The Impact of Beverage Choice on Early Childhood Caries in Children between the ages of Two and Five Years Old in Kentucky

H. Hazle, DMD, C. Perez DDS, K. Dingrando DMD
Division of Pediatric Dentistry
G. Hawk MS
Dr. Bing Zhang Department of Statistics
University of Kentucky, Lexington, KY

Introduction

Early Childhood Caries (ECC) is multifactorial, largely dependent on parental behaviors and influences leading to consumption of high sugar containing foods and non-fluoridated beverages. Overall, previous studies show there has been a decline in consumption of milk, fruit and vegetables, with an increase in consumption of sugar-sweetened beverages (SSBs). (1) Early introduction of SSBs that is, by the end of the first year of life, is positively associated with caries trajectories from age 12 to 48 months. (2) The 2001 Kentucky survey for the National Oral Health Surveillance System (NOHSS) reported a 34.6% caries prevalence in children ages five to 13. A more recent study in 2012 showed that the caries rate in Kentucky in children ages five to nine was 33% (2). However, a lack of research exists that addresses children between the ages of two and five and their total beverage intake accounted for by the guardian and the correlation that may have with caries presence. The high prevalence of Early Childhood Caries (ECC) in Kentucky's children, which does not appear to be decreasing, warrants further investigation. We speculate that children between the ages of two to five years of age who consume primarily non-fluoridated water beverages will have a higher caries prevalence. The purpose of this study is to use a parent/guardian survey and the DMFT index to examine the association between beverage choice and early childhood dental caries among a representative sample of children two to five years of age seen for routine dental exams in a hospital based residency program. We believe that higher intake of non-fluoridated beverage choices in children ages two to five will have a positive correlation to caries experience, with children receiving more fluoridated water daily having less dental caries experience overall than children who primarily consume non-fluoridated beverages.

Methods

- **Sample:** 96 surveys distributed to KY Clinic Parents of 2-5 year old children seen for routine dental appointments
- **Inclusion Criteria:** Healthy children between the ages of two and five years of age who were able to sit for a clinical (and radiographic per AAPD guidelines) exam who had or have had all twenty primary teeth present.
- **Design:** A voluntary electronic survey using REDcap consisting of questions regarding their child's consumption of various amounts/types of sugar sweetened and non-sugar sweetened beverages.
- **Procedures:** A survey was handed out to any parent of KY Clinic patients between the ages of two and five years of age. Demographics of parents were asked in the survey including age and race of child. A second survey was done by the principal investigator marking how many teeth have previously been affected by caries and how many teeth are currently affected by caries.
- **Statistical analysis:** Descriptive statistics, Fisher's Exact tests and quasi-Poisson regression models. All analysis was performed using SAS 9.4, with a significance level of 0.05.

Conclusions

- Hispanic/Latino patients consume significantly less tap water versus bottled water; and Hispanic/Latino and Black patients consume marginally significant more bottled water than tap water than other representative population groups **(Tables 1 and 2) *p*-value=0.002 and *p*-value=0.008**
- When comparing tap water consumption to bottled water consumption, consuming 2 or more cups of tap water daily has a more significant impact on reducing caries prevalence than consuming 2 or more cups of bottled water **(Graphs 1 and 2) *p*-value=0.011**
- Soda and sports drinks such as Gatorade have a more significant impact on caries experience than milk, chocolate milk, and juice does contributing to higher caries prevalence.

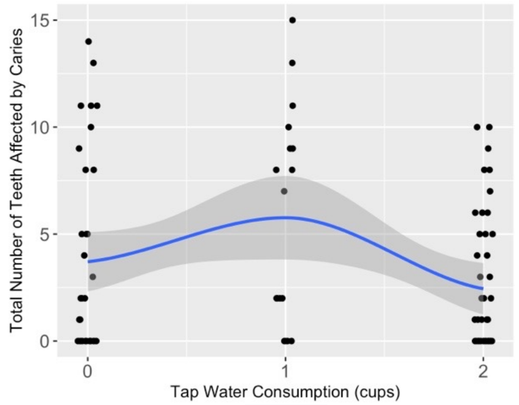
Table 1

Tap Water	None	1 cup	2+ cups	p-value
White (n = 43)	14 (32.6%)	7 (16.3%)	22 (51.2%)	0.002
Hispanic/Latino (n = 23)	15 (65.2%)	4 (17.4%)	4 (17.4%)	
Black (n = 18)	5 (27.8%)	4 (22.2%)	9 (50.0%)	
Other (n = 12)	---------	2 (16.7%)	10 (83.3%)	

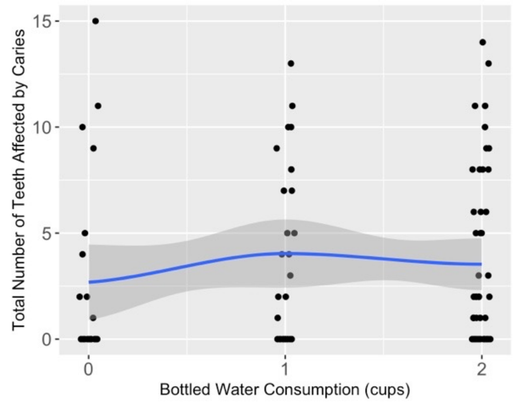
Table 2

Bottled Water	None	1 cup	2+ cups	p-value
White (n = 43)	16 (37.2%)	13 (30.2%)	14 (32.6%)	0.008
Hispanic/Latino (n = 23)	1 (4.3%)	7 (30.4%)	15 (65.2%)	
Black (n = 18)	1 (5.6%)	4 (22.2%)	13 (72.2%)	
Other (n = 12)	4 (33.3%)	3 (25.0%)	5 (41.7%)	

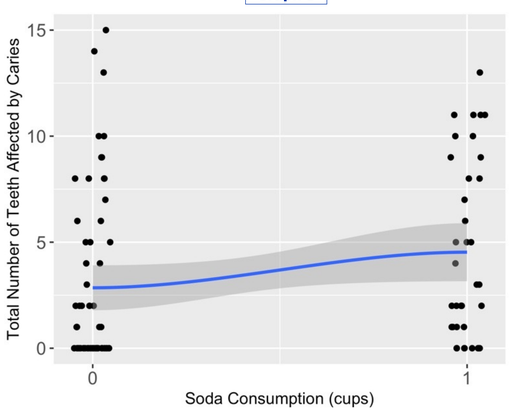
Graph 1



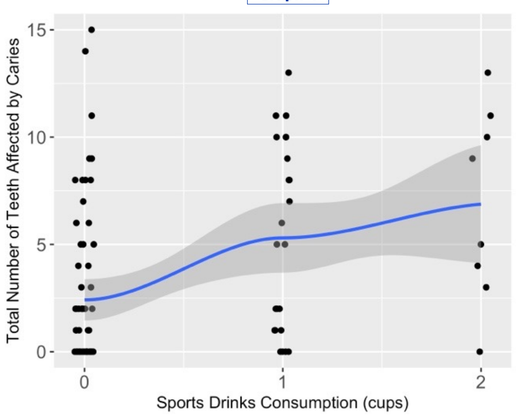
Graph 2



Graph 3



Graph 4

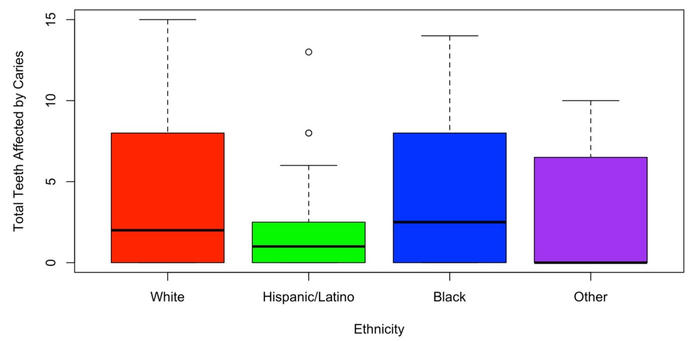


Results

- 65.2% Hispanic/Latino patients drink no tap water **(Table 1) *p*-value=0.002**
- 65.2% Hispanic/Latino patients and 72.2% Black patients drink 2 or more cups of bottled water **(Table 2) *p*-value=0.008**
- 0.6 times as many teeth were affected by caries in patients drinking 2 or more cups of tap water each day compared to 1.4 times as many teeth affected by caries in patients drinking only 1 cup of tap water each day **(Graph 1) *p*-value=0.011**
- Patients drinking soda had an estimated 1.6 times as many total teeth affected by caries as those not drinking any soda **(Graph 3) *p*-value=0.059**
- Patients drinking 1 cup daily and those drinking 2 or more cups daily of sports drinks such as Gatorade had an estimated 2.6 and 3.0 times as many total teeth affected by caries, respectively, as those not drinking any sports drinks **(Graph 4) *p*-value=0.0006**
- Average number of teeth affected by caries are not significantly different across the ethnicity categories studied **(Chart 1) *p*-value=0.344**

Chart 1

Boxplots of Total Caries, by Ethnicity



References

1. Wilder, Jocelyn R. et al. "The Association Between Sugar-Sweetened Beverages and Dental Caries Among Third-Grade Students in Georgia: Association Between Sugar-Sweetened Beverages and Dental Caries." *Journal of public health dentistry* 76.1 (2016): 76–84. Web.
2. Bernabé, E et al. "Early Introduction of Sugar-Sweetened Beverages and Caries Trajectories from Age 12 to 48 Months." *Journal of dental research* 99.8 (2020): 898–906. Web.
3. Kandel, Elizabeth A, Jenna M Richards, and Catherine J Binkley. "Childhood Caries in the State of Kentucky, USA: A Cross-Sectional Study." *BMC oral health* 12.1 (2012): 38–38. Web.