


Knowledge, Attitude and Practices Regarding Consumption of Carbonated Soft Drinks Among the Dental Students: A Cross-Sectional Study

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ABSTRACT

Objective: To assess and evaluate the knowledge, attitude, and practices regarding the consumption of carbonated drinks among dental students. Carbonated drinks are pervaded by carbon dioxide and have more adverse effects since they are acidic in nature. Nowadays, these are consumed more widely globally, causing many systemic diseases; diabetes and obesity are common. **Material and Methods:** This study includes 204 individuals belonging to the age group of 18-26 years. A self-structured objective type cross-sectional questionnaire survey was conducted to assess the knowledge, attitude, and practice of dental students regarding carbonated drinks. The participants were instructed to mark the most appropriate correct answer from the given list of close-ended type questions. **Results:** Of 204 dental students, the study population includes 125 female and 79 male students. 98.5% of the students knew about carbonated drinks, while 1.5% were unaware. **Conclusion:** Most participants preferred to have carbonated drinks even with their awareness about the ill effects of these drinks. Possible implications by the government authorities may probably increase awareness among the population.

Keywords: Carbonated Beverages; Soft Drinks; Knowledge, Attitude, Practice.

Introduction

A carbonated drink is defined as a fluid infused with carbon dioxide and consumed for hydration or refreshment, such as cola or other soft drinks [1]. At the same time, a soft drink is a non-alcoholic beverage, typically carbonated and sweetened. Soft drink is a generic term for a carbonated beverage commonly called 'soda' or 'pop' either artificially sweetened with an average of < 5 calories of saccharin or aspartame or an average of 170 calories of glucose, fructose purchased in cans or bottles or served from a tap [2]. The total sugar consumption for children and adults must not be more than 10% of their total daily energy intake, around 12 teaspoons of table sugar. To avoid dental caries, it should be 5%, around 6 teaspoons of table sugar as recommended by WHO, which is less than 25g of added sugar found in a can or bottle of soft drink [3].

The drinks can be served as water beverages, carbonates, fruit and functional beverages. However, carbonated beverages have more adverse effects than non-carbonated ones since they are more acidic and are frequently held in oral cavity for a more extended period of time [4]. As a result, soft drinks, or sugar-sweetened beverages (SSBs), are the most popular sugary drinks in Saudi Arabia that are consumed by large proportion in greater quantities and are the fourth largest consumers of carbonated beverages globally, as reported by Euromonitor International in 2017 [5].

One study reported about 75% consumption of various soft drinks, energy or sports drinks, and fruit drinks that are rich in added sugar by Saudis as they are known well to all, readily and extensively available in the market. These drinks are identified as 'extra food,' i.e., a food that should be consumed in smaller quantities or occasionally by The Australian Guide to Healthy Eating. The Communication on Obesity Action for Child Health (COACH) Reference Group defined it as "once a week or less" [6].

97.3% of boys and 97.9% of girls have been reported consuming soft drinks on a weekly basis in Saudi Arabia. Moreover, frequent/weekly consumption of sweets and chocolate was more than 95% among boys and girls. It has been reported that the increased consumption of sweets and carbonated drinks among male school children (10-14 years) in Saudi Arabia consequently increased the reporting of obesity and overweight [7]. Soft drinks are rich sources of sugars and energy that provides no nutritional value but only 'empty' calories [6]. Adverse effects of high intake contribute to dental caries, metabolic disorders, hypertension, triglyceride level, osteoporosis, obesity and type-2 diabetes. Also, children have a poor nutritional intake of milk from the diet due to the shift towards large amounts of sugary drink consumption. Furthermore, acidic carbonated refreshments convey much of the air as carbon dioxide to the stomach, which can bring about distension, activating the reflux mechanism [6,7].

Erosion of teeth occurs where there is loss of tooth structure resulting from a chemical etching of the tooth surface by acid and/or chelation without the involvement of bacteria. In addition, there will be loss of tooth structure, hypersensitivity, and overall change in tooth form. The damage ranges from loss of surface luster, which is barely noticeable and is evident on clean, dry enamel, to partial or complete dentin exposure with a characteristic yellowish appearance. A higher prevalence and association of dental erosion in Saudi Arabia preschool children have been reported due to the excess consumption of citrus and fruit juices and carbonated beverages [8]. Enamel dissolves within 20 minutes after soft drink consumption and the pattern of erosion is identified by the frequency of tooth structure exposure to acidic beverages. Several studies confirmed this positive correlation between the consumption of soft drinks, caries, and tooth erosion [4].

Though there are several studies relating to soft drink consumption globally, research still needs to be done on the Saudi Arabian population [3,4,7,8]. Keeping this in mind, the current study was done to determine

the level of knowledge, attitude, and practices regarding the consumption of carbonated soft drinks among dental students.

Material and Methods

Sampling and Study Design

This cross-sectional study was carried out among two hundred and four individuals aged 18-26 years.

Data Collection

After getting ethical approval from the institutional ethical and research committee, a self-structured objective type questionnaire was prepared for collecting the data and distributed amongst the dental students. The questionnaire validity was tested from 10% of the expected sample size of the population. In order to evaluate the knowledge, attitude, and practice regarding the consumption of carbonated beverages, the subjects were asked to mark the correct choice against the given list of answers. Later, the collected data were cross-verified for completeness, and mistakes, if any, were rectified and altered accordingly.

Statistical Analysis

The data obtained were entered into Microsoft Excel, and descriptive statistical analysis in frequency distribution and percentages was carried out.

Results

Of the 204 dental students, 125 female and 79 male students participated in the present study. Table 1 shows the knowledge, attitude, and practice of the students (n=204) regarding carbonated drinks. 98.5% of the students had heard about carbonated drinks, with a negligible (1.5%) study population unaware of them. About the awareness of the components present in carbonated drinks, 46.1% responded positively. Regarding the caloric value, 61.8% gave a positive response. About the knowledge on sugar-free carbonated drinks, only 15.7% are not aware of their presence. Interestingly 97.1% know that the consumption of carbonated drinks is bad for health and 58.8% know about the adverse effects on teeth. A greater (72.5%) number enjoy having them, and 72.1% are ready to quit them if asked. 95.1% don't want to recommend carbonated drinks consumption to others. While 31.9% want to satisfy their thirst, 17.2% feel energized by having them. 85.8% prefer to have a carbonated drink along with the meal. 68.1% don't feel any change in the intraoral environment, and 77.9% don't brush their teeth after consumption. 70.1% have no feeling of discomfort after consuming the carbonated drinks.

Table 1. Frequency analysis.

| Variables | Responses | N | % |
|--|-----------------|-----|------|
| Have you heard about carbonated drinks? | No | 3 | 1.5 |
| | Yes | 201 | 98.5 |
| Do you know the components of carbonated drinks? | No | 110 | 53.9 |
| | Yes | 94 | 46.1 |
| Do you know the caloric values of the carbonated drinks? | No | 78 | 38.2 |
| | Yes | 126 | 61.8 |
| Are you aware of sugar free carbonated drinks? | No | 32 | 15.7 |
| | Yes | 172 | 84.3 |
| Do you think the consumption of carbonated drinks is: | Good for health | 6 | 2.9 |
| | Bad for health | 198 | 97.1 |

| | | | |
|--|----------------|-----|------|
| Do you know about the ill effects of consumption of carbonated drinks on general health? | No | 27 | 13.2 |
| | Yes | 177 | 86.8 |
| Do you know about the adverse effects of carbonated drinks on teeth? | No | 84 | 41.2 |
| | Yes | 120 | 58.8 |
| Do you enjoy having carbonated drinks? | No | 56 | 27.5 |
| | Yes | 148 | 72.5 |
| If you were asked to quit/stop, would you quit drinking the carbonated drinks? | No | 57 | 27.9 |
| | Yes | 147 | 72.1 |
| Would you like to recommend carbonated drinks for prolonged consumption? | No | 194 | 95.1 |
| | Yes | 10 | 4.9 |
| Why do you consume carbonated drinks? | Satisfy thirst | 65 | 31.9 |
| | Feel energized | 35 | 17.2 |
| | Others | 104 | 51.0 |
| Do you prefer drinking carbonated drinks? | With a meal | 175 | 85.8 |
| | Without a meal | 29 | 14.2 |
| Did you ever try sugar free carbonated drinks? | No | 75 | 36.8 |
| | Yes | 129 | 63.2 |
| Did you feel any change in oral environment after carbonated drinks consumption? | No | 139 | 68.1 |
| | Yes | 65 | 31.9 |
| Do you brush your teeth after drinking the soft drinks? | No | 159 | 77.9 |
| | Yes | 45 | 22.1 |
| Did you experience any feeling of discomfort after consuming the carbonated drinks? | No | 143 | 70.1 |
| | Yes | 61 | 29.9 |

Table 2. Comparing variable with mean, standard deviation, confidence intervals, F value, and p-value.

| Variables | SD | | 95 % CI | | F value | p-value |
|--|------|-------|-------------|-------------|---------|---------|
| | Mean | | Lower bound | Upper bound | | |
| Age | 3.11 | 1.113 | 2.95 | 3.26 | 61.884 | 0.000 |
| Gender | 1.61 | 0.488 | 1.55 | 1.68 | 1.202 | 0.307 |
| Have you heard about carbonated drinks | 0.99 | 0.121 | 0.97 | 1.00 | 1.663 | 0.132 |
| Do you know the components of carbonated drinks? | 0.46 | 0.500 | 0.39 | 0.53 | 0.199 | 0.977 |
| Do you know the caloric values of the carbonated drinks? | 0.62 | 0.487 | 0.55 | 0.68 | 0.777 | 0.589 |
| Are you aware of sugar free carbonated drinks? | 0.84 | 0.365 | 0.79 | 0.89 | 3.564 | 0.002 |
| Do you think consumption of carbonated drinks is: | 1.97 | 0.169 | 1.95 | 1.99 | 1.148 | 0.336 |
| Do you know about the ill effects of consumption of carbonated drinks on general health? | 0.87 | 0.340 | 0.82 | 0.91 | 1.934 | 0.077 |
| What are associated ill effects you know of the consumption of carbonated drinks? | 3.77 | 2.858 | 3.38 | 4.17 | 1.659 | 0.133 |
| Do you know about the adverse effects of carbonated drinks on teeth? | 0.59 | 0.493 | 0.52 | 0.66 | 1.985 | 0.069 |
| What would you prefer from the following? | 1.99 | 0.842 | 1.87 | 2.11 | 2.959 | 0.009 |
| Do you enjoy having carbonated drinks? | 0.73 | 0.447 | 0.66 | 0.79 | 1.444 | 0.199 |
| If you were asked to quit/stop, would you quit drinking the carbonated drinks? | 0.72 | 0.450 | 0.66 | 0.78 | 5.411 | 0.000 |
| Would you like to recommend carbonated drinks for prolonged consumption? | 0.05 | 0.216 | 0.02 | 0.08 | 1.565 | 0.159 |
| Are you concerned about the level of sugar in carbonated soft drinks? | 0.54 | 0.499 | 0.48 | 0.61 | 0.543 | 0.775 |
| When did you first start drinking carbonated drinks? | 1.70 | 0.766 | 1.59 | 1.80 | 3.343 | 0.004 |
| Which factor influences you to start the consumption of carbonated drinks? | 2.72 | 1.880 | 2.46 | 2.98 | 0.293 | 0.940 |
| Why do you consume carbonated drinks? | 2.19 | 0.892 | 2.07 | 2.31 | 0.680 | 0.666 |
| Which is your favourite carbonated soft drink? | 3.20 | 1.927 | 2.93 | 3.46 | 1.258 | 0.278 |
| How often do you consume carbonated soft drinks? | 2.91 | 1.169 | 2.75 | 3.07 | 3.167 | 0.005 |
| What is your frequency of consumption of carbonated drinks per day? | 1.21 | 0.561 | 1.13 | 1.29 | 1.361 | 0.232 |

| | | | | | | |
|---|------|-------|------|------|-------|-------|
| What is the average quantity of carbonated drinks consumed by you each time? | 1.63 | 0.634 | 1.54 | 1.72 | 2.116 | 0.053 |
| Do you prefer drinking carbonated drinks? | 1.14 | 0.350 | 1.09 | 1.19 | 0.931 | 0.473 |
| How do you consume carbonated drinks? | 1.74 | 0.761 | 1.63 | 1.84 | 1.857 | 0.090 |
| Did you ever try sugar free carbonated drinks? | 0.63 | 0.483 | 0.57 | 0.70 | 0.612 | 0.720 |
| Which is your favorite sugar free carbonated drink? | 2.41 | 1.315 | 2.23 | 2.59 | 0.411 | 0.871 |
| Did you feel any change in oral environment after carbonated drinks consumption? | 0.32 | 0.467 | 0.25 | 0.38 | 1.519 | 0.174 |
| Do you brush your teeth after drinking the soft drinks? | 0.22 | 0.416 | 0.16 | 0.28 | 1.010 | 0.420 |
| Did you experience any feeling of discomfort after consuming the carbonated drinks? | 0.30 | 0.459 | 0.24 | 0.36 | 0.485 | 0.819 |

SD: Std. Deviation.

Discussion

Dentistry is a branch of health specialty devoted to maintaining oral health. Dentists not only diagnose and treat problems of teeth, gums, and related parts of the mouth but also can diagnose many intraoral manifestations of systemic conditions. Oral health is the window to overall health, and dentists are the safeguards for oral health. Knowledge and practices of dental students about carbonated drinks not only help them but also can influence to a larger extent to the general population. The consumption of carbonated beverages increases the possibility of caffeine overdose, which can be toxic, especially to children and adolescents. Consuming high amounts of sugar-sweetened beverages can have various adverse impacts on oral and general health. It ranges from increased chances of tooth decay to a higher risk of heart disease and metabolic disorders like type-2 diabetes [4,9].

The current cross-section questionnaire study was conducted with the aim to assess the knowledge, attitude, and practices regarding carbonated beverages among dental graduates. In the present study, 98.5% of the participants had heard about carbonated drinks, which is in accordance with the study of Nitya et al. [10] (98.57%). Furthermore, 86.8% of the participants were aware of the ill effects of carbonated drinks on general health, which is in accordance with the study done by Kharde et al. [11], who noted 72.7%.







In the present study, 58.8% of the participants were aware of the harmful effects on teeth. Therefore, the findings were more than that of Kharde et al. [11] (10%), Alnusayri et al. [4] (26.27%), and less than that of Nitya et al. [10] (98.57%). Furthermore, the majority of participants started consuming carbonated drinks between the age of 22-26 years (33.8%), which is in accordance with the study done by Alnusayri et al. [4] (38.98%), but their study population was in between 11-15 years.

When asked about an attempt to quit carbonated drinks consumption, 72.1% responded positively, which conflicts with other studies by Alnusayri et al. [4] (14.40%), Nitya et al. [10] (30.28%), and Kharde et al. [11] (37.3%). 49.0% of the study population consumes 200-350 ml of carbonated drinks, which is in accordance with the study of Alnusayri et al. [11] (41.52%). Regarding the frequency of consumption, 84.3% of the research sample consumes once a day, while the study population of Gupta et al. [12] noted 72.88% consuming twice daily.

Conclusion

A high proportion of dental graduates are consuming relatively high amounts of carbonated and energy drinks. The awareness should be created through proper education - initiated suitable from the school level, as it creates knowledge and awareness of different age groups. Motivating about the ill effects of carbonated drinks through media, potential intervention, and mediated by the government authorities in developing and promoting healthier dietary habits will help in possible awareness of decreased intake of carbonated drinks.

Authors' Contributions

| | | | |
|------|---|---|---|
| KKM |  | https://orcid.org/0000-0002-3296-6649 | Conceptualization and Writing - Original Draft. |
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| BEMA |  | https://orcid.org/0000-0002-3089-0978 | Methodology and Investigation. |
| VB |  | https://orcid.org/0000-0002-5228-7133 | Formal Analysis, Resources, Data Curation, Writing - Original Draft and Writing - Review and Editing. |

All authors declare that they contributed to critical review of intellectual content and approval of the final version to be published.

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None.

Conflict of Interest

The authors declare no conflicts of interest.

Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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