ABSTRACT

**Background:** The carbonated drink manufacturing companies have set young school/college going children as their primary target customers who are consuming it on daily basis and frequency of drinking vary depending on affordability and need. The consumption of carbonated drink has been increased recently that has led us to think about its unwanted effects on health. It has been identified that consuming more carbonated drinks may cause low bone mineral density. 

**Objectives:** To identify the frequency of consumption of carbonated drinks in medical students and to assess the knowledge regarding adverse effects of these drinks and association of BMD.

**Methodology:** It was a cross sectional study conducted at Baqai Medical University Karachi from

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May to August 2020. Students of MBBS 4th year and BDS final year were approached, sample size was calculated at 50% precision of total population i.e 100 participants were recruited by convenient sampling from the mentioned classes. Preformed questionnaire was administered to identify the frequency and knowledge regarding the subject and bone mineral density through Single x-ray absorptiometry (SXA).

**Results:** The study participants almost (90%) were aware of the name carbonated drink of, 85.5% were aware regarding the harmful effects, and 75.5% were having knowledge about the ingredients. Majority were aware regarding health related effects but they were not having knowledge about names of the specific diseases. There was no significant (0.079) association between carbonated drink consumption and BMD.

**Conclusion:** Students were aware of health related hazards caused by carbonated drinks there was no association of carbonated drink consumption and BMD.

**Keywords:** Medical students; carbonated drinks; knowledge; BMD.

1. **INTRODUCTION**

1.1 **Background**

With the time universal behavioral spectrum has changed at biological, physical, chemical and cultural levels. It has affected people life style and improved their working skills, clothing, food habits according to the need of time [1]. The example of this is consumption of carbonated drink that has reduced the demand of natural products including fresh juices [2]. The carbonated drink manufacturing companies has set young school/college going children as their primary target customers who are consuming it on daily basis and frequency of drinking vary depending on affordability and need [3]. The ingredients that a carbonated drink contain are water, sugar, caramel, caffeine, phosphoric acid and flavoring agents and the main driving force behind consumption is its taste [4]. Caffeine has been identified as one of the ingredients which is responsible for addiction among the consumers [5].

Though it is observed that there is awareness among the consumers regarding the harmful effects of these drinks on health but carbonated drinks are seemed to be most commonly consumed beverages of the date [6,7]. The consumption of carbonated drink has been increased recently that has led us to think about its unwanted effects on health [8]. The research suggests that the kids who drink a lot of carbonated beverages may have a risk of becoming fat, weak-boned, cavity-prone and caffeine addicted [9]. Scientific studies have shown that the most common side effects of carbonated drinks are; dental enamel erosion, dental caries, bone fractures, low-bone density, obesity and weight gain, non-alcoholic fatty liver disease (NAFLD), chronic kidney disease (CKD), type 2 diabetes, hypertension, increase in uric acid concentration, gout, hyper-uricemia, coronary heart disease, belching and heartburn, acidity, etc. [10].

It has been identified that consuming more carbonated drinks may cause low bone mineral density (BMD) [11,12]. However, despite awareness and knowledge regarding the harmful effects of carbonated beverages the youth of our country is consuming these drinks. The aim of this study is to identify the frequency of consumption of carbonated drinks in medical students and to assess the knowledge regarding adverse effects of theses drinks and association of BMD.

2. **MATERIALS AND METHODS**

It was a cross sectional study conducted at Baqai Medical University Karachi from May to August 2020. Students of MBBS 4th year and BDS final year were approached, sample size was calculated at 50% precision of total population i.e 100 participants were recruited by convenient sampling from the mentioned classes. After an informed signed consent demographic data including dietary habits, lifestyle, frequency consumed carbonated beverages drinking and knowledge regarding its risks on health history was recorded through interviewer administered Performa. Bone mineral density (BMD) was checked by heel scan device The bone mineral density through Single x-ray absorptiometry (SXA), being inexpensive and an effective way of establishing the risk of fracture in future, was done on right foot heel of all 90 subjects. For maximum exposure, the patient placed his right foot on the moulded support plate. The recorded BMD is expressed in grams per square centimetre (g/cm2). The data was entered and analysed on SPSS version 20. Categorical variables are expressed in frequency
and percentages whereas chi square test was applied as test of significant at 95% confidence interval and p-value <0.05 is considered as significant.

3. RESULTS

Majority of participants about (63.3%) of this survey falls in the range of 23-25 further details are shared in Fig. 1.

Table 1 shows the knowledge of students regarding the carbonated drinks, when the students were asked about the name carbonated drink 90% of them marked as yes, 85.5% were aware regarding the harmful effects, and 75.5% were having knowledge about the ingredients.

Table 2 depicts the attitude of students about carbonated drinks 83 (92.2%) of the students do not like to recommend carbonated drinks for prolonged consumption 74 (82.2%) were in the favor of consuming fruit juice if they were given an option between carbonated drinks and fruit juice 42 (46.6%) students were influenced by the taste of carbonated drinks 50 (55.5%) of the students agreed that the type of the food is the key attraction towards carbonated drinks 82 (91.1%) of the students have stated that they would not prefer their children to consume carbonated drinks 70 (77.7%) of the students would like to get more information and they also like to teach the others about carbonated beverages. Out of 90 participants, 8 (8.8%) were not drinking any carbonated drinks, 35 (39%) consume 1-3 drinks, 36 (40%) consume 4-6 drinks per week and 11 (12.2%) were consume more than 6 drinks in a week.

To check the association of BMD the criteria was set as normal (-1 or above) and low BMD (-1.1 to -2.4) and osteoporotic (<-2.5). The result was not significant with the frequency of consumption of carbonated drink however, low BMD was observed in participants who use to consume 4-6 or more drinks per day.

![Fig. 1. Demographic profile if medical students](image)
Table 1. Knowledge about carbonated drink among medical & dental students

| Variable (n=90)                                    | Yes       | No        |
|---------------------------------------------------|-----------|-----------|
| Ever heard about Carbonated Drinks                | 81 (90%)  | 9 (10%)   |
| Ever heard about the harmful effects of Carbonated Drinks | 77 (85.5%) | 13 (14.4%) |
| Knowledge of Ingredients of Carbonated Drink      | 68 (75.5%) | 22 (24.4%) |
| Knowledge of Caloric Value of Carbonate Drink     | 50 (55.5%) | 40 (44.4%) |

Knowledge of harmful effects associated with the Consumption of Carbonated Drinks

| Harmful Effect                                    | Yes       | No        |
|---------------------------------------------------|-----------|-----------|
| Gastritis                                         | 25 (27%)  | 65 (72%)  |
| Joint pain                                        | 13 (14%)  | 77 (85%)  |
| Diabetes                                          | 11 (12.2%)| 79 (87%)  |
| Teeth and Bone Disease                            | 15 (16%)  | 75 (83%)  |
| Sleep Disturbance                                 | 24 (26%)  | 66 (73%)  |
| Other                                             | 2 (2.2%)  | 88 (97.7%)|

Do you know carbonated drink contain,

| Ingredient                                        | Yes       | No        |
|---------------------------------------------------|-----------|-----------|
| Sugar                                             | 88 (97.7%)| 2 (2.2%)  |
| Caramel                                           | 43 (47.7%)| 47 (52%)  |
| Phosphoric acid,                                  | 29 (32%)  | 61 (67%)  |
| Flavouring Caffeine                               | 38 (42%)  | 52 (57%)  |

Table 2. Attitude about carbonated drink among medical & dental students at baqai medical university

How many Carbonated drinks do you drink per week

| Frequency | 0  | 1-3 | 4-6 | 7 or more |
|-----------|----|-----|-----|-----------|
| Number of Participants                           | 8 (8.8%) | 35(39%) | 36(40%) | 11 (12.2%) |

Would you like to recommend Carbonated Drinks for Prolonged Consumption

| Yes/No   | Yes | No  |
|----------|-----|-----|
|          | 7 (7.7) | 83 (92.2) |

Would You like to Prefer

| Beverage | Yes | No |
|----------|-----|----|
| Fruit Juice | 74 (82.2) | 16 17 |
| Tea      | 60 (66) | 30 (33) |
| Carbonated Drinks | 1 (1.1) | 89 (99) |
| Energy Drinks  | 15 (16) | 75 (83) |

What is important when you think of drinking a beverage

| Importance   | Yes       | No        |
|--------------|-----------|-----------|
| Taste        | 80 (88.8%)| 10 (11%)  |
| Nutrition    | 48 (53%)  | 42 (46%)  |
| Price        | 14 (15%)  | 76 (84%)  |

Influencing Factor to start Carbonate Drink

| Factor            | Yes       | No        |
|-------------------|-----------|-----------|
| Taste             | 42 (46.6%)| 48 (53%)  |
| Media Advertisement | 9 (10)   | 81 (90%)  |
| Easy Access       | 6 (6.6)  | 84 (93%)  |
| Appeal of Drink   | 75 (83%)  | 15 (16.6%)|

Would you prefer your children to take Carbonate Drink

| Preference          | Yes | No  |
|---------------------|-----|-----|
|                     | 8 (8.8%) | 82 (91.1%) |

Would you like to get more information about beverages

| Information                  | Yes | No  |
|-----------------------------|-----|-----|
| Would you like to know more | 70 (77.7%) | 20 (22.2%) |

Would you like to teach others about beverage

| Teaching                | Yes | No |
|-------------------------|-----|----|
| Would you like to teach | 71 (78.8%) | 19 (21.1%) |

Tried Quit/Stop habits of Consumption of Carbonate Drink

| Habit                  | Yes | No  |
|------------------------|-----|-----|
| Would you like to try  | 67 (74.4%) | 23 (25.5%) |

Table 3. Drinking frequency

| Frequency of drinking | 0          | 1-3  | 4-6 | 7 or more | p-value |
|-----------------------|------------|------|-----|-----------|---------|
| Number of Participants| 8 (8.8%)   | 35(39%) | 36(40%) | 11 (12.2%) | 0.079   |
| BMD score             | 0.8 ± -1.2 ± -0.2 | -1.2 ± -0.2 | -1.4 ± -0.3 |
4. DISCUSSION

In our study students were seemed to be aware of the constituents of the carbonated drinks as shown in Table 1. Majority of them has said yes, when they were asked about its harmful effects, and calories. The result is similar with the cohort study conducted by Casuccio A et.al in medical students [13]. Though the study participants were medical students but they were unaware of the specific harmful effects i.e. Gastritis, Tooth decay, bone mineral deficiency and diabetes caused by carbonated drinks [14]. Majority was unaware that a carbonated drink may contain phosphoric acid and caffeine as ingredients that is contrary to the findings of another study in which it is reported that the study participants were aware of these ingredients [15,16]. Carbonated drinks have been consumed more in the young population as reflected by our results that medical students also use to consume 3-7 carbonated beverages in a week as shown in Table 2. That is similar with other studies [17,18]. After awareness the studies participants refused to recommend carbonated drinks and preferred other beverages over it, furthermore, the data regarding questions mentioned in Table 3. Seemed to be limited in literature to the best of our search we do not found any similar or contrary results for these enquiries. There was no significant association of carbonated drink consumption and BMD in our population however, the participants who mentioned that they use to consumes more than 3 drinks a week showed a low BMD mean as shown in Table 4. The results are similar to the findings of YongMei T et al who reported that less consumption of carbonated drinks is associated with high BMD. Our findings are also similar with other study in which the significant association was reported between high consumption of carbonated drinks and low BMD though our results are stating the same but these are not statistically significant (p-value-0.079).

5. CONCLUSION

Medical students use to consume 3-7 carbonated drinks per week, they seemed to be aware that it may have health related hazards but they were unaware of specific diseases caused by consumption of these drinks. Medical Students who consume 3-7 drinks a week were having low BMD.

CONSENT

As per international standard or university standard, Participants’ written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

Study was approved by Baqai medical college ERC.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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