

# Soft Drinks Intake is Associated with Obesity and Urine Disorders in Medical Students

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## ABSTRACT

**Aim:** To determine the ramifications of soft drinks on Body Mass Index and effects on various renal parameters.

**Study design:** Cross-sectional study

**Place and duration of study:** HBS Medical and Dental College from 1<sup>st</sup> January 2020 to 31<sup>st</sup> December 2021.

**Methodology:** One hundred and ten students from first year to final year MBBS were recruited from Medical Colleges of Islamabad. We assessed caffeinated sugar beverage consumption (Sprite, Mountain Dew, Coke, Pepsi & 7-Up). Inclusion criteria consisted of users (n=48) who took caffeinated soft drinks at least 5-7 glasses/week. Those who took less than this drink was labelled non-users (n=62). Questionnaire we used was self-administered about sociodemographic data, height, weight, soft drinks consumption frequency, and a record of urine R/E Combi 10 strip test.

**Results:** There were 41(37.3%) males and 69(62.7%) females. The percentage of underweight, normal, overweight and obese students was 31.8%, 36.4%, 22.7% and 9.1% respectively. Out of total females (62.7%), the group overweight (30.4%) and obese (10.1%) was highly significant. (p=0.008). The user students n=48(43.6%) took caffeinated drinks more than 5-7 glasses/week and were found to be significantly obese p=0.17 as compared to non-users n=62(56.4%). Soft drink consumption was significantly associated with proteins appearance in urine (p=0.00) and leucocytes (p=0.17) and the mean PH of urine of soda users was highly significantly acidic (p=0.00) by using combi-10 test strips.

**Conclusion:** Very high sugar contents and other ingredients in soft drinks can be associated with obesity, metabolic and kidney disturbances in young students which in chronic cases exacerbate the condition.

**Keywords:** Obesity, Urine disorder, Caffeinated drinks

## INTRODUCTION

In the United States average diet, the sugar enriched soft drinks with caffeine are substantial caloric source (5% of total caloric intake) and they are major source of added sugar (intake 33% of total).<sup>1</sup> Such sugar enriched drinks predispose obesity, cardiovascular, End-stage Renal-Disease and diabetes mellitus type 2<sup>2-4</sup>. Highly sweetened beverages and added sugar are particularly advised to be limited by 2015 Dietary Guidelines for Americans and the American Heart Association<sup>5,6</sup>.

These beverages are hypercaloric along with refined carbohydrates, therefore lead to overweight and imbalance of energy in young people. 74% of Mexican population consumes soft drinks (SDs), that is 115 liter per annum per person<sup>7</sup>. Caloric intake becomes very high with SDs, because they contain high-fructose corn syrup (HFCS)<sup>8</sup>. Younger generation who are consuming these drinks significantly more, possess higher body mass index (BMI)<sup>9</sup>.

A significant direct association of SSB with CKD was found in the Jackson Heart Study (3003 participants, 185 CKD cases) with 8 years of follow-up<sup>10</sup>. TLGS, SSB consumption in Iranian ranged from <0.5 to >4 servings in a week<sup>11</sup>. With an OR (95% CI) of 1.92 (1.05; 3.48) very high risk of CKD was found linked with high intake<sup>12</sup>. Moreover, most of such drinks contain caffeine in greater concentrations which is predisposing CKD and other cardiovascular issues<sup>13</sup>.

## MATERIALS AND METHODS

The students of HBS Medical and Dental College, Islamabad were examined in this cross-sectional study. The students from 1<sup>st</sup> year to Final year (n=110) after taking informed consent were recruited in this study. Non-probability convenient sampling was done. The sample size was calculated by using Open-Epi calculator. We assessed caffeinated and very sugar beverage consumption (Regular soft drinks Mountain Dew Coke, Pepsi, Sprite & 7-Up). Inclusion criteria consisted of users who took caffeinated soft drinks at least 5-7 glasses/week. There were 48 students. Those

who took less than this drink was labelled non-users (n=62). The study was formally approved by the Review Board and Ethical Committee.

**Questionnaire:** Google form questionnaire with self-modification was utilized. Combur-Test Strips Roche Germany was used to examine ten parameters in student obtained urine samples. The questionnaire along with demographic information got information about frequency and quantity of famous sweetened soft drinks. History of related metabolic abnormalities and family history was asked by multiple questions, including Likert scale questions.

**Anthropometric measurement:** Students were measured for height and weight. With these data body mass index (BMI) was calculated, body mass index (BMI) was categorized as normal (<25 kg/m<sup>2</sup>), overweight (25 to 30 kg/m<sup>2</sup>), or obese (>30 kg/m<sup>2</sup>) and this categorization of the BMI groups was based on the WHO guidelines<sup>13</sup>.

**Urine routine examination by Combur-test strips Roche Germany:** Estimation of multiple variables of urine like PH, Specific gravity, urine proteins, WBCs, RBCs, Bilirubin, Ketone bodies, Urobilinogen, Nitrates, and Glucose can be determined. The data were analyzed using SPSS-25. The Chi-square test was applied and P<0.05 was considered as significant.

## RESULTS

There were 41(37.3%) males and 69(62.7%) females. When BMI has calculated the percentage of underweight, normal, overweight and obese students was 31.8%, 36.4%, 22.7% & 9.1% respectively. Out of total females (62.7%), the group overweight (30.4%) and obese (10.1%) was highly significant (p=0.008) [Fig. 1]. The user students 48 (43.6%) took caffeinated drinks more than 5-7 glasses/week and were found to be significantly obese p=0.17 as compared to non-users 62(56.4%) [Fig. 2].

Soft drink intake was significantly associated with proteins appearance in urine (p=0.00) and white blood cells (p=0.17) (Table 1) and the mean PH of soda users was highly significantly acidic (p=0.00) by using combi-10 test strips (Fig 3). Specific gravity was unaffected in these students (Fig 4).

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Table 1: Association of soft drink intake with urine parameters

| Variable             | Soft Drink Intake |            | P value |
|----------------------|-------------------|------------|---------|
|                      | Yes               | No         |         |
| <b>Proteins</b>      |                   |            |         |
| Yes                  | 42 (64.6%)        | 23 (35.4%) | 0.000   |
| No                   | 6 (13.3%)         | 39 (86.7%) |         |
| <b>WBCs</b>          |                   |            |         |
| Yes                  | 18 (62.1%)        | 11 (37.9%) | 0.017   |
| No                   | 30 (37%)          | 51 (63%)   |         |
| <b>RBCs</b>          |                   |            |         |
| Yes                  | 2 (40%)           | 3 (60%)    | 0.620   |
| No                   | 46 (46.8%)        | 59 (56.2%) |         |
| <b>Bilirubin</b>     |                   |            |         |
| Yes                  | 2 (100%)          | -          | 0.188   |
| No                   | 46 (42.6%)        | 62 (57.4%) |         |
| <b>Ketone bodies</b> |                   |            |         |
| Yes                  | 48 (43.6%)        | 62 (56.4%) | 0.110   |
| No                   | 48 (43.6%)        | 62 (56.4%) |         |
| <b>Urobilinogen</b>  |                   |            |         |
| Yes                  | 9 (45%)           | 11 (55%)   | 0.542   |
| No                   | 39 (43.3%)        | 51 (56.7%) |         |
| <b>Nitrates</b>      |                   |            |         |
| Yes                  | 16 (64%)          | 9 (36%)    | 0.018   |
| No                   | 32 (37.6%)        | 53 (62.4%) |         |
| <b>Glucose</b>       |                   |            |         |
| Yes                  | 7 (63.6%)         | 4 (36.4%)  | 0.138   |
| No                   | 41 (41.4%)        | 58 (58.6%) |         |

P<0.05\*

Table 2: Significant association of Mean PH and Specific gravity of soda users by using ANOVA test

| Variable         |                | Sum of Squares | Df  | Mean Square | F      | Sig. |
|------------------|----------------|----------------|-----|-------------|--------|------|
| PH               | Between Groups | 15.936         | 1   | 15.936      | 64.325 | .000 |
|                  | Within Groups  | 26.755         | 108 | .248        |        |      |
|                  | Total          | 42.691         | 109 |             |        |      |
| Specific Gravity | Between Groups | .000           | 1   | .000        | .855   | .357 |
|                  | Within Groups  | .007           | 108 | .000        |        |      |
|                  | Total          | .007           | 109 |             |        |      |

Fig 1. Male and Female students are categorized as underweight, normal, overweight, and obese

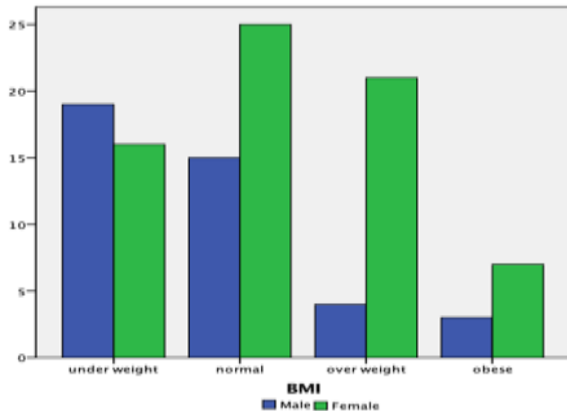


Fig 2: The ratio of underweight, normal, overweight, and obese soda intake users and non-users

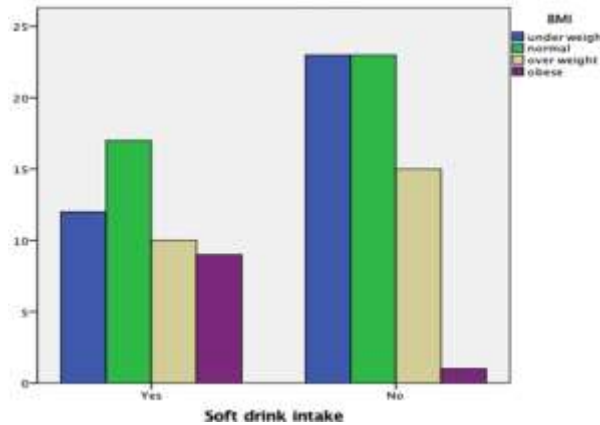


Fig 3: Mean PH of soda drinks intake users and non-users

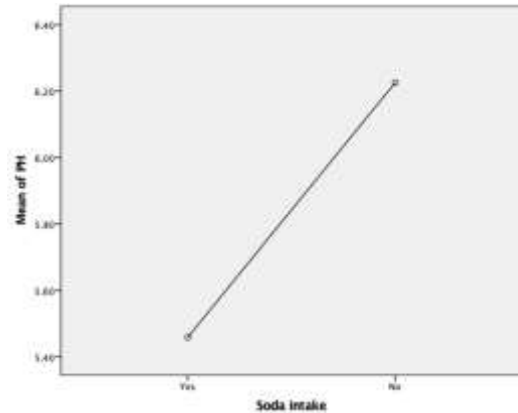
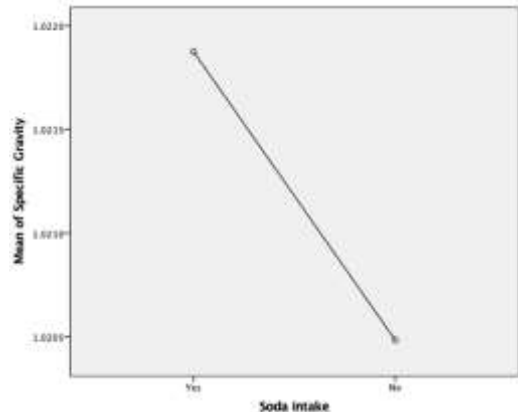


Fig 4: Mean specific gravity of soda intake users and non-users



**DISCUSSION**

Soft drinks are one of the most widely consumed beverages and are very popular amongst youngsters. Studies have proved sweetened beverages like Coca-Cola or other soda drinks are detrimental to health. Soda drinks consumption on regular basis is thought to be responsible for weight gain, obesity, cardiovascular and renal disorders. This study explored the harmful effects of soda drinks on health parameters.

The current study explored that there is an increased risk of being overweight in people who are regular consumers of soft drinks. These results are like the findings of Turnbull et al<sup>14</sup> and Khatatbeh et al<sup>13</sup> who stated that regular consumption of caffeinated drinks and fast-food leads to a reversible increase in blood cholesterol levels and weight gain which is the basic footstep for many diseases.

The present study proves that the people who are not consumers of soft drinks are not obese and the ones who have regular soft drink intake are obese. These findings are like Schiano et al<sup>15</sup> who stated that soft drinks and sweeteners intake leads to an increase in the incidence of weight gain and obesity.

The findings of the present study suggest that urine analysis of the participants who are regular consumers of soft drinks has an increased number of nitrates in urine as compared to those who do not consume soft drinks. Gandarilla-Esparza et al<sup>16</sup> states that chronic exposure to nitrates in water for human consumption caused metabolic and hormonal alterations and genotoxic damage in women. This finding suggests the risk of metabolic disturbances in soft drink users.

Aitekenov et al<sup>17</sup> stated that patients, with high protein concentration in urine, have various kinds of illnesses in the kidney, referred to as proteinuria. Results of the present study showed that an increased number of proteins are found in the urine of people consuming soft drinks regularly.

Hu and Malik<sup>18</sup> proved that regular consumption of SSBs can lead to weight gain and substantially increase the risk of developing chronic diseases including metabolic syndrome, type 2 diabetes mellitus and chronic heart diseases. The present study states that there are increased glucose levels in the urine of the people who have a regular intake of soft drinks as compared to the group who doesn't consume soft drinks on regular basis.

Urine analysis of both groups in the present study suggests that WBCs are present in the urine of the group who has soft drinks. This proves that soft drinks make people prone to infections, chronic kidney disease, and decreased immunity. Kwon et al<sup>19</sup> states that the presence of WBC in urine is an indicator of urinary tract infections and chronic kidney disease. Rebholz et al<sup>20</sup> stated that higher consumption of sugar-sweetened beverages was associated with an elevated risk of subsequent chronic kidney disease.

## CONCLUSION

The high intake of soft drinks exerts a more significant influence on the metabolic pathways, body weight, obesity, and kidney functions. A high concentration of sugar and other ingredients in soft drinks may play a role in metabolic and kidney disturbances. Chronic use of soft drinks should be especially discouraged to avoid these negative effects.

**Conflict of interest:** Nil

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