



Original Article



Knowledge, Attitude, and Practice of Healthcare Professionals of Pakistan Regarding Consumption of Carbonated Drinks

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ABSTRACT

Carbonated drinks contain acidic ingredients and high amounts of sugar. Such constituents lead to adverse oral and systemic manifestations, such as caries, dental erosion & hypersensitivity, diarrhea, GERD, respiratory, and bone disorders. **Objectives:** To determine the awareness, attitude, and practice of healthcare workers regarding carbonated drinks and to gauge their attitude and consumption habits regarding these drinks. **Methods:** A cross-sectional study was carried out across Pakistan, over eight months from January 2022 to August 2022. There was adequate representation from all provinces, and 1930 MBBS, BDS, and Allied Health Science workers filled out a pre-tested questionnaire. These professionals had different designations in government and private setups. A non-probability convenience sampling was done. Frequency and percentages depicted the data. One-way ANOVA was performed to compare composite knowledge and attitude scores, while Chi-square tests with Cramer's V were used for practice variables. **Results:** 97.5% of the healthcare workers knew about carbonated drinks, but only 85.1% were aware of their composition, whereas 93.1% knew about their side effects. 34.4% consumed carbonated drinks with meals. 87.2% believed that carbonated drinks have harmed teeth, and 60.2% experienced changes in the oral environment. **Conclusions:** Despite an abundance of knowledge regarding the composition and harmful effects of carbonated beverages, their consumption was high among the targeted population.

INTRODUCTION

The carbonated drinks are universally consumed beverages that are enjoyed by every generation. Their consumption has become a trend, which is on the rise [1]. High consumption of these drinks is reported to have significant health concerns, as they contain excessive quantities of sugars and acids [2]. Weight gain and obesity [3], nutritional deficiencies, cardiac diseases, neurological ailments, bone fractures, type II diabetes [4], and multiple metabolic malfunctions are commonly associated

problems [5]. On top of this, these drinkables can also lead to dental ailments, for example, caries [6], dentin sensitivity, gum problems, and tooth loss [7]. Globally, the revenue generated in the soft drinks market has escalated to US\$468.50bn in 2026 [8]. The assimilation of carbonated beverages can induce dental decay in children as well as adolescents [9]. Healthcare professionals can play a vital role in society in promoting oral health and in making people aware of the unfavorable effects of excessive intake



of carbonated drinks. An Indian study analyzed the carbonated drink consumption pattern among medical students. It was deduced that 44.09% participants consumed carbonated drinks and 26.36% experienced adverse effects of soft drinks [10]. There has been an increased consumption of carbonated drinks in Pakistan, as there has been globally [11]. A Pakistani study explored the consumption pattern of carbonated drinks in secondary school students; around 85% of them enjoyed having these beverages [12].

Although studies have explored the level of knowledge and practices of healthcare professionals regarding carbonated drinks, limited research has targeted healthcare workers across all fields and across diverse populations, particularly from multiple provinces. Moreover, the majority of studies have highlighted the general health effects of carbonated drinks, but specific ill effects on dentition have not been properly targeted. Therefore, the study aimed to assess the knowledge, attitudes, and practices of healthcare professionals from all fields across all provinces of Pakistan regarding carbonated drink consumption and its impact on dental health.

METHODS

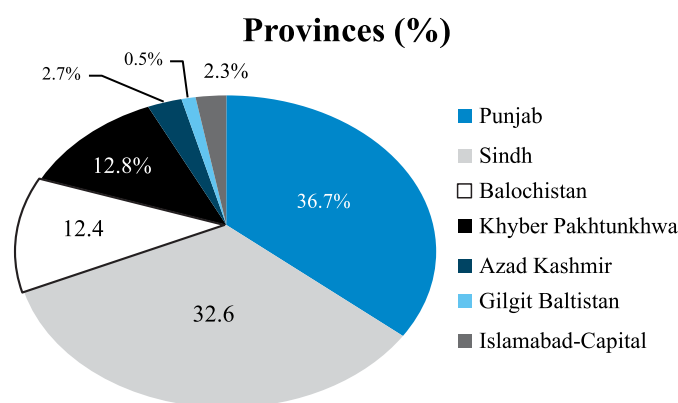
This was a cross-sectional study conducted on healthcare professionals in Pakistan who were approached in their private or government setups and institutes. The study was completed in a period of eight months from January 2022 to August 2022 after receiving an ethical letter from the Ethical Review Board of Combined Military Hospital Lahore Medical College and Institute of Dentistry (Reference No.4412/ERC/CMH/LMC; dated 13th August 2021). It was directed towards MBBS doctors, BDS doctors, and the workers of Allied Health Sciences (psychologists, physiotherapists, biochemists, pharmacists, radiographers, sonographers, nutritionists, homeopathic and neuropathic doctors, and speech therapists). The healthcare workers from Punjab, Sindh, Baluchistan, KPK, Azad Kashmir, Gilgit Baltistan, and Islamabad, the capital, were approached. The doctors who fall under the age bracket of 20-60 and above were targeted. This study excludes nurses, technicians, assistants, and other supporting staff. Healthcare workers with medical problems known to independently affect the oral cavity, like GERD, vomiting, bulimia, and anorexia, were also excluded from the study to reduce potential confounding and enhance internal validity. Additionally, any non-carbonated drinks, non-sugary drinks, lemon, vinegar, and acidic medicines were also excluded. A sample size was calculated using the WHO formula for cross-sectional studies ($n = Z^2 p (1-p) / d^2$). Assuming an expected prevalence (p) of 50%, with a 95% confidence level ($Z=1.96$) and a

margin of error of 5% ($d=0.05$), the minimum required sample size was 384 participants. To enhance study precision, a total of 2000 participants were approached, of which 35 individuals refused participation, and 35 were excluded due to unreliable responses. The final analyzed sample was composed of 1930 participants, yielding an overall response rate of 96.5%. A non-probability convenience sampling was done. The majority of participants were approached directly in person at their clinics/hospitals and educational institutes by a team of researchers. The participants were briefed about the purpose of this study and the nature and content of the questionnaire. Some of the participants were approached online, and the questionnaire on Google Form was sent to them through professional WhatsApp groups, professional Facebook medical groups, and institutional email accounts. To ensure honest responses, a consent and honesty statement was added in the beginning, stating that responses will be kept anonymous and will be used only for academic purposes. An attention check question was added in the questionnaire to filter out careless and fake responses. A preexisting closed-ended questionnaire was used in this study, whose validity was already confirmed [13]. For the internal reliability of the questionnaire, a pilot survey was conducted among 30 healthcare professionals, and Cronbach's alpha value was found to be 0.865.

Data analysis has been conducted on a sample of 1930 respondents from all the provinces of Pakistan. SPSS software (Statistical Package for Social Sciences, IBM, USA) version 23.0 was used. Statistical tests included frequency analysis and cross-tabulation. One-Way ANOVA was used to assess the composite knowledge and the composite attitude scores. Before ANOVA, the assumptions of normality and homogeneity of variances were assessed using the Shapiro-Wilk test and Levene's test, respectively. Post-hoc pairwise comparisons were performed using Tukey's HSD test. The categorical practice variables were evaluated by the chi-square test. The strength of associations was determined by Cramer's V, where statistical significance was set at $p < 0.05$.

RESULTS

The sample consisted of 56.8% females and 43.2% males who were mainly aged between 20 and 39 years. Moreover, over 50% of the respondents were MBBS, and 34.4% were BDS. The sample consisted of only 10.3% of Allied Health Sciences respondents. It was seen that the majority of respondents (63.7%) belonged to Government hospitals or colleges, and only 36.3% were from private setups. A major chunk of the sample belonged to Punjab (36.7%) and Sindh (32.6%), as these two are the country's largest provinces in terms of population (Figure 1).

**Figure 1:** Responses from Province (n=1930)

The awareness level of carbonated drinks among all three kinds of healthcare professionals was very high (97.5%). Around 85% of healthcare workers knew about the components of carbonated drinks. All healthcare professionals were well aware of the side effects of these beverages (93.1%). The composite knowledge scores did not differ significantly among professional groups (ANOVA $F=0.195$, $p=0.823$). Homogeneity of variances was confirmed by Levene's test ($p=0.498$). Post-hoc Tukey HSD showed no significant differences between MBBS, BDS, and Allied Health Science workers ($p=0.815$) (Table 1).

Table 1: Knowledge of Healthcare Professionals Regarding Carbonated Drinks

Responses	Frequency (%)	MBBS	BDS	Allied Health
Awareness of Carbonated Drink				
Yes	1881 (97.5%)	1040	651	190
No	49 (2.5%)	31	12	6
Awareness of the Composition of Carbonated Drinks				
Yes	1642 (85.1%)	913	571	158
No	288 (14.9%)	158	92	38
Awareness of the Side Effects of Carbonated Drinks				
Yes	1798 (93.1%)	1005	611	182
No	288 (6.8%)	158	92	38
Awareness of Sugar-Free Carbonated Drinks				
Yes	1749 (90.6%)	975	591	183
No	181 (9.4%)	96	72	13

The majority of the respondents preferred Coca-Cola (34.8%), followed by Sprite (19.6%) and Pepsi (10.0%). It was also seen that 9.3% of respondents didn't consume any carbonated drinks. A mixed response was observed when respondents were asked about their future consumption of

carbonated drinks. The composite attitude scores did not differ significantly among professional groups (ANOVA $F=0.186$, $p=0.830$). Homogeneity of variances was confirmed by Levene's test ($p=0.006$). Post-hoc Tukey HSD showed no significant differences between MBBS, BDS, and Allied Health Science workers ($p=0.768$) (Table 2).

Table 2: Attitude of Healthcare Professionals Regarding Carbonated Drinks

Responses	Frequency (%)
Preferred Carbonated Drinks	
Pepsi	193 (10.0%)
Coca Cola	679 (35.2%)
Sprite	379 (19.6%)
Fanta	180 (9.3%)
Dew	94 (4.9%)
Red Bull or Energy Drinks	68 (3.5%)
Sports Drinks	40 (2.1%)
Malt	118 (6.1%)
I Don't Consume	179 (9.3%)
Planning To Stop Consumption of Carbonated Drinks	
Yes	901 (46.7%), (MBBS=519, BDS=296, Allied Health=86)
No	825 (42.7%), (MBBS=456, BDS=284, Allied Health=85)
I Don't Consume/I Have Already Stopped Consumption	204 (10.6%), (MBBS=96, BDS=83, Allied Health=25)
Believing Carbonated Drinks Can Hurt Teeth	
Yes	1682 (87.2%), (MBBS=901, BDS=607, Allied Health=174)
No	236 (12.2%), (MBBS=158, BDS=56, Allied Health=22)
Maybe	12 (0.6%), (MBBS=12, BDS=0, Allied Health=0)

The majority of the respondents consume carbonated drinks once or twice a week (23.7%) or once or twice a month (22.9%). Some of these respondents either always consumed carbonated drinks with their meals (34.4%). 38.9% of respondents suggested that they did not consume carbonated drinks with meals (95% CI: 36.7-41.1%). 60.2% (95% CI: 58.0-62.4) experienced changes in the oral environment. Chi-square values hinted at a strong association between all practice variables and the field of study. Although Cramer's V gave values in lower ranges, it suggested that the consumption practices of MBBS, BDS, and Allied Health workers were quite similar (Table 3).

Table 3: Practice of Healthcare Professionals Regarding Carbonated Drinks

Responses	Frequency (%)	95% CI	MBBS	BDS	Allied Health	Chi-square (p-Value) Cramer's V
Frequency of consuming carbonated drinks						
I Don't Consume	180 (9.3)	—	99	68	23	$\chi^2=63.30$ (<0.001) $V=0.128$
Once or Twice a Day	259 (13.4%)	—	171	58	30	
Thrice or More a Day	122 (6.3%)	—	55	48	19	

Once or Twice a Week	458 (23.7%)	—	275	164	19	
Thrice or More a Week	137 (7.1%)	—	86	39	12	
Once or Twice a Month	442 (22.9%)	—	221	175	46	
Thrice or More a Month	169 (8.8%)	—	95	48	26	
Once or twice, or three times a Year	163 (8.4%)	—	79	63	21	
Prefer to consume carbonated drinks with meals						
Yes	664 (34.4%)	32.3-36.5	381	245	38	x ² =25.29 (<0.001) V=0.081
No	751 (38.9%)	36.7-41.1	424	234	93	
Sometime	515 (26.7%)	24.7-28.7	266	184	65	
Number of years of consumption of carbonated drinks						
I Don't Consume/Stopped	217 (11.2%)	—	117	72	28	x ² =34.31 (<0.001) V=0.094
Less Than a Year	83 (4.3 %)	—	36	37	10	
1-4	104 (5.4%)	—	77	16	11	
5-9	187 (9.7)	—	109	65	13	
10-13	261 (13.5%)	—	137	89	35	
14-15	387 (20.1 %)	—	204	150	33	
More than 15	696 (36.1%)	—	396	354	66	
Experience any change in the oral environment due to the consumption of carbonated drinks						
Yes	1162 (60.2%)	58.0-62.4	642	414	104	x ² =19.03 (0.001) V=0.070
No	278 (14.4%)	12.8-16.0	122	105	36	
Maybe	499 (25.9%)	23.9-27.9	303	143	53	

95% CI=95% Confidence Interval is reported only for primary binary outcome variables

DISCUSSION

97.5% of MBBS, BDS, and Allied Health Science workers were aware of carbonated drinks, 85.1% knew about the composition of carbonated drinks, and 93.1% knew about their adverse effects. As opposed to the Metta *et al.* study, where only 46.1% of dental students knew about the composition of carbonated drinks, and 97.1% knew about the adverse effects of these beverages [14]. Although our study has targeted professional doctors from multiple specialties, Metta *et al.* have targeted only dental students [14]. Coca-Cola was the most consumed beverage by practitioners, as 35.2% of the target population selected it as their most preferred drink, and this was followed by Sprite (19.6%). A KAP study conducted among university students of Malaysia revealed that every week, 52.3% of participants consumed soft drinks and 46% consumed fresh fruit juices [15]. In the present paper, 87.2% healthcare professionals believed that these beverages have harmful effects on teeth, and 0.6% were unsure about their dental effects; as opposed to Metta *et al.* study, where 58.8% were aware of the adverse effects on dentition [14]. 46.7% of our respondents were willing to quit consumption of such harmful beverages. As opposed to the Malaysian study, in which 99.7% undergraduate students showed positive attitudes towards giving up consumption [16]. Overall attitude scores revealed no significant differences among groups (ANOVA $F=0.186$, $p=0.830$). Post-hoc Tukey comparisons revealed consistent consumption among all groups ($p=0.768$). Studies have shown a dose-response association between the frequency of consumption of

carbonated drinks and adverse oral changes [17, 18]. Upon inquiring about the frequency of consumption, 13.4% of healthcare workers consumed once or twice a day, and 6.3% consumed thrice or more a day. This conflicts with Metta *et al.* where 84.3% dental students consumed once daily [14], and with Gedi *et al.* where 30.5% participants consumed daily [19]. The present paper found that 60.2% (95% CI: 58.0-62.4) of healthcare professionals noted damaging effects in their oral cavities. Although the association was statistically significant ($\chi^2=19.30$, $p=0.001$), the very weak effect size (Cramer's $V=0.070$) demonstrated limited practical significance, likely under the influence of a large sample size. Similar self-reported dental complaints have been documented by Niaz *et al.* where 41.7% reported sensitivity and 41.1% reported caries [20].

This study focused on healthcare workers of all age groups, with higher qualifications, work environments, and various professional sectors all over Pakistan. A large sample size provides a strong and generalizable estimate of knowledge, self-reported oral changes, and attitude towards consumption of carbonated drinks. This study has not explored the statistical association between demographic variables and consumption habits of healthcare professionals. Additionally, this study has not provided a detailed clinical assessment of changes in the oral cavity due to the ill effects of carbonated drinks. Future research needs to assess the analytical association between demographic factors and consumption of these beverages. Future research should incorporate a

longitudinal design to study the behavior of healthcare workers over time, and clinical assessment should also be included as part of data collection.

CONCLUSIONS

The majority of healthcare workers demonstrated good knowledge of the adverse effects of carbonated drinks, but their attitudes and consumption practices were moderate. This pattern was consistent across MBBS, BDS, and Allied Health Professionals.

Authors' Contribution

Conceptualization: AS, JS

Methodology: MJ, ZN, JA

Formal analysis: AS, MU, JA

Writing and Drafting: AS, JS, MJ

Review and Editing: JS, MJ, AS, ZN, MU, JA

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

All the authors declare no conflict of interest.

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REFERENCES

- [1] Dey D. Carbonated Drinks: Market Dynamics, Public Health Implications, and Emerging Trends. 2025 Nov. doi: 10.2139/ssrn.5757463.
- [2] Riasat T, Bilal A, Iftikhar A, Zafar M. An Empirical Analysis of Carbonated Beverage Consumption Trends and Health Consequences among Tertiary Education Students. *Journal for Current Sign.* 2025 Sep; 3(3): 1421-46. doi: 10.63075/jcs.v3i3.340.
- [3] Nguyen M, Jarvis SE, Tinajero MG, Yu J, Chiavaroli L, Mejia SB et al. Sugar-Sweetened Beverage Consumption and Weight Gain in Children and Adults: A Systematic Review and Meta-Analysis of Prospective Cohort Studies and Randomized Controlled Trials. *The American Journal of Clinical Nutrition.* 2023 Jan; 117(1): 160-74. doi: 10.1016/j.ajcnut.2022.11.008.
- [4] Kabthamer RH, Wu T, Beigrezaei S, Franco OH, Hodge AM, de Courten B. The Association of Sweetened Beverage Intake with Risk of Type 2 Diabetes in an Australian Population: A Longitudinal Study. *Diabetes and Metabolism.* 2025 May; 101665. doi: 10.1016/j.diabet.2025.101665.
- [5] Khalid N. Impact of Carbonated Beverages on Early Onset of Osteoporosis: A Narrative Review. *Nutrition and Health.* 2024 Jul; 30(2): 207-14. doi: 10.1177/02601060231201890.
- [6] Hassan Sr HI, Othman SM, Hassan Jr H, Othman S. Sugar-Sweetened Beverage Consumption and Its Association with Dental Caries among Adolescents in Erbil, Iraq: A Cross-Sectional Study. *Cureus.* 2024 Apr; 16(4). doi: 10.7759/cureus.58471.
- [7] Inchingolo AM, Malcangi G, Ferrante L, Del Vecchio G, Viapiano F, Mancini A et al. Damage from Carbonated Soft Drinks on Enamel: A Systematic Review. *Nutrients.* 2023 Jan; 15(7): 1785. doi: 10.3390/nu15071785.
- [8] Stellenbosch University. Bureau For Economic Research. Economic Prospects: Economic Activity is Expected During 2025-2026. BER: Economic Prospects: Full Survey. 2025 May; 40(2): 1-45.
- [9] Barajas-Torres GC, Klünder-Klünder M, Garduño-Espinosa J, Parra-Ortega I, Franco-Hernández MI, Miranda-Lora AL. Effects of Carbonated Beverage Consumption on Oral pH and Bacterial Proliferation in Adolescents: A Randomized Crossover Clinical Trial. *Life.* 2022 Nov; 12(11): 1776. doi: 10.3390/life12111776.
- [10] Sharma SH, Tiwari MS, Mishra AM, Sharma DI. Consumption Behavior and Awareness of Medical Students About Dental Erosion and Its Association with Consumption of Carbonated/Acidic Beverages. *Asian Journal of Pharmaceutical and Clinical Research.* 2022; 15(10): 56-9. doi: 10.22159/ajpcr.2022.v15i10.46112.
- [11] Khan A, Latif A, Abbas L, Javed F, Khan A, Iqbal A. Knowledge, Attitude and Practices Regarding Consumption of Carbonated Beverages in District Bannu: A Cross-Sectional Study. *Social Science Review Archives.* 2025 Aug; 3(3): 1095-100. doi: 10.70670/sra.v3i3.942.
- [12] Bilal A. Exploring Consumption and Effects of Carbonated Soft Drink among Secondary School Students in Rahim Yar Khan (Pakistan). *Journal of Asian Development Studies.* 2024 Jan.
- [13] Gupta R, Solanki A, Sharma S, Gumber P, Sharma A, Upadhyay R. A Knowledge, Attitude, and Practices of Soft Drinks among Adolescent Students and Their Dental Health: A Questionnaire Study. *International Journal of Dental Health Concerns.* 2015; 1(1): 1-5. doi: 10.15713/ins.ijdhc.3.
- [14] Metta KK, Afif MA, Althagfi NM, Ezzaddin RO, Alam BE, Bandela V. Knowledge, Attitude and Practices Regarding Consumption of Carbonated Soft Drinks Among the Dental Students: A Cross-Sectional Study. *Pesquisa Brasileira em Odontopediatria e Clínica Integrada.* 2022; 22: e210187. doi: 10.1590/pboci.2022.071.
- [15] Cheah K and Chua PL. Knowledge, Attitude, and Practice of Sugar-Sweetened Beverages (SSB)

- among University Students in Klang Valley, Malaysia. Malaysian Journal of Medicine and Health Sciences. 2023 Nov; 19(6): 186-92. doi: 10.47836/mjmhs.19.6.25.
- [16] Shahadan SZ, Salman SN, Ismail MF, Risdiana N. Knowledge, Attitude, and Practice Regarding Sugar-sweetened Beverages Among Undergraduate Students in Kuantan: A Cross-sectional Study. Malaysian Journal of Medicine and Health Sciences. 2025 Sep; 21(5): 44-52. doi: 10.47836/mjmhs.21.5.6.
- [17] Zaidi A, Karim AA, Mohiuddin S, Khan A, Syed A, Jehangir M et al. Dental Sensitivity Associated with Consumption of Fizzy Drinks: A Cross-Sectional Study. Pakistan Journal of Medicine and Dentistry. 2018; 7(4): 5-.
- [18] Kumar N, Amin F, Dahri WM, Khan S, Zaidi H, Rahman S et al. Impact of Acidic Beverages on Composition and Surface Characteristics of Human Teeth: Scanning Electron Microscopic, Stereomicroscopic and Energy Dispersive X-Ray Analyses. BioMed Central Oral Health. 2024 Jul; 24(1): 837. doi: 10.1186/s12903-024-04491-4.
- [19] Gedi S and Taşyikan HA. Knowledge, Attitude and Consumption Pattern of Sugar-Sweetened Beverages Among Somali Students in Turkey. Journal of Basic and Clinical Health Sciences. 2022 May; 6(2): 579-88. doi: 10.30621/jbachs.861149.
- [20] Niaz A, Sana R, Bahar R, Rizwan M, Spugmai M. Sweetened Beverages Consumption and Self-Reported Oral Health among Young Adults: A Cross-Sectional Study in Peshawar: Sweetened Beverages Consumption and Oral Health among Adults. Pakistan Journal of Health Sciences. 2024 Nov: 149-54. doi: 10.54393/pjhs.v5i11.2512.