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Original Article

Relationship Between the Consumption of Beverage Use and its Effects on Oral Health

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ABSTRACT

The current study of beverages as likely contributors to the prevalence of oral diseases in the general population has initiated interest in investigating the association of beverage use and its impact on oral health. **Objective:** To explore the relationship between beverage consumption and its impact on oral health. **Method:** Data were gathered from 377 college students for a cross-sectional study by using a convenience sampling technique. The study included male and female students, aged 19-25, excluding those who declined or couldn't communicate in Urdu/English. verbal consent was taken and confidentiality was maintained. A 95% confidence interval and a p-value of equal and < 0.05 were used to identify significant findings. **Results:** The study included 377 medical and dental college students of which 273 (72.4%) were females and 104 (27.6%) were males. Soft drinks were correlated with dental caries (65.1%) which was followed by sensitivity (14.2%), calculus/plaque (10.7%), and tooth staining (10.1%). Tea consumption was associated with dental caries (54.5%). The relationship between beverage type and its impact on oral health was highly significant (p-value < 0.001). Furthermore, the frequency of beverage consumption and its effect on oral health showed significant results, with a p-value of 0.006. **Conclusions:** The findings suggest a significant correlation between beverage consumption and various oral health issues, including dental caries, sensitivity, calculus, and staining.

INTRODUCTION

Youth has been considered a fundamental period of life in terms of food related behaviors. During this period, youth spend more time with their friends and also make different food preferences. Avoiding healthy food and consuming harmful sugar containing drinks can impair the health of the individual badly. Therefore, consumption of soft drinks has been reportedly consumed by youth in larger quantities [1]. Youngsters are specifically inclined to choose carbohydrate-rich soft drinks thus increasing their risk of getting dental cavities more frequently [2, 3]. Sugar-sweetened beverages, which are defined as drinks with added sugars, naturally occurring sucrose or other calorie-sweetening agents, high-fructose corn syrup or concentrated fruit juice, are a common source of dietary sugars. There has been a substantial rise in utilization and ease of use of beverages in many countries during the past 20 years, particularly fruit drinks, sports drinks and carbonated drinks with additional sugar. They are related to several metabolic diseases which are diabetes and cardiovascular disease, and they significantly increase obesity [4]. Some of the beverages have an unsafe impact on the dental as well as on the general health of human beings which include young people and teens [3]. The excessive content of sugar and acids in beverages with cariogenic and acidogenic potential can cause dental caries, enamel erosion, calculus and periodontal problems [5-7]. In addition to containing an excessive quantity of sugar, these drinks are acidic by nature, which immediately lowers the pH of the mouth. Although the saliva's ability to act as a buffer can initially counterbalance this effect,

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continued consumption of sugary drinks can affect the oral health of an individual [8]. Manufacturers and government companies have made efforts to minimize the harmful effects of sugar-containing drinks on dentition and general health. They have adopted various strategies to help reduce the use of beverages which include banning the sale of drinks at schools, restricting advertisements of soft drinks, modifying the composition, and increasing taxation on soft drinks [5]. Dental caries is the most common non-communicable infection throughout the world. Approximately, 2.4 billion people are affected by caries of permanent teeth and 486 million teens are affected with caries worldwide. Treatment of dental caries is expensive, generating costs equal to 5–10% of healthcare budgets in industrialized countries [4]. Therefore, understanding the impact of beverage consumption on oral health is essential for policymakers and healthcare providers to develop strategies that reduce dental caries and other diseases, thereby alleviating the burden on the healthcare system. This study was conducted to investigate the relationship between consumption of beverage use and its effects on oral health.

METHODS

A cross-sectional study was conducted over 2 months from 1st September to 30th October 2023, after obtaining ethical approval from the research and Ethical Review Board Lahore Medical and Dental College (FD/1237/23). The survey was conducted by circulating a close-ended questionnaire among the students of LMDC, Lahore by employing a convenience sampling technique. The Open Epi calculator version 3.01 estimated the sample size to be 330 participants, using a 95% confidence level, 5% precision and a 33% prevalence rate for dental caries [4]. However, the sample size was raised to 377 students to account for possible non-responses and dropouts. This decision was made under the assumption that not all individuals initially recruited will participate. The questionnaire comprised various questions which were asked by conducting face to face interviews with the students of LMDC by the researcher. The participants were asked various questions which were age, gender, types of beverages used, frequency of taking beverages and knowledge of dental effects with consumption of beverages. Different questions were asked about the effects on the oral cavity like generalized sensitivity, generalized staining, calculus/plaque, and dental caries. Students were briefed on the study's aim and procedure. The consent form detailed the study's objectives, procedures, confidentiality assurances and commitment to scientific research. Participants were asked to seek clarity or ask questions about any aspect of the consent form. They were informed of their rights to decline or withdraw from participation at any stage and a pilot survey involving ten respondents was conducted to validate the questionnaire before the start of the study. Students were recruited from Lahore Medical and Dental College, Lahore, consisting of students from any academic year in medical and dental disciplines of both genders, aged between 19 to 25 years. Exclusion criteria included refusal to participate, age outside the 19-25 range, and inability to communicate in Urdu or English. SPSS version 26.0 was used for data analysis and descriptive statistics were calculated for percentages and frequency. Chi-square test of significance was applied to assess any significant differences in beverage intake intensity and oral health outcomes. P-value of 0.05 or less was considered statistically significant.

RESULTS

There were 377 students out of which 104 (27.6%) were males while 273 (72.4%) were female students as shown in table 1.

Table 1: Gender Wise Distribution of the Students of LMDC (n=377)

Type of Students (Gender)	N (%)	Total
Male	104 (27.6%)	377
Female	273 (72.4%)	

Table 2 showed the student knowledge that soft drinks were linked to dental caries 110 (65.1%), followed by generalized sensitivity 24 (14.2%), plaque 18 (10.7%), and tooth staining 17 (10.1%). Tea correlated with caries 60 (54.5%), while alcohol linked to plaque 20 (40.8%) and fruit juices to sensitivity 19 (38.8%). The association between beverage types and oral health effects was significant (P-value < 0.001).

Table 2: Distribution of Student's Knowledge (LMDC) According to the Types of Beverages and Effects on Oral Health (n=377)

Types of Beverages	Effects on Oral Health N (%)				P-Value
	Generalized Staining of Teeth	Generalized Sensitivity	Dental Caries	Calculus/ Plaque	
Soft drink	17 (10.1%)	24 (14.2%)	110 (65.1%)	18 (10.7%)	0.000
Tea	16 (14.5%)	15 (13.6%)	60 (54.5%)	19 (17.3%)	
Alcohol	12 (24.5%)	15 (30.6%)	2 (4.1%)	20 (40.8%)	
Fruit Juices Energy Drinks	13 (26.5%)	19 (38.8%)	15 (30.6%)	2 (4.1%)	

Table 3 showed that participants consuming beverages once daily showed lower chances of tooth staining 13 (18.3%), caries 31 (43.7%), sensitivity 15 (21.1%), and calculus/plaque 12 (16.9%). Those drinking beverages 2-3 times daily were more associated with caries 103 (60.9%). The correlation between beverage frequency and oral health effects was significant (p-Value = 0.006).

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Table 3: Distribution of Student's Knowledge (LMDC) According to Frequency of Beverages Intake and Effects on Oral Health (n=377)

Frequency of Taking Beverages	Effects on Oral Health N (%)				P-Value
	Generalized Staining of Teeth	Generalized Sensitivity	Dental Caries	Calculus/ Plaque	
Once Per Day	13 (18.3%)	15 (21.1%)	31 (43.7%)	12 (16.9%)	0.006
Two To Three Times Per Day	13 (7.7%)	30 (17.8%)	103 (60.9%)	23 (13.6%)	
One To Two Times Per Week	18 (22.0%)	15 (18.3%)	34 (41.5%)	15 (18.3%)	
Rarely	14 (25.5%)	13 (23.6%)	19 (34.5%)	9 (16.4%)	

DISCUSSION

Our study found a significant relationship between higher consumption of soft drinks and dental caries (65.1%), followed by tea (54.5%) and fruit juices (30.6%). Another study was conducted in Saudia Arabia revealed that fizzy soft drinks have a negative impact on teeth (67.83%) and can lead to dental plaque or white patches (61.89% vs. 41.47%) [9]. While other study showed that 50.6% of the students were consuming sugary drinks and had dental caries of 25.7% and 16.5% of calculus [10]. In fact, preliminary evidence suggests that increased consumption of ultra-processed foods and drinks was linked to a higher risk of developing dental caries [11]. An investigation carried out in Saudi Arabia in 2016 showed a direct correlation between the use of beverages and dental caries [12]. A similar study on the impact of beverage use on oral health found that sweetened sugary drinks were associated with dental caries (OR = 1.57), which led to tooth loss in permanent dentition impacts 60% to 90% of children and the majority of adults and teens as shown by WHO report though another study shown by Leena Verma's study revealed that approximately 65% of the students believed that sweets, soft drinks, and chips cause tooth decay ($p < 0.001$) [13-15]. SSD intake was notably linked with increased caries occurrence as indicated by the DMFS indices, leading to a greater likelihood of dental decay [16]. Khairnar MR et al., identified a significant correlation ($p < 0.001$) between dental caries and the frequency of sugary food consumption, alongside tea intake (p-value= 0.02) [17]. A study revealed that alcohol addiction not only impacts overall health but also affects oral health significantly. Alcoholics face elevated risks of developing dental caries and gingival diseases [18]. According to our study, taking beverages once in a day reduces the risks of tooth staining, caries, sensitivity and plaque while frequent intake (2-3 times daily) significantly increases caries risk, showing a strong correlation (p = value 0.006) [19]. Hadilou M *et al.*, in her study, showed that the most common consumption pattern was 1-2 servings (approximately 300 ml per serving) per day among 25% of participants and about 82.73% were aware of dental erosion, and 81.82% knew that carbonated or acidic beverages cause erosion, leading to sensitivity [20]. According to the study results, DMFT showed no association with natural fruit juice or SSB consumption. However, a 4-year prospective study by Tahmassebi JF et al., involving Finnish adults over 30 reported that high SSB consumption increased DMFT by 31% to 33% [4]. On the contrary, Hadilou's M revealed that consuming tea and coffee weekly led to a 13% lower DMFT compared to daily consumption (p=0.01) and so lowers the chances of dental caries [20].

CONCLUSIONS

Beverages are associated with increased caries, calculus, and sensitivity. Consumption of beverages should be reduced, especially in children and youth by continued efforts through policymakers, practitioners' dental public health leaders by oral health education, and clinicians to minimize consumption of beverages for reducing the burden of oral disease.

Authors Contribution

Conceptualization: SHAH
Methodology: SHAH
Formal analysis: ZN, SHAH, SLSS, NGS
Writing, review and editing: SHAH, SLSS, NGS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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