sugar, especially in the form of sugar-sweetened beverages, the World Health Organization (2015) underlined the need to assess various behavioural change strategies. Given the significant sociocultural significance of food [15,16], it is important to conduct formative research in a particular national context because the relative importance of various components can vary between countries [10]. Investigating consumer behaviour and preferences in the target market is smart and timely given the rising level of competition and the arrival of numerous domestic and foreign competitors into the soft drink business. Recent changes in the soft drink industry have made it more important than ever to do research on customer needs, preferences, and the factors that influence their consumption [16,17, 18]. In order to create effective marketing strategies for this emerging market with so much potential, marketers will benefit from having a better understanding of the attitudes and consumption patterns of Indian consumers. Agencies interested in promoting healthy foods and beverages will also benefit from this understanding. The ageing effect is likely to have an impact on consumers' decision-making and consumption behaviour [19], and among the different generational groups, Gen Y consumers (aged between 18 and 29 years) are the most significant and targeted in the food market and in the markets for soft drinks [10,20].

An effective food labelling system can aid in the reduction of obesity by allowing consumers to make healthier purchasing decisions [21]. It is also critical that all customers understand food labelling schemes [22]. Product labels with traffic lights have been shown to assist consumers in making healthier food choices [23,24]. Experts focused on product labelling as a critical method for educating people and assisting them in making healthier choices. As previous works demonstrate, it ensures that product labelling is an important source of information that can influence consumer decision-making. [25]. The purpose of this study was to determine the consumption pattern and its association with nutritional status.

2. Material and methods

This cross-sectional study was conducted among 100 younger adults, aged 20-30 years selected randomly from different social media resources based on Kolkata, West Bengal India. The study was conducted during October 2021 to January 2022.Simple random sampling was used to select the respondent and further were screened according to the objective of the study. Present online survey was conducted on the basis of responses obtained from using pretested standardised questionnaires. The google forms were prepared and shared with the respondents. Social media platforms were used like Facebook, WhatsApp, LinkedIn.

The data were put in Microsoft excel worksheet (Microsoft, Redwoods, WA, USA) and checked for accuracy. Coding was done accordingly. Association between two attributes were calculated by Pearson‘s Chi -square test. $P < 0.05$ was considered statistically significant. All statistical tests were conducted using Statistical Package for the Social Sciences software, version 20.0 (SPSS Inc.,Chicago, IL, USA), by keeping BMI status level (undernutrition/ normal/overweight or obese(I,II & III)) as a dependent variable.

3. Results and discussion

Table 1 Summary of soft drink consumption pattern and its association with nutritional status of the respondents (N=100)

Parameters	BMI						Total *n* (%)	Chi-square test(p)
	Underweight *n* (%)	Normal n (%)	Overweight n (%)	Obesity-I *n* (%)	Obesity-II *n* (%)	Obesity-III *n* (%)		
Age (years)								
20-25	2 (2.94)	21 (30.88)	11 (16.17)	26 (38.23)	6 (8.82)	2 (2.94)	68 (100)	6.42 (0.26)
26-30	0 (0.00)	9 (28.12)	1(3.12)	19 (59.37)	2 (6.25)	1 (3.12)	32(100)	
Do you think that consumption of cold drinks is good for your health?								
Yes	1 (12.5)	3 (37.5)	1(12.5)	3 (37.5)	0 (0.00)	0 (0.00)	8 (100)	7.91 (0.63)
Maybe	0 (0.00)	1 (25.0)	0 (0.00)	3 (75.0)	0 (0.00)	0 (0.00)	4 (100)	
No	1 (1.13)	26 (29.54)	11(12.5)	39 (44.31)	8 (9.09)	3 (3.40)	88 (100)	
Consumption of cold drinks are very harmful to health; it gives extra calories and no nutrients. So, if asked to, will you stop consuming cold drink?								
No	1 (5.55)	5 (27.77)	4 (22.22)	6 (33.33)	1 (5.55)	1 (5.55)	18 (100)	4.64(0.46)
Yes	1 (1.21)	25 (30.48)	8 (9.75)	39(47.56)	7 (8.53)	2 (2.43)	82(100)	
How often do you consume cold drinks?								
Never	0(0.00)	0 (0.00)	2 (100)	0 (0.00)	0 (0.00)	0 (0.00)	2 (100)	35.90 (0.01)
Occasionally	1 (2.04)	17 (34.69)	4 (8.16)	23 (46.93)	2 (4.08)	2 (4.08)	49(100)	
Monthly	1 (5.55)	7(38.88)	2 (11.11)	5(27.77)	3 (16.66)	0 (0.00)	18(100)	
Weekly	0 (0.00)	5(20.00)	4 (16.00)	15(60)	1 (4.00)	0 (0.00)	25(100)	
Daily	0 (0.00)	1(16.66)	0 (0.00)	2(33.33)	2 (33.33)	1 (16.66)	6(100)	
What types of cold drinks do you prefer to consume?								
Plain soda water	0(0.00)	1(33.33)	1 (33.33)	1(33.33)	0 (0.00)	0(0.00)	3(100)	15.5(0.74)
Regular soft drinks	1 (2.38)	18(18.36)	3 (7.14)	15(35.71)	4 (9.52)	1 (2.38)	42 (100)	
Zero added sugar soda	0 (0.00)	0 (0.00)	2 (40.0)	3 (60.0)	0 (0.00)	0 (0.00)	5 (100)	

Diet cold drinks	0 (0.00)	2 (50.0)	0 (0.00)	2 (50.0)	0 (0.00)	0 (0.00)	4(100)	
Fruit flavored cold drinks	1 (2.17)	9 (19.56)	6 (13.04)	24 (52.17)	4 (8.69)	2(4.34)	46(100)	
Do you trust on the labels of cold drinks containing natural colors and artificial flavorings?								
May be	2 (6.06)	9 (27.27)	1 (3.03)	18 (54.54)	3 (9.09)	0 (0.00)	3 (100)	19.74 (0.03)
Yes	0 (0.00)	7 (24.13)	3 (10.34)	17(58.62)	2 (6.89)	0 (0.00)	29(100)	
No	0 (0.00)	14 (36.84)	8 (21.05)	10(26.31)	3 (7.89)	3 (7.89)	38(100)	
Cold drinks contain artificial colors and flavorings which are harmful to health , so, if asked to , will you stop consuming cold drink ?								
No	2 (6.89)	9 (31.03)	6 (20.69)	11 (37.93)	2(6.89)	0 (0.00)	29 (100)	4.75(0.44)
Yes	0 (0.00)	21 (29.58)	6 (8.45)	34(47.88)	6 (8.45)	3 (4.22)	71(100)	
Do you consume colored cold drinks?								
Yes	1 (1.61)	21 (33.87)	6 (9.67)	29 (46.77)	3 (4.84)	2 (3.22)	62 (100)	3.85 (0.57)
No	1 (2.63)	9 (23.68)	6(15.79)	16 (42.10)	5 (13.15)	1 (2.63)	38(100)	
While choosing a cold drink what influences your decision?								
Taste	2 (5.55)	14 (38.89)	3 (8.33)	13 (36.11)	2 (5.55)	2 (5.55)	36 (100)	17.82(0.27)
Availability	0 (0.00)	2(33.33)	1 (16.67)	1(16.67)	2 (33.33)	0 (0.00)	6(100)	
Natural Flavorings	0 (0.00)	2(50.00)	1 (25.00)	1(25.00)	0 (0.00)	0 (0.00)	4(100)	
Taste, price, availability &natural flavorings	0 (0.00)	11(21.15)	6 (11.54)	30(57.69)	4(7.69)	1 (1.92)	2(100)	
Do you have any idea thatfrequent consumption of cold drinks can affect your teeth?								
Don’t know	0 (0.00)	6 (42.85)	2 (14.28)	5 (35.71)	1 (7.14)	0 (0.00)	14 (100)	3.54(0.96)
No	0 (0.00)	1 (20.00)	1 (20.00)	3 (60.00)	0 (0.00)	0 (0.00)	5 (100)	
Yes	2 (2.46)	23 (28.39)	9 (11.11)	37 (45.68)	7 (8.64)	3 (3.70)	81(100)	
Cold drinks consumption is one of the several causes of tooth decay . Soda weaken the tooth enamel added with carbonation, sugar, and acids encourage growth of bacteria leading to cavities ,so, if asked to , will you stop consuming cold drink ?								
No	1 (8.33)	4 (33.33)	2 (16.67)	4 (33.33)	1(8.33)	0 (0.00)	12 (100)	3.85(0.57)

Yes	1 (1.13)	26 (29.54)	10(11.36)	41(46.59)	7 (7.95)	3 (3.40)	88(100)	
Do you know consumption of cold drinks lead to obesity / overweight?								
Maybe	0 (0.00)	2 (20.00)	2 (20.00)	2 (20.00)	5 (50.00)	1 (10)	10 (100)	4.46(0.92)
No	0 (0.00)	3 (37.5)	2 (25.00)	0 (0.00)	3 (37.5)	0 (0.00)	8(100)	
Yes	2 (2.43)	25 (30.49)	8 (9.75)	2 (2.43)	37 (45.12)	7 (8.54)	82(100)	
Consumption of cold drinks contribute to weight gain causing obesity as they contain 'empty calories' ,so, if asked to , will you stop consuming cold drink ?								
No	1 (8.33)	5 (41.67)	1 (8.33)	3(25.00)	2 (16.67)	0 (0.00)	12 (100)	6.40(0.26)
Yes	1 (1.14)	25 (28.40)	11(12.5)	42 (47.72)	6 (6.81)	3 (3.41)	88(100)	
Do you trust on the labels about the Nutritional facts on the cold drinks?								
No	1(2.00)	17 (34.00)	5 (10.00)	21 (42.00)	5(10.00)	1 (2.00)	50 (100)	1.90(0.86)
Yes	1 (2.00)	13 (26)	7(14.00)	24(48.00)	3 (6.00)	2 (4.00)	50(100)	
Do you have any idea that frequent consumption of cold drinks can lead to hyperglycaemia/high blood sugar?								
Don't know	0 (0.00)	5 (25.00)	2 (10.00)	10 (50.00)	3 (15.00)	0 (0.00)	20 (100)	5.39(0.86)
No	0 (0.00)	2 (22.22)	2 (22.22)	4(44.44)	1 (1.11)	0 (0.00)	9(100)	
Yes	2 (2.81)	23 (32.40)	8 (11.26)	31(43.66)	4 (5.63)	3 (4.22)	71(100)	
Cold drinks contribute to diabetes risk as these sugary drinks can cause sharp rise in blood sugar levels, so, if asked to, will you stop consuming cold drink?								
No	0 (0.00)	3 (33.33)	2 (22.22)	2 (22.22)	2(22.22)	0 (0.00)	9 (100)	5.03(0.41)
Yes	2 (2.19)	27 (29.67)	10(10.98)	43(47.25)	6 (6.59)	3 (3.30)	91(100)	

In the present study total 2% respondents were underweight,30% were normal and 68% respondents belonged to overweight/obesity. Table 1 shows relation between BMI and Age of candidates. The table shows that 30.88% have normal BMI, 16.17% are overweight, 38.23% of 20 – 25 age group had obesity I, 8.82% and 2.94% are obesity II and obesity III, and only 2.94% are underweight. Among the age group 26 – 30, 59.37 % are under Obesity I, 28.12% are normal, 6.25% are Obesity II, 3.12% are obese III and 0% are underweight and 3.12% are overweight. Insignificant statistical association has been found between BMI and age of the participants using chi-square test. (Chi square – 6.429, p-0.267). Table 1 shows relation between BMI and Results of questionnaire Idea on Frequent consumption of cold drinks affecting teeth of the Participants or Target Population to candidates. The table shows that among 100 respondents, 14 of them do not have an idea about frequent consumption of cold drinks affecting teeth. 5 of them do not know that frequent consumption of cold drinks can affect teeth. And, 81% of them know that frequent consumption of cold drinks can affect teeth. Among the 'Don't know' category 0 % belongs to underweight, 42.85% normal, 14.28% overweight, 35.71% obese I, 7.14% obese II, and 0% belong to obese III. Among the 'No' category, 0% belong to underweight, 20% normal, 20% overweight ,60% obese I, 0% obese II, and 0% belong to obese III. Among 'Yes' category, 28.39 % are of normal BMI, 2.46 % of underweight, 11.11% overweight, 45.67% obese I, 8.64 % obese II, and 3.70%

belong to obese III. Insignificant statistical association was found between BMI and age of the participants using chi-square test (Chi – square –3.543, p-0.966).

Table 1 shows relation between BMI and Results of questionnaire to candidates. The table shows that among 100 respondents 10 of them are not sure about the idea of frequent consumption of cold drinks leading to obesity. 8 of them don't have any idea that frequent consumption of cold drinks can lead to obesity. And, 82% of them have the idea that frequent consumption of cold drinks can lead to obesity. Among the 'Maybe' category 0% belongs to underweight, 20% normal, 20% overweight, 50% obese I, 10% obese II, and 0 % belong to obese III. Among the 'No' category 0 % belongs to underweight,37.5% normal ,25% overweight ,37.5% obese I, 0% obese II, and 0% belong to obese III. Among the 'Yes' category,2.43 % of underweight, 30.48 % are of normal BMI, 9.75% overweight, 45.12% obese I, 8.53% obese II, and 3.65% belong to obese III. Insignificant statistical association is found between BMI and response on cold drink consumption having any idea on frequent consumption leading to obesity of the participants knowing that frequent consumption can affect teeth using chi-square test (Chi Square-4.467, p-0.924).

Table 1 shows relation between BMI and Results of questionnaire to candidates. The table shows that among 100 respondents, 20 of them don't have any idea that frequent consumption of cold drinks can lead to hyperglycemia/high blood sugar, 9 of them are not sure about the idea of frequent consumption of cold drinks leading to high blood sugar. 71 of them have the idea that frequent consumption of cold drinks can lead to high blood sugar.

Among the 'Don't know' category 0% belongs to underweight, 25% normal, 10% overweight, 50% obese I, and 15% obese II, and 0 % belong to obese III. Among the 'Not sure' category 0 % belongs to underweight, 22.22% normal, 22.22% overweight ,44.44% obese I, 11.11% obese II, and 0% belong to obese III. Among the 'Yes' category, 2.81% of underweight, 32.39 % are of normal BMI,11.26% overweight, 43.66% obese I, 5.63% obese II, and 4.22% belong to obese III. Insignificant statistical association is found between BMI and response on cold drink consumption having any idea on frequent consumption leading to high blood sugar of the participants using chi-square test (Chi-square-5.379, p-0.864).

Obesity and associated diabetes rates are rising worldwide. At least one in 20 adults currently has diabetes, and there are more than 1.5 billion overweight people in the world. Since 1980, there has been a global increase in obesity, and as a result, the majority of the world's population currently resides in nations where being overweight causes more fatalities than being underweight. The prevalence of diabetes among adults aged 20 to 79 years rose from 5.5% in 2000 to 7.0% in 2010; and about 15% by the end of 2020. Interestingly 60% of people with diabetes live in low- or middle-income countries. Not only that the younger adults of India is having the high risk of Cardiovascular diseases (CVD) as well[27]. Thus, the continued rise of soft drink consumption poses a global public health risk of worsening obesity, diabetes & CVDs [26].

The relationship between soft drink consumption and nutrient intake is difficult to interpret. Soft drink consumption may be a sign of poor nutrition, with people who drink more sweetened beverages eating poorer diets in general. Soft drinks may also increase people's desire for non-nutritious foods. One study found that people who drank more soft drinks had diets with higher overall glycemic indexes,[28] supporting the prediction that eating foods with high glycemic indexes (such as soft drinks) might encourage people to eat more of them.[29] Other studies have found that soft drink consumption is related to the consumption of foods such as hamburgers and pizza [30], but not to an overall healthy eating index [29]. Additionally media has significant impact on such food consumption pattern as well[31].

Food and beverages are an important part of the Indian social context, and this is especially true for university-aged students. Importantly, any intervention to reduce caloric soft drink consumption in this age group would need to be carefully planned and implemented in order to avoid undermining alcohol moderation messages. Health promotion strategies that address both obesity prevention and alcohol harm reduction goals could be developed with careful coordination and planning. Considering nutrition education special emphasis should be given towards mindful eating approach[32].Not only that our youth should be aware about importance of following traditional Indian foods as well[33].

Present observation is based on the results of online responses received from 100 candidates in the age group between 20- and 30-years youth, on specific 16 questions in relation to cold drinks consumption and thereafter derived relation between BMI (particularly focusing on obesity) with each question indicated. 88% of respondents are well aware about the unhealthy impact of soft drinks. Whereas considering practice 6% of the respondents drink soft drinks daily and 25% have it on a weekly basis.42% of the respondents prefers regular soft drinks whereas 46% prefers fruit flavoured cold drinks. Again 62% of the respondents prefers coloured soft drinks. Considering attitude of the respondents 12% of them still willing to have soft drinks even after knowing its ill effects on tooth enamel.

The present study has many caveats such as

- Online data collection has limitation over direct conversation,
- Respondents are only 100 in number,
- Cross checking of data validation was not possible,
- The soft drink consumption dataset did not include fruit drinks that were independently related to the risk of diabetes, likely because of their high sugar content.

All these limitations have made the outcome and results conservative.

4. Conclusion

The focus groups provided a rich context in which to explore and gain insight into young adults' attitudes, perceptions and behaviours relating to soft drink consumption. The fact that soft drinks offer energy with little accompanying nutrition, displace other nutrient sources, and are linked to several key health conditions such as diabetes is further impetus to recommend a reduction in soft drink consumption. Further studies using descriptive research designs are needed to better understand the prospective associations among beverage consumption and obesity in the age group of 20 to 30 years, who are the future of our country as a whole.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflicts of interest

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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