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Sweetened Beverages Consumption and Self-Reported Oral Health among Young Adults: A Cross-Sectional Study in Peshawar

Aiman Niaz[1], Ruqayya Sana[2*], Rida Bahar[3], Muhammad Rizwan[3] and Malaika Spugmai[4]

[1]Department of Community Dentistry, Khyber Medical University, Peshawar, Pakistan
[2]Department of Community and Preventive Dentistry, Sardar Begum Dental College, Peshawar, Pakistan
[3]Department of Dental Surgery, Sardar Begum Dental College, Peshawar, Pakistan
[4]Sahara Medical College, Narowal, Pakistan

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***Corresponding Author:**
Ruqayya Sana
Department of Community and Preventive Dentistry, Sardar Begum Dental College, Peshawar, Pakistan
sana.ruqayya@gmail.com

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ABSTRACT

Sweetened beverage consumption has become a growing concern due to its potential negative effects on oral health, particularly among young adults. **Objectives:** To assess the consumption patterns and self-reported oral health of sweetened beverages among young adults in Peshawar. To evaluate the association of self-reported oral health and sweetened beverage consumption among young adults. **Methods:** A cross-sectional study was conducted among 163 young adults in Peshawar. An online questionnaire was sent to study participants via convenience sampling. A structured questionnaire was used to collect data. Data were entered and analyzed using SPSS 26. The chi-square test was employed to assess the association between different categorical variables and $p<0.05$ was considered significant. **Results:** The mean age of the participants was 19.37 + 1.57 years. Soda was the most frequently consumed beverage (33.1%), followed by energy drinks (11.7%), favored tea (9.8%), packed juices (11.7%), and other beverages (14.8%). Around 41.7% of the participants experienced tooth sensitivity, 41.1% had dental caries and 37.4% had gum problems. Significantly more female than male consumed sweetened beverages daily. **Conclusions:** A positive link between increased intake of sugary drinks and poor oral health. To tackle this issue, it is crucial to implement public health initiatives, school-based programs, and policy reforms aimed at reducing sugary drink consumption and enhancing oral health.

INTRODUCTION

In recent times, energy drinks, soda and other soft drinks have become increasingly popular. There has been a significant hike in demand for sweetened beverages especially among the young population [1]. Fruit-favoured beverages with added artificial sweeteners and preservatives are liked by all young adults. The increase in consumption raises concern among health professionals and dentists [2]. Several health hazards are reported from the use of sweetened drinks including obesity, diabetes, and tooth decay, due to the high sugar content of these beverages [1, 3]. The rise in the consumption of sweetened beverages raises concerns about oral diseases, especially dental caries [4]. The high sugar content develops an active acidic environment in the oral cavity [2]. The combination of acid production and fermentable carbohydrates creates an environment conducive to bacterial growth, leading to tooth enamel breakdown and, consequently, dental caries [2, 3]. According to the World Health Organization, sugar intake should be limited to less than 10% of total energy consumption, and ideally, to less than 5% for optimal health benefits [3]. Regardless of these clear recommendations, the consumption of sweetened beverages is increasing at an alarming rate among young adults [4]. Studies have demonstrated a connection between sweetened beverage consumption and both oral health problems and general health issues [4-6]. In the United States, sugar-sweetened beverages contribute approximately 7% of the daily caloric intake

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among young adults [5]. A strong correlation exists between sugary drink consumption and dental caries in children and adolescents. While the evidence is limited, it's well-established that health and dietary habits formed during young adulthood often persist throughout life. Young adults are often involved in risk-taking behaviours while ignoring any preventive measures, and unhealthy eating and drinking habits are among those behaviours [1, 7]. Similarly, dietary choices are influencing oral health status among this vulnerable group, leading to a vicious health cycle [1, 8]. The perception of young adults regarding their oral health is important in shaping their eating habits. It serves as an indicator of oral health-related quality of life, thus affecting the psychological and social impact of oral health [1, 4]. Self-reported oral health is a fundamental factor in understanding individuals' views of their dental health, which can be affected by consumption patterns of artificial beverages [7]. More evidence is growing on the linkage of sugary beverages to poor oral health [9]. However, the research gap still exists in our understanding of how young adults perceive dietary habits with oral health. The implications of this research will extend beyond individual health, influencing public health strategies aimed at reducing diet-related dental diseases. Insights into young adults' perceptions of oral health and its connection to sweetened beverage consumption can guide targeted educational campaigns and preventive measures [3, 10]. Public health initiatives, including community-based programs and university health services, can utilize findings from this study to foster an environment that encourages healthier beverage choices and increased oral health awareness. Furthermore, exploring the relationship between sweetened beverage consumption and self-reported oral health can lead to the development of holistic strategies that address not only dietary behaviours but also the psychological and social aspects of health [11]. Pakistan has one of the highest rates of sweetened beverage consumption globally, with approximately 99.3% of the population consuming these drinks. Yemen shows the second-highest daily and weekly consumption rates around 60% [5]. The consumption of sugar-sweetened drinks poses a significant public health issue, particularly affecting the dental health of young adults.

This study aims to identify the patterns of sweetened beverage consumption among young adults. The secondary objectives are to assess the self-reported oral health of young adults and explore its association with their patterns of sweetened beverage consumption. By examining these dietary habits and health perceptions, the study seeks to provide a comprehensive understanding of their interplay, ultimately guiding future research interventions.

METHODS

A cross-sectional study was conducted from April to September 2024 among young adults. A sample size of 179 young adults was calculated using the Open-Epi calculator. The sample size was calculated assuming a proportion of 12% [12], a precision of 5%, and a 95% confidence interval, with a 10% non-response rate. This yielded a minimum required sample size of 163 participants, which was adjusted to 179 to account for a 10% non-response rate. A well-structured self-administered questionnaire was used to collect data. The questionnaire was pilot-tested on 5% of the sample size. Data collection was started after obtaining ethical approval from the Ethical Review Board of Gandhara University (Certificate No. GU/Ethical Committ/2024/160). Participants were recruited through a digital distribution strategy through the snowball sampling technique. The online questionnaire was shared via WhatsApp and social media groups among students of Gandhara University, Peshawar. Informed consent was obtained from each participant at the start of an online questionnaire. Participants aged 18-25 years who were residents of Peshawar were included in the study. Individuals who were younger than 18 or older than 25 years were excluded. Additionally, participants who were unable to understand or complete the questionnaire were not included in the study. All the collected data were entered and analyzed using SPSS version 26.0. Mean and standard deviation were calculated for the age of participants. Frequency tables and percentages were generated for categorical variables. The chi-square test was conducted to determine the association between different categorical variables and p-values less than 0.05 were considered significant.

RESULTS

A total of 179 questionnaires were distributed online to young adults for this cross-sectional study. After data cleaning and deletion of incomplete responses, a total of 163 complete responses were included in the study. The mean age of the participants was 19.37 + 1.57 years. Female participants were 69.9% (114), while male participants were 30.1% (49). All of the participants were college students, 69.3% (113) were 1st year students and 23.3% (38) were 2nd year students. Around 5.6% (9) were 3rd year students and 1.8% (3) were 4th year students. When asked how often the participants consume sweetened beverages in one week, 19% (31) of participants reported daily consumption, while 25.8% (42) once a week, 30.7% (50) reported 2-3 times per week, 11% (18) more than 4 times a week, and 13.50% (22) reported that they do not consume any sweetened beverages during the week. The consumption pattern of sweetened beverages in one week among young adults is shown in figure 1.

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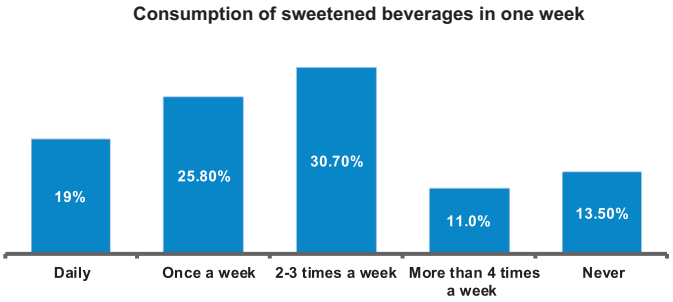

Figure 1: Consumption of Sweetened Beverages in One Week among Young Adults

The participants were asked about the type of beverages they consume. 54 (33.1%) soda and energy drinks were consumed by 19 (11.7%) and 16 (9.8%) consumed favoured tea. Approximately 19 (11.7%) packed juices and 55 (33.7%) consumed drinks other than those mentioned. A higher prevalence of sweetened beverage consumption was found in female than male. Several participants used a combination of different drinks, which were as follows; 3.7% soda and packed juices, 3.7% consumed energy drinks and packed juices, 2.5% soda and favoured tea, while 1.8% of participants consumed soda, energy drinks, packed juice, flavored tea, and other drinks in different combinations. The number of beverages consumed per day was analyzed. Results showed that 30.1% of participants do not consume any drink daily, one drink was consumed by 60.7% of participants, two drinks were consumed by 5.5% of participants, and 3.7% of participants consumed three drinks in a single day. The oral health practices and the self-reported dental problems of young adults are demonstrated in table 1.

Table 1: Oral Health Behaviors and Self-Perceived Oral Health Conditions of Young Adults

Oral Health Behaviour and Self-Perceived Oral Health Condition	n (%)
Tooth Brushing Frequency	
Once a Day	93 (57.1%)
Twice a Day	64 (39.2%)
Do Not Brush Their Teeth	6 (3.7%)
Use of Mouthwash	
No Use of Mouthwash	118 (72.4%)
Use Mouthwash	45 (27.6%)
Flossing	
Use floss	132 (81%)
Do Not Use Floss	31 (19%)
Previous Dental Visit	
In the last 6 Months	43 (26.4%)
In the 6-12 Months	20 (12.3%)
More Than A Year Ago	42 (25.8%)
Never Visited A Dentist	58 (35.5%)
Tooth Sensitivity	
Reported Tooth Sensitivity	68 (41.7%)
No Tooth Sensitivity	95 (58.3%)
Gum Problems	
Experienced Gum Problems	61 (37.4%)
No Gum Problems	102 (62.6%)
Tooth Cavities	
Had A Tooth Cavity	67 (41.1%)
Never Had A Tooth Cavity	96 (58.9%)
Bad Breath	
Experienced Bad Breath	56 (34.4%)
Never Had Bad Breath	107 (65.6%)
Tooth Pain After Consumption of Sweetened Beverage	
Never Experienced Tooth Pain	119 (73%)
Experienced Tooth Pain	44 (27%)
Tooth Sensitivity After Consumption	
Experienced Tooth Sensitivity	50 (30.7%)
Never Experienced Tooth Sensitivity	113 (69.3%)

The participants were asked whether they were aware of the health hazards of sweetened beverages, 141 (86.5%) reported that they were aware of the harmful effects of sweetened beverages while 22 (13.5%) were unaware. A greater number of female was aware of the negative impact of sweetened beverages on oral health compared to male ($p<0.05$). The participants were asked if they had received any information from a healthcare provider or any other source on oral health risks related to the use of sweetened beverages, 93 (57.1%) reported that they had received any such information while 70 (42.9%) denied receiving any such information. Chi-square test to examine the association between frequency of sweetened beverage consumption (daily, weekly, and non-consumers) and self-reported oral health conditions (tooth sensitivity, tooth cavities, gum problems, and bad breath). The findings of associations between sweetened beverage consumption and self-reported oral health conditions are highlighted in table 2.

Table 2: Association Between Oral Health Conditions and Frequency of Sweetened Beverage Consumption Among Young Adults

Oral Health Condition	Frequency of Sweetened Beverage Consumption	n (%)	p-Value
Tooth Sensitivity	Daily Consumers	18/31 (58.1%)	>0.05
	Once a Week	16/42 (38.1%)	
	2–3 Times/Week	21/50 (42.0%)	
	>4 Times/Week	8/18 (44.4%)	
	Non-Consumers	5/22 (22.7%)	
Tooth Cavities	Daily Consumers	19/31 (61.3%)	>0.01
	Once a Week	18/42 (42.9%)	
	2–3 Times/Week	19/50 (38.0%)	
	>4 Times/Week	9/18 (50.0%)	
	Non-Consumers	4/22 (18.2%)	
Gum Problems	Daily Consumers	17/31 (54.8%)	0.06
	Once a Week	15/42 (35.7%)	
	2–3 Times/Week	20/50 (40.0%)	
	>4 Times/Week	6/18 (33.3%)	
	Non-Consumers	5/22 (22.7%)	

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Bad Breath	Daily Consumers	14/31 (45.2%)	>0.05
	Once a Week	17/42 (40.5%)	
	2-3 Times/Week	17/50 (34.0%)	
	>4 Times/Week	7/18 (38.9%)	
	Non-Consumers	4/22 (18.2%)	

Daily consumers of sweetened beverages exhibited significantly higher rates of tooth sensitivity, cavities, and bad breath compared to less frequent or non-consumers ($p<0.05$). There was no association between gum diseases and consumption of sweetened beverages.

DISCUSSION

The current study was conducted to assess the patterns of sweetened beverage consumption and self-reported oral health status among young adults in Peshawar. There has been a marked increase in consumption of sugary sweetened beverages among young adults in recent years which has raised serious concerns among health professionals. The study revealed a concern high prevalence of sugar-sweetened beverage consumption among young adults in Peshawar. A substantial proportion of participants, 30.7%, were frequent consumers. Another study conducted in Pakistan stated that 12% of college students consume sweetened beverages [12]. A study conducted in Saudi Arabia found that 93.6% of participants consumed soft drinks weekly, with 40.8% consuming them daily. Another study reported that 98.5% of participants consumed soft drinks within three months [13]. A study done in Kuwait, also reported the majority of participants (93.8%) consumed weekly beverages and 32.6% consumed daily beverages [5]. The use of different types of beverages usually depends on the personal preferences and tastes of individuals. The results of the current study showed different variations according to the kind of beverage consumption. Soda was the most frequent and preferable drink among the individuals (33.1%) which comes in resemblance to other studies done in Lahore, Bahrain and Australia showing similar preference among young populations [14, 15]. Another drink that was most popular and frequently used among young adults was energy drinks (11.7%). The data from low-middle-income countries also showed evidence that carbonated drinks are consumed 1.39 times more among young adults. Moreover, 54.3% of adolescents consume at least one carbonated drink per day [16]. A notable finding was the diverse range of beverage combinations consumed by participants. For instance, 3.7% consumed a mix of soda and packed juices, while another 3.7% opted for energy drinks and packed juices. Additionally, 2.5% combined soda and flavoured tea, and 1.8% consumed a variety of beverages including soda, energy drinks, packed juices, flavored tea, and others. Our study found that the most common consumption pattern was one beverage per day, reported by 60.7% of participants. A smaller proportion, 5.5%, consumed two beverages daily, while 3.7% consumed three. A study done during COVID revealed that there was an increase of uptake of sugary beverage use increased by 32% and led to oral health emergencies in 18% of individuals. During this time one out of five individuals preferred using sweetened beverages, showing a shift in dietary habits [11]. Habitual consumption of sweetened beverages is linked to type 2 Diabetes as evident from research [17]. Most of the participants suffered from dental caries and tooth sensitivity in the past year. Bad breath was experienced more by female in comparison to male. A systematic review revealed an increase in the odds of caries and an increased Decayed, Missing and Filled teeth score as compared to no-sugar beverage users [14, 18]. Similarly, primary dentition showed an increase in caries prevalence up to two times in those taking sugary diets and drinks as compared to non-sugary consumers [4]. Similarly, caries prevalence is positively associated with sugar-sweetened beverages with 60.9% and 85 % more prevalence among consumers and non-consumers [19, 20]. Most of the participants in this study experienced tooth pain and sensitivity immediately after consumption of sweetened beverages. Similarly, a study on health professionals reported that 84% of daily consumers had sensitivity, along with 97% discoloration and 87% erosion [2, 20]. A strong understanding of the health risks associated with added sugar is crucial for making informed dietary choices. In our study, the majority of participants (86.5%) demonstrated adequate knowledge about the negative impact of sugar-sweetened beverages on both general and oral health. These findings align with previous research, which has also shown a positive relationship between awareness and knowledge and the consumption of sugar-sweetened beverages [12]. When asked about receiving information on the oral health risks associated with sugar-sweetened beverages, 57.1% of participants reported having been informed by a healthcare provider or other source. This aligns with findings from a study of medical and dental university students, which indicated that dental students, in particular, possessed a higher level of knowledge on the subject [12].

CONCLUSIONS

The findings reveal a significant association between daily consumption and increased rates of tooth sensitivity, cavities, and bad breath, compared to those who consume sugary drinks less frequently or not at all. A positive link between increased intake of sugary drinks and poor oral health. To tackle this issue, it is crucial to implement public health initiatives, school-based programs, and policy reforms aimed at reducing sugary drink consumption and enhancing oral health.

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Authors Contribution

Conceptualization: AN
Methodology: AN, RS, RB, MR, MS
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Writing review and editing: AN, RS, MR, MS

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

Conflicts of Interest

All the authors declare no conflict of interest.

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