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Research Article

Effects of Sweetened Beverage Consumption on Dental Caries and Oral Health-Related Quality of Life in Children

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Abstract

Background: A major public health concern for young children is dental caries, and drinking sugar- sweetened beverages has been found to be a significant risk factor. The Objective of this study was to assess the frequency and effect of sugar-sweetened beverage consumption on dental caries and oral health related quality of life among children aged 6-12 years presenting

to HBS Dental Hospital, Islamabad.

Methods: This was a cross-sectional study, conducted on 100 children aged 6-12 years attending HBS Dental Hospital Islamabad from July 2024 to December 2024. The children were recruited by using non probability consecutive sampling technique. Data were collected by the principal investigator through validated Questionnaires; food frequency questionnaire (FFQ) and Child Oral Health Impact Profile (COHIP); furthermore intra oral examination was done by a trained dentist via Decayed, Missing, and Filled Teeth (DMFT) index. The data analysis was done by using SPSS version 22.

Results: Out of total 100 children 45 were females and 55 were males. 65% consumed sugary food/drinks daily. Mean DMFT score (indicator of dental caries) was 3.5 (± 2.1). Children with high sugar-sweetened beverage consumption reported more dental problems and discomfort. Children who consumed sugary food/drinks daily had a significantly higher risk of dental caries (OR = 3.8, 95% CI = 1.5-9.5).Furthermore for quality of life in relation to oral health overall well being, psychological, difficulty concentrating and social domains(55%, 50%. 45% and 40% respectively) were found affected.

Conclusions: Consuming Sugary food/drinks are significantly associated with an increased risk of tooth decay and have a negative impact on quality of life in relation to oral health among children aged 6-12 years. Public health efforts should emphasize reducing sugar-sweetened beverage intake and promoting oral health education to prevent dental caries and encourage overall health.

Key Words: Dental caries, Sugar consumption, Decayed, Missing, Filled, Oral health

Introduction

Globally, dental caries among children is the most commonly encountered persistent condition (1). Particularly in poor countries, the World Health Organization (WHO) classifies tooth decay aa major public health issue (2). The consumption of sugar containing drinks has increased the risk of obesity, tooth decay and other health problems (3). Considering that children make an especially susceptible group (4), the intake of Sugary sweetened beverages (SSBs) has become a serious issue around the globe. Pakistani children have an increased prevalence of caries and their SSBs intake is rising (5). Among youngsters (6), for dental caries the sugar sweetened beverage (SSB) consumption is listed as a prominent risk factor. The World Health Organization (WHO) advises lowering sugar consumption to prevent dental caries and other health problems (7). Poor access to oral health care services worsens this problem; Pakistani children suffer from a prevalent health condition called as dental caries (8). Sugary sweetened beverages (SSBs) are a main contributor of dental

caries in children due to their high acidity and sugar level, which promotes tooth decay and enamel erosion. The consumption of SSBs has been associated to an increase in dental caries risk; data shows a dose response relationship whereby more intake equals more caries incidence (9).

Impact on Dental Caries: Numerous studies demonstrate that children who consume SSBs frequently have significantly higher dental caries rates compared to those with low or no consumption. For example, children consuming more than 250 ml of SSBs daily have a higher risk of tooth decay compared to those consuming less than 71 ml per day(8). A systematic review found that 34 out of 37 studies reported positive links among sugar-sweetened beverage intake and caries among young children.

Dose-Response Relationship: The risk of caries increases with the frequent use and quantity of SSB consumption. Moderate consumption (2-7 times per week) already raises caries risk, which escalates further with daily or more frequent intake.

Early Exposure Effects: Early introduction and regular consumption of sugary drinks in infancy and toddlerhood are linked to higher caries prevalence in primary teeth and potentially permanent teeth later on. For instance, children consuming sugary drinks at least once a week by 1.5 years old had nearly twice the odds of caries by age 5 compared to those consuming less frequently.

Association with Caries Risk: Several studies reveal that kids who eat SSBs have much more dental caries rates than those with little to none intake. Children eating more than 250 ml of SSBs every day, for instance, have a greater risk of caries than those eating less than 71 ml daily(8).

Mechanism of action of sugary intake: The sugars in SSBs provide substrates for oral bacteria, therefore creating acids that de- mineralize tooth enamel surface. Furthermore, the acidity of many sweetened beverages directly promotes enamel erosion, so increasing the likelihood of caries (10).

Review of related literature: According to previous research released in the Journal of Dentistry for Children, kids who drink sugary drinks, development of tooth decay are high. Effective ways to lower the risk of caries and to improve the oral health of youngsters include controlling sugar intake and encouraging dietary education, according the study (11). Research reported at the 24th World Congress indicated that school children's risk of caries is strongly linked with sugary food and beverages consumption. The study emphasizes how important it is for parents, teachers, and medical professionals to recognize the hazards related with SSB intake (12).

According to a research released in BMC Oral Health, increased caries experience in

10 and 15yearolds was linked to consumption of sugary-sweetened beverages. According to the research, attempting to minimize or eliminate SSB intake will help avoid dental caries (13). According to another study published in Minerva Dental and Oral Science, the intake of sugared beverages in children linked to caries incidence. To avoid dental caries, the study advises encouraging adequate oral hygiene practices and cutting sugary drink consumption (14).

Some key findings from these studies included Sugar-sweetened beverage consumption is a significant risk factor for caries in children. Dental caries affect a major proportion of young children, with studies suggesting that nearly half of children may be affected. Regulating sugar

Methodology

This research employed a cross-sectional design. Children aged 6-12 years, attending HBS Dental Hospital, Islamabad, from July 2024 to December 2024 were included by using Non probability consecutive sampling technique. Excluded were the children with special needs or impairments, Children using drugs that influence oral health and Children with systemic illnesses influencing oral health. To ensure a 95% confidence interval and 5% margin of error, a sample of 100 children was calculated based on the anticipated prevalence of sugar-sweetened beverage consumption. The data was collected by the principal investigator after taking written informed consent from the parents/guardians who agreed to participate in the study. A validated food frequency questionnaire (FFQ) developed by Willett et al. (1985) was administered to parents/guardians to gather information on sugar-sweetened beverages (SSBs) intake and other relevant factors. FFQ consists of 61 number of items with five point likert scale 0(Never) to 4(daily). Intra Oral examination using the DMFT (Decayed, intake, promoting dietary education, and good oral hygiene practices can decrease the risk of caries. 18 months old may be at risk of caries due to sugar-sweetened beverage consumption, with further risks increasing with age. (11, 14)

Missing, and Filled Teeth) index to assess the prevalence of dental caries was conducted by trained dentist with at least 2 years of experience. The Child Oral Health Impact Profile (COHIP) developed by Broder et al. (2007) was used to assess the impact of dental caries on children's oral health related quality of life. COHIP consists of 34 number of items with five point likert scale 0(Never) to 4(very often). Data were recorded accurately and confidentially.

Ethical Considerations

Informed consent was obtained from parents/guardians. Confidentiality and anonymity of participants were maintained.

Statistical Analysis

The data analysis was done by using SPSS version 22. Descriptive statistics, logistic regression, chi-square and independent sample t-test were applied to analyze the data and determine the association between SSB intake and caries. The Pearson correlation coefficient was used to assess the correlation between SSB consumption and dental caries. P-value of ≤ 0.05 was kept as significant.

Results

Table1: Demographic characteristics of Children/Guardian

Variable	**Mean**	**SD**
Age	9.2	1.8
Variables	**Frequency (%)**	
Total participants	100	
Girls	45(45%)	
Boys	55(55%)	
Education status of Parent/Guardian	Primary 40(40%) Middle 30(30%) Secondary and above 30(30%)	
Socioeconomic status	Low. 20(20%) Middle 40(40%) High. 40(40%)	

This table presents the demographic variables of the 100 children/guardian, including age and gender of children, education status of guardian, and socioeconomic status. The mean age of the children was 9.2 years (± 1.8). The sample consists of 55% boys and 45% girls. The education status of parent/Guardian is distributed across primary (40%), middle (30%), and secondary and above (30%). The socioeconomic status is categorized into low (20%), middle (40%), and high (40%).

Table2: SSB Consumption and Dental Caries

Variables	**Values**
Prevalence of daily SSB consumption	65%
Mean DMFT score	3.5 (± 2.1)
Odds Ratio (OR) for dental caries	3.8 (95% CI = 1.5-9.5)
Correlation between SSB consumption and DMFT score	r = 0.35, p = 0.001

Table 2 shows the association among sugar-sweetened beverages consumption and caries. The table highlights daily SSB consumption, mean DMFT score, odds ratio for dental caries, association among SSB consumption and DMFT score.

Table3: Prevalence of daily SSB consumption

Sugary Food/Beverage	Daily Consumption Percentage
Soda	25%
Sweetened tea/coffee	15%
Energy drinks	3%
Fruit juice	2%
Chocolate	10%
Cake	5%
Toffee/Candy	5%

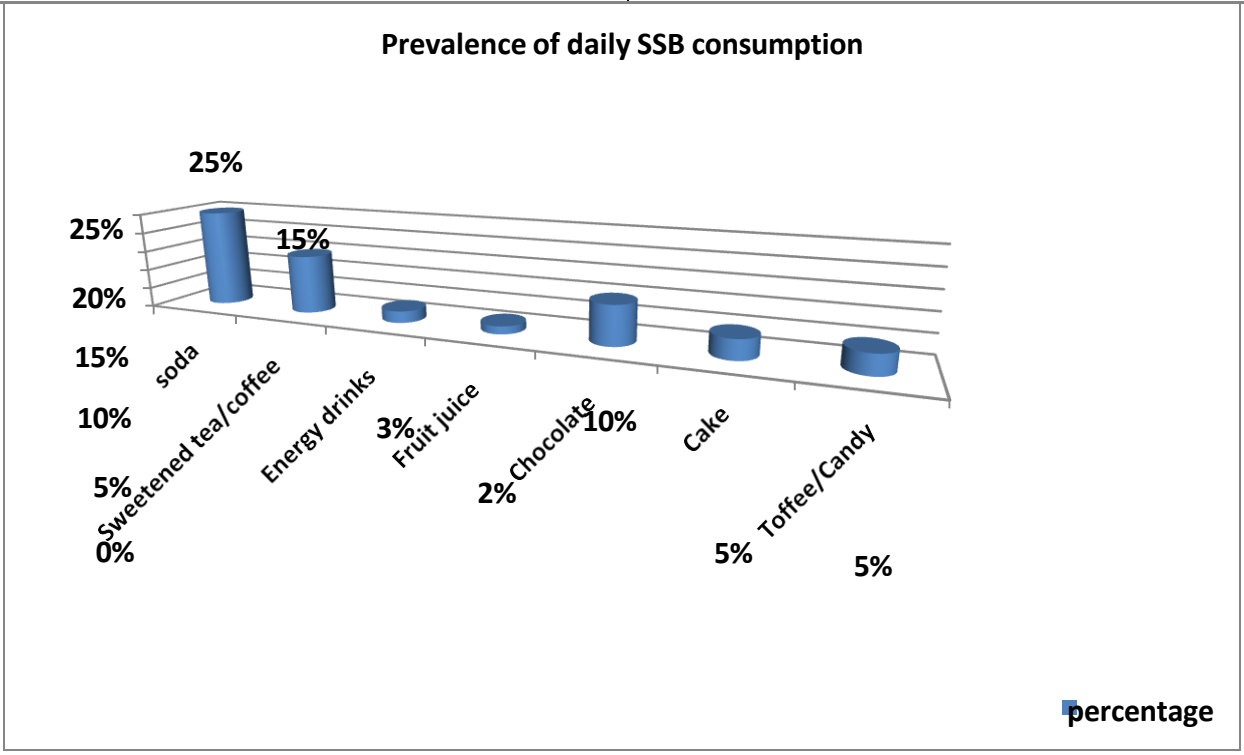
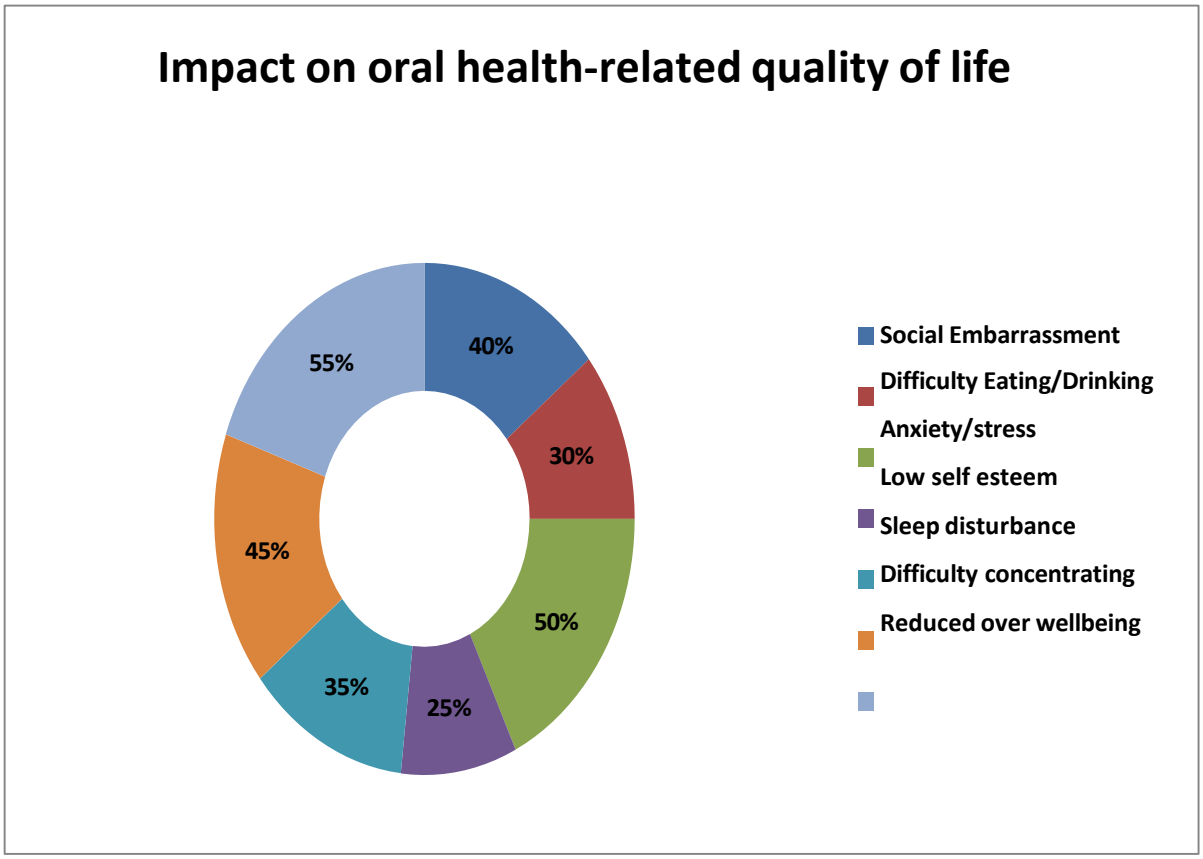


Table4: Impact on oral health in relation to quality of life

Impact	Percentage

Social Embarrassment	40%
Difficulty Eating/Drinking	30%
Anxiety/stress	50%
Low self esteem	25%
Sleep disturbance	35%
Difficulty concentrating	45%
Reduced over wellbeing	55%

Table 3 showed the Negative impact on oral health in relation to quality of life, particularly in reduced overall well being, psychological, difficulty concentrating and social domains(55%, 50%. 45% and 40% respectively)



Discussion

This study explored the correlation among sugar-sweetened beverage (SSB) consumption and dental caries among children ages 6-12 Years. Research also revealed the adverse effect of SSB consumption on quality of life related to oral health. The findings showed a clear association between SSB consumption and dental caries, which agrees by earlier studies (6). High prevalence of SSB intake among youngsters (65% ate sugary food/beverages daily) and great link between SSB intake and dental caries (OR = 3.8, 95% CI = 1.59.5) were found. The current evidence strongly supports a positive association between sweetened beverage consumption and the development of dental caries in children, as well as a potential negative impact on their oral health-related quality of life(3). SSB usage was a significant risk factor for dental caries (6). A favorable association among SSB intake and dental caries has also been demonstrated (18). The rate of SSB intake among kids in research (65%) is consistent with other studies(8).

Several studies have been shown a clear, dose-dependent relationship among the intake of sugar-sweetened beverages (SSBs) and the risk of dental caries in children. Data from the U.S. National Health and Nutrition Examination Survey (NHANES) indicate a statistically significant correlation between added sugar intake and the number of decayed, missing, or filled tooth surfaces in children less than 18 years of age (21). This relationship is biologically plausible, as the sugars in SSBs provide a substrate for cryogenic bacteria, leading to acid production and demineralization of tooth enamel (22).

A systematic review and meta-analysis found that children with higher SSB consumption had significantly increased odds of developing dental caries compared to those with lower intake (OR=1.53–1.57), and a clear dose-response gradient was observed(23). Furthermore, a longitudinal U.S. study reported that frequent SSB intake during late infancy (10–12 months) was linked with an 83% higher likelihood of dental caries by age six, even after adjusting for confounders such as tooth brushing habits and other dietary factors(24).

The timing of exposure appears to be important. While some studies found no association between any SSB intake during infancy and later caries, higher frequency of SSB consumption during late infancy (≥3 times/week) was significantly associated with increased caries risk at age six. This suggests that late infancy is a critical period for establishing healthy beverage habits, and interventions during this window could be particularly effective in reducing caries risk(25).

Dental caries in children's can have a profound impact on their oral health-related quality of life. Caries can cause pain, discomfort, and infection, leads to difficulties in eating, speaking, and sleeping, as well as missed school days and impaired psychosocial well-being. This study found

Negative impact on oral health in relation to quality of life, particularly in reduced overall well being (55%), psychological(50%), difficulty concentrating(45%) and social domains(40%) Although direct measures of quality of life were not the primary focus of most studies reviewed, the established links between caries and these adverse outcomes highlight the broader implications of SSB consumption for children's overall well-being(26).

Conclusion

This study emphasizes the close correlation between sugar-sweetened beverages (SSB) consumed and dental caries. The results imply that frequent SSB intake raises the risk of dental caries and so worsens oral health related quality of life.

Limitation

This was a single centered study conducted on small sample size.

Future recommendations

1. Longitudinal studies aimed at determining the long run impacts of SSB consumption on dental caries and oral health related quality of life.
2. Designing particular strategies to lower SSB consumption among children.
3. Evaluating the effectiveness of oral health education programs**.**

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