BRIEF REPORT

Sugar-Sweetened Beverage Intake in a Rural Family Medicine Clinic

Laura Pinon, MD, Birgit Khandalavala, MD, and Jenenne Geske, PhD

Background: **Sugar-sweetened beverages (SSBs) are a major source of calories, and are associated with adverse health outcomes. Because the majority of studies are undertaken in urban areas, the rural intake of SSB presents a significant gap in current knowledge. The objective of our study was to assess SSB intake in a rural primary care clinic.**

Methods: **The Beverage Intake Questionnaire is a 15-item self-reported questionnaire and has been extensively validated to assess habitual SSB consumption. The survey was administered to adult primary care clinic patients presenting for routine care over a 6-week period at a clinic in a rural central Nebraska community (population < 1,000).**

Results: **Survey participants (n = 121) were primarily white with an average age of 61 years (SD = 18.0) and an average body mass index (BMI) of 29.9 kg/m^2 (SD = 7.5). Participants consumed an average of 1.05 SSBs per day (SD = 1.3), and 33.5% of respondents consumed one or more SSBs per day. The average daily caloric intake from SSBs was 153 Kilocalories (Kcals) compared the national average intake of 145 Kcals. The most commonly consumed caloric beverages, based on Kilocalories consumed, were 100% juice and regular soda. SSB consumption was not related to with BMI.**

Discussion: **In a rural primary care clinic, the daily consumption of SSB by patients was found to be a noteworthy source of calories, with no significant difference in consumption across BMI categories. Mitigation of SSB consumption by rural primary care clinicians is imperative for optimizing health. (J Am Board Fam Med 2019;32:601–606.)**

Keywords: **Beverages, Body Mass Index, Energy Intake, Health Behavior, Nebraska, Primary Health Care, Rural Population, Self Report, Sweetening Agents, Sugars**

Sugar-sweetened beverages (SSBs) are a major source of calories in the typical American diet and have been increasingly associated with a number of adverse health outcomes.[1,2] Regular intake of SSBs has been directly correlated to enhanced cardiovascular risk.[3] Studies also report that they can lead to diabetes independent of adiposity,[4] early onset of menarche,[5] and clinical coronary heart disease[6] due to a high dietary glycemic load, insulin resistance, and impaired β-cell function.[3]

SSB consumption is found to be higher in rural populations and has been associated with household food insecurities and greater rates of unhealthy behaviors, including smoking, inadequate sleep or exercise, higher rates of fast food consumption, infrequent breakfast meals, and low fruit and vegetable intake.[7,8] Reducing SSB consumption may lead to healthier dietary habits along with increased vegetable consumption and a reduction in overall empty-calorie intake.[9,10]

Interventions that target a reduction in SSB consumption as compared with improvements in physical activity indicate that strategies targeted at the SSB component were more effective.[11] Studies have shown extensive evidence of improvement in health outcomes where SSB consumption has been specifically targeted.[1] The benefits of SSB reduction have been noted in primary prevention of

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From the Memorial Family Medicine Residency Program, Memorial Hermann Health System, Sugar Land, TX (LP); Department of Family Medicine, University of Nebraska Medical Center, Omaha, NE (BK, JG).
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Corresponding author: Laura Pinon MD, Memorial Family Medicine Residency Program, Physicians at Sugar Creek, 14023 Southwest Freeway, Sugar Land, TX 77478-3553 (E-mail: lpinon17@gmail.com).

obesity and other cardiovascular risk factors,[3] as well as established comorbidities, particularly type 2 diabetes.[12] Health care providers can assess SSB consumption of patients using a number of methods. The Food Frequency Questionnaire (FFQ) is one of the more common tools; however, it is typically long and burdensome, taking up to 60 minutes to complete, and it requires validation specifically for each local population.[13–15] While food diaries, relying on 24-hour recall, provide more accurate and less biased estimates of consumption, this method requires more resources,[15] limiting the feasibility of using it with patients, particularly in a rural setting. Hence, a brief Beverage Intake Questionnaire (BEVQ-15) was developed and validated against the FFQ.[15] It is suited for patients who have lower literacy levels and takes under 3 minutes, on average, to complete.[16] The BEVQ-15 was validated, in part, in an urban population in the state of Nebraska.[16]

Although the majority of such studies examining the assessment of SSB consumption are conducted in urban communities,[2] rural populations are often at a greater risk of disease and health disparities, and encounter a higher incidence of obesity.[7,8] There are few studies reported in the literature on rural SSB consumption, presenting a major gap in current knowledge.[7] We undertook a study using the BEVQ-15 with a primary objective of determining rural SSB consumption patterns. Our long-term goal is to promote reduction of SSB consumption using targeted interventions at the point of care, and to optimize rural health outcomes.

Methods

The current study took place in a rural, central Nebraska community-based primary health care center. The township consisted of less than 1000 people and has no fast food or chain restaurants within city limits. There are two gas stations and one grocery store. The study clinic and affiliated hospital are the sole medical establishments in the town, and they provide services for six surrounding towns. The clinic population is 75.1% white, with patient ages ranging from 0 to 111 years, and a median age of 43 years.

A third-year medical student recruited all adult patients aged 19 years and older presenting at the assigned family medicine clinic during her 6-week-long rural rotation. Patients were approached after being roomed, before the arrival of the attending physician, and were asked to fill out the BEVQ-15 beverage questionnaire. Two patients refused participation; reasons for refusal were not given. Institutional review board approval was obtained from the University of Nebraska Medical Center (IRB No. 271-17 EX).

The BEVQ-15 is a self-reported 15-item questionnaire that measures the intake of caloric and non-caloric beverages, including water, alcohol, and a variety of sugar-sweetened beverages. The survey has a readability level of 4.8, suggesting it is appropriate for those with at least a fourth-grade education.[16] It allows for the determination of both frequency and amount, in ounces, of beverage consumption, which will be converted into caloric energy.[15] Demographic data included age, height, weight, insurance status, race/ethnicity, and general health conditions. In addition, the time it took to complete the survey was recorded. Participants could choose to complete the survey in either English or Spanish.

Results

Over the 6-week summer period, 121 surveys were administered, taking an average of 3.7 minutes to complete. The cohort was primarily white (95%) with ages ranging from 22 years to 94 years of age; the median age was 64 years (SD = 18.0). The average body mass index (BMI) was 29.9 kg/m^2 (SD = 7.5) (Table 1). Participants consumed an average of 1.05 SSBs per day (SD = 1.3) and 33.5% of respondents consumed 1 or more sugar-sweetened beverages (SSBs) per day. The average daily Kcals consumed via SSBs was 153 Kcals (SD = 337), while the average daily number of Kcals consumed via all beverages was 337 Kcals (SD = 351.4). The beverage providing the highest average number of kilocalories per day is 100% juice, followed by regular soda and whole milk (Table 2). The average intake of water for all participants was 33.8 oz per day (SD = 16.4).

There was a significant negative Pearson's correlation between water consumption and SSB consumption (r = −0.197; *P* = .038). Although results of an analysis of variance (ANOVA) revealed that there was no significant difference in the kilocalories consumed via SSBs across differing BMI categories (*P* = .561) (Table 3), participants with a BMI between 35.0 and 39.9 kg/m^2, on average, consumed the most kilocalories from SSBs (230.5 Kcals; SD = 370.6). There was a positive correla-

Table 1. Demographics

Characteristics	Study Sample*	Clinic Population*	Community Population†	Nebraska Population[26]†
Age (years), median	64.0	43.0	41.5	36.2
Race/ethnicity, N (%)				
Caucasian	115 (95.8)	81.1%	96.7%	88.0%
African American	0 (0)	1.5%	0.9%	4.7%
Hispanic	0 (0)	NA	NA	NA
American Indian	(.8)	NA	0.0%	0.8%
Asian	0 (0)	3.2%	0.0%	2.1%
Other	4 (3.3)	14.2%	2.4%	4.4%
Insurance status, N (%)		NA	NA	NA
Medicare	61 (50.4)			
Medicaid	6 (5.0)			
Private	72 (59.5)			
Self pay	9 (7.4)			
BMI (kg/m^2), mean (SD)	29.9 (7.5)	NA	NA	NA
BMI, categorized, N (%)		NA	NA	NA
BMI <18	5 (4.2)			
BMI 18.5 to 24.9	20 (16.9)			
BMI 25.0 to 29.9	43 (36.4)			
BMI 30.0 to 34.9	25 (21.2)			
BMI 35.0 to 39.9	13 (11.0)			
BMI >40	12 (10.2)			

*Includes only adults age 19+.
†Includes all ages.
BMI, body mass index; NA, not available; SD, standard deviation.

tion between BMI and the total amount (in ounces) of beverages consumed (r = 0.215; P = .020)

Discussion

SSBs are a key contributor of calories in our rural primary care clinic study population, who consumed an average of 153 Kcals per day from SSBs. The consumption in this population was slightly higher than the national average of 145 Kcals per day.[2] This rural study population had a higher proportion of people consuming 1 or more SSBs in a day (35.5%) than the overall average of Nebraska (28.5%) as well as the overall average in a study that looked at 23 other states and the District of Columbia (26.2%).[17] This is important to note because rural populations are at enhanced risk of chronic disease, potentially due to lower socioeconomic status and less availability of healthy food sources.[7] A high consumption rate of SSBs can amplify this increased disease risk.[3]

A study conducted in 2016 found that 98.5% of physicians counsel patients on sugar-sweetened beverage consumption, primarily when the patients were already overweight or obese.[18] However, our results indicate such counseling may be needed regardless of BMI and may be indicated for reduction of cardiovascular risk independent of weight.[10] Our study supports that assessment of SSB intake and the mitigation of consumption along with promotion of healthy eating patterns is critical in the underserved rural population.[7,8]

The brevity of the BEVQ-15, which incorporates the computation of caloric amounts, makes it much more feasible to administer in a clinic patient population than the much longer FFQ or a more complex food diary. The Nebraska validation sample suggests that this instrument may be well-suited to our study population.[16] The survey has also been shown to be reliable in measuring changes in rates of consumption, allowing progress to be monitored over time.[16] In addition, it seems to fit into the daily flow of the clinic; the medical student did not encounter any survey-related complaints from the clinic staff or patients.

Assessing SSB consumption in a little-studied rural population is a strength of this study. It in-

Table 2. Average Beverage Consumption in Fluid Ounces and Kilocalories Per Day

Beverages	Mean Kilocalories (SD)	Mean Fluid Ounces (SD)
Regular soft drink*	52.5 (139.3)	3.9 (10.5)
100% juice	63.8 (137.7)	3.6 (7.8)
Whole milk	49.8 (173.3)	2.2 (7.6)
2% milk	37.7 (81.1)	2.0 (4.3)
Tea/coffee w/ cream*	38.8 (83.5)	4.7 (10.2)
Sweetened juice drink*	24.1 (85.0)	1.7 (6.0)
Sweet tea*	19.6 (75.9)	2.0 (7.6)
Energy drink*	25.1 (108.7)	1.8 (7.8)
Skim milk	14.5 (41.3)	1.3 (3.6)
Hard liquor	23.6 (117.1)	0.4 (1.7)
Beer	15.8 (47.8)	1.5 (4.6)
Wine	6.6 (26.4)	0.3 (1.3)
Black coffee	3.2 (5.0)	9.0 (14.2)
Diet soda	1.60 (3.9)	5.4 (13.2)
Water	0	33.8 (16.4)

*Sugar-sweetened beverage.
SD, standard deviation.

Table 3. Average Kilocalories from Total Beverage Consumption and Sugar-Sweetened Beverages

Ethnicity/Race	SSB Kilocalories, Mean (SD)	Total Kilocalories, Mean (SD)
Caucasian	155.0 (233.4)	346.9 (115)
American Indian	64.3	439.9
Other	134.3 (4.4)	323.2 (13.6)
>1 race identified	0.0 (0.0)	83.9 (118.7)
BMI category		
BMI <18	53.4 (105.3)	210.8 (118.8)
BMI 18.5 to 24.9	100.9 (164.2)	333.4 (347.2)
BMI 25.0 to 29.9	159.8 (227.8)	342.5 (391.4)
BMI 30.0 to 34.9	137.8 (175.3)	303.5 (245.3)
BMI 35.0 to 39.9	230.5 (370.6)	385.5 (400.6)
BMI >40	210.5 (300.6)	396.0 (438.6)

BMI, body mass index; SSB, sugar-sweetened beverage; SD, standard deviation.

cludes a moderately sized sample and uses a validated instrument. The limitations of our study are inherent to any study using self-reported data. Social desirability factors may have led to underreporting of SSB consumption. Many participants were uncertain about serving sizes of glasses or cups, compared with standard bottles or cans. Participants mentioned that their beverage habits varied with the season, with iced drinks predominating in the summer and hot drinks predominating in the winter. The surveys in this study were completed during the summer; seasonal variation may have impacted the findings. Further, the age of the participants and the primarily white sample do not allow for comparison to a younger and/or ethnically diverse population.

Future steps could consist of administering surveys to groups that are known to have higher SSB consumption, such as younger people or ethnic and racial minorities.[19] Those at high cardiovascular risk may also be a good target population.[2] The BEVQ-15 has been validated for use in children and adolescents, and is available in a computerized format using pictures and video, making it suitable for most patients of any age or ability.[20,21] Outside of self-reported survey assessments, SSB consumption could be confirmed using the biomarker δ13C, which could objectively measure added sugar intake in patients via blood draw.[22]

The clinical significance of SSB consumption has been increasingly evident from observational studies that have reported adverse cardiovascular health outcomes with SSB consumption, and a higher incidence of diabetes and metabolic syndrome.[1,3] A causal relationship has yet to be clearly established and validated, however reduction of SSB consumption is widely advocated with recently updated pediatric obesity guidelines recommending complete elimination of SSBs.[23] There is emerging evidence from several studies demonstrating reduced SSB intake improves weight loss or reduces weight gain in both children and adults.[24,25] Directly targeting SSB consumption in the clinical setting may have the potential to impact the prevention of cardiometabolic disease.[26] In a rural practice with higher numbers of children, given the higher risk of obesity, identification of SSB consumption and targeted interventions may be even more imperative.

Conclusion

SSB intake reduction is emerging as a significant factor in improving health outcomes. In our rural primary care clinic, patients' daily consumption of SSB was found to be a noteworthy source of calories. Since there was no significant difference in the consumption of kilocalories via SSBs across BMI categories, screening all patients and mitigating SSB consumption for patients irrespective of their

BMI may contribute to health improvements.[1] Disparities in rural populations are multi-faceted and include chronic health issues and obesity.[7,8] Our findings support previous research and should guide larger studies with a focus on community-based interventions aimed at the improvement of overall rural health.[8] Assessing beverage intake for all patients remains a first step in leading to increased patient awareness. The efficacy of primary care interventions needs further research and advocacy, including the investigation of different elements of nutrition education. In addition, public health efforts should focus on campaigns leading to policy changes, regulations, and laws specifically aimed at lowering access to SSBs and increasing taxation.

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