Short Communication

Prevalence and Associated Factors with Sugar-sweetened Beverages Consumption among Kurdish High-school Children

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Abstract

Adolescents' excessive consumption of sugar-sweetened beverages (SSBs) has become a global concern due to its detrimental effects on health. We explored the prevalence and associated factors of the consumption of SSB in high-school children in the Kurdistan Region. In this study, we included 560 students randomly from the 152 available high schools in Duhok City in the Kurdistan Region. Both genders of high school children who registered for the academic years 2021–2022 in 32 high schools were eligible. The study found that a considerable number of students did not eat breakfast (32.68%). Mostly, the students had lunch (83.21%) and dinner (53.57%), with 53.57% having extra eating portions. A significant percentage of the students consumed junk food (fast food) more than three times per week (39.82%) and consumed SSB 1–3 times/day (61.07%) at varying frequencies. The study found that 14.64% and 12.86% were overweight and obese, respectively. The prevalence of SSB consumption 4–5 times/week was 47.68% (soda), 21.61% (tea), 34.64% (coffee), 22.50% (energy drink), and 36.25% (juice). A similar prevalence of SSB consumption was found among parents (23.39%) and friends/classmates (20.36%). The male students were more likely to consume tea ($P = 0.0104$). However, female students were more likely to consume juice and energy drinks ($P = 0.004$ and $P < 0.0001$, respectively). Students with lower levels of education were also more likely to consume SSB. The intake of SSB was high among high school children in the Kurdistan Region and was related to gender and parents' consumption.

Keywords: Energy drinks, fast foods, fruit juices, nutritional status

Introduction

Adolescents' excessive consumption of sugar-sweetened beverages (SSBs) has become a global concern due to its detrimental effects on health. Several studies indicate that higher SSB intake is associated with an increased risk of weight gain and obesity.[1] SSBs encompass beverages containing added artificial sugar or beverages with sugar content exceeding 5% added during processing. Examples of SSBs include tea drinks, carbonated drinks, sweetened milk tea, milk drinks, coffees, sweetened fruit juices, sodas, sports drinks, energy drinks, fruit-flavored drinks, and beverages with added sugar.[2,3] Beyond its implications on obesity, the excessive consumption of SSBs in children may lead to heightened risks of insulin resistance, dental caries, sleep disturbances, and health concerns related to caffeine intake.[4,5]

The consumption of SSBs is on the rise in many low- and middle-income countries (LMICs), primarily due to the effects of widespread urbanization and aggressive beverage marketing. According to a report utilizing survey data from adults in 187 countries, SSB intake was found to be higher in upper-middle-income countries and lower-middle-income countries when compared to high-income or low-income countries.[6]

SSBs offer minimal nutritional value, and substantial evidence has established a connection between their consumption and weight gain, as well as an increased risk of type 2 diabetes mellitus (T2DM), cardiovascular disease (CVD), and certain cancers. Metabolic Syndrome (MetSyn) is a cluster of risk factors that appears before the onset of T2D and CVD.[7]

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How to cite this article: Abdulah DM, Sulaiman SJ, Abdulmajeed AA. Prevalence and associated factors with sugar-sweetened beverages consumption among Kurdish high-school children. Indian J Community Med 2025;50:385-91.

Received: 15-09-23, **Accepted:** 15-04-24, **Published:** 30-01-25

Access this article online

Quick Response Code:

Website: www.ijcm.org.in

DOI: 10.4103/ijcm.ijcm_654_23

SSBs constitute the primary source of added sugar in the diet and encompass both carbonated and non-carbonated soft drinks, fruit drinks, and sports drinks containing added caloric sweeteners. These beverages lack nutritional value and are considered low in quality. Extensive research has consistently established a robust association between SSB consumption and weight gain[2] and an increased risk of T2DM.[5] As a result, many dietary guidelines and policies have been formulated to address SSB consumption.[8] Furthermore, emerging evidence indicates that SSBs also pose a significant risk factor for CVD and related risk factors.[9,10] The reports on the intake of SSB in the Kurdistan Region and Iraq are very limited.[11] In addition, the related factors to intake of SSB have not been explored in the literature.

Evidence from various countries worldwide indicates that several factors influence SSB consumption among children. These factors include physical activity level,[12] sleep quality,[13] fast food intake,[14] the availability and accessibility of SSBs at home,[14] parental role models,[15] and peer pressure.[16] Given the differences in social and food culture between Iraqi Kurdistan and other countries, it becomes essential to research the factors influencing SSB intake in this region. Home-related factors, in particular, may have a significant impact on SSB consumption among children.[16] In this study, we aimed to explore the prevalence and associated factors to the consumption of SSB in high-school children in the Kurdistan Region.

Subjects and Methods

Study design and participants

In this cross-sectional study, we obtained a random sample of students from the available high schools in Duhok City. The participants of this study were male and female high school children aged 13–18 years old. Both genders of high school children who registered for the academic years 2021–2022 in 32 high schools in Duhok City were eligible for this study. The participants have different religions, lifestyles, and other socio-demographic aspects. The data were collected between November 2021 and April 2022.

Sampling technique

Out of the 152 high schools in Duhok city, 32 schools (21.05%) were selected through simple random sampling; 16 high schools from each east and west administration. The estimated number of classes in each high school was 20 in this study. The number of selected students from each school is based on the number of students in each school and has been calculated according to the proportion. The number of students in each school × target population (560)/number of all secondary school students (population) (n = 10733). Ultimately, the study aims to include between 560 and 600 children.

The sample size for this study was determined using Cochran's Sample Size Formula. This formula allows the calculation of an appropriate sample size based on the desired level of precision, confidence level, and the estimated proportion of the attribute present in the population. Cochran's formula is particularly suitable for situations involving large populations. When dealing with smaller populations, a correction factor is applied to reduce the sample size obtained from Cochran's formula, as a smaller sample can provide more information about such populations. $n_0 = \frac{Zpq^2}{e^2}$

In this case:

- "e" represents the desired level of precision, also known as the margin of error.
- "p" is the estimated proportion of the population that possesses the attribute under consideration.
- "q" is calculated as 1- p.

Considering an estimated population of high-school children in Duhok City between 12,000 and 15,000, the required sample size was found to be between 373 and 375. However, to account for potential missing information and refusal rates, we decided to increase the sample size beyond this range. As a result, the actual sample size used in the study exceeded the minimum requirement to ensure that sufficient data would be collected and accounted for. In this study, we included 560 high school children in the final analysis.

It is important to mention that we tried to obtain a representative sample of the high school students in the studied region. The number of students who were selected from each school was between 17 and 25 students. The number of classes in each high school was between 8 and 13. We obtained two calluses from each high school through random sampling. Finally, we obtain the required number of students through pre-determined random numbers.

Measures

Children completed a set of questionnaires to gather data on their sociodemographic background, home-related factors, community environmental factors, and consumption of SSBs. The students answered an adapted version of the SSB questionnaire. The students were asked to respond to the questions by telling the frequency of using the SSB. To differentiate the types of the SSB, we had a colorful picture of the SSB types with ourselves. Also, the researchers administered the questions and recorded the responses in a pre-designed questionnaire (research-administered self-reported technique).

Intake of sugar-sweetened beverages

The students provided information about the quantity and frequency of their SSB intake weekly, covering the past one-year period. For this purpose, a questionnaire was developed using a modified version of the Beverages Intake Questionnaire (BEVQ-15),[17] which was originally designed to estimate the daily grams and energy intake of 15 beverages, including water and other SSB, among adults. The newly adapted version of the BEVQ-15 was specifically tailored to measure SSB consumption among children. It included 13 beverage categories, namely sweet fruit juice, tea drinks, coffee drinks, instant coffee, sweet milk tea, milk drinks, plant protein drinks, Asian specialty drinks, carbonated drinks, 100% fruit

juice drinks, vegetable juices, low-calorie carbonated drinks, energy/sports drinks, and water. This modified tool allowed for a comprehensive assessment of the children's beverage intake patterns.[18]

Home and school-related factors

In this study, home-related factors pertain to several aspects, including the presence of SSBs in the home, and parents' consumption and consumption by friends or classmates at high school.

Statistical analyses

The general information of the children is presented in mean (SD) and no (%). The prevalence of SSB among high school children was determined by dividing the number of students who consumed the SSB by the total number of students multiplied by 100. The distribution of SSB of high school children among different demographic factors was examined in a Pearson Chi-squared test. The significant level of difference was determined in a $P < 0.05$. The statistical calculations were performed using JMP Pro 14.3.0.

Ethical approval

The ethical approval for this study was obtained from the Scientific Research Division of the Directorate of Planning at the Duhok Directorate General of Health. The protocol was registered on 18 August 2021 in reference number: 18082021-8-35. The Scientific Research Division is a joint ethics committee between the Duhok Directorate General of Health and the University of Duhok in this region. The permission of the General Directorate of Education was received in Duhok City. Also, we received permission from each school from the school administration. It was not possible to obtain the permission of the parents for this study. The Ethics Committee relied on the permission of the corresponding departments only. However, the children were free to participate or not in this study.

Results

Of the total 562 students invited for this study, only two students rejected to participate. The mean age of the school children was 15.53, ranging from 13 to 18 years old. The students were males (42.32%) and females (57.68%) and lived in different residential areas (urban: 89.82% and rural: 10.18%). Half of the students were physically active (50.18%) for a median of 40 min/day. The physically active students did <45 min/day (26.96%), 45–60 min/day (14.46%), and >60 min/day (8.75%) of exercise at varying frequencies. The study found that most of the students were normal sleepers (58.04%), followed by long sleepers (37.86%) and short sleepers (4.11%; Table 1).

In terms of diet-related characteristics, the study found that a considerable number of students did not eat breakfast (32.68%). Mostly, the students had lunch (83.21%) and dinner (89.46%), with 53.57% having extra eating portions. A significant percentage of the students consumed junk food (fast food) more than three times per week (39.82%). Additionally, a considerable percentage of the students consumed SSB 1–3 times/day (61.07%) at varying frequencies per day and week. The students' fat intake was considerable, with 82.14% consuming it in mild-moderate amounts and 17.86% consuming it in excess. The study found that 14.64% and 12.86% were overweight and obese, respectively. Most of the parents had a low level of education [Table 2].

The study showed that the consumption of SSB was common among high school students in Kurdistan Region. The prevalence of SSB consumption 4–5 times/week was 47.68% (soda), 21.61% (tea), 34.64% (coffee), 22.50% (energy drink), and 36.25% (juice). A similar prevalence of SSB consumption was found among parents (23.39%) and friends/classmates (20.36%; Table 3 and Figure 1). The study also showed that male students were more likely to consume tea compared to female students ($P = 0.0104$). However, female students were more likely to consume juice and energy drinks compared to males ($P = 0.004$ and $P < 0.0001$, respectively). Students with lower levels of education were also more likely to consume SSB [Table 4].

Discussion

This investigation revealed a prevalent pattern of SSB

Table 1: General and diet-related characteristics among high school children in Kurdistan Region

Characteristics of children ($n=560$)	Statistics No (%)
Student age (13–18 years)	Mean (SD): 15.53 (1.69)
Gender	
Male	237 (42.32)
Female	323 (57.68)
Residence	
Urban	503 (89.82)
Rural	57 (10.18)
Exercise	
No	279 (49.82)
Yes	281 (50.18)
Exercise/day (10–180 min)	Med (IQR): 40 (30)
Exercise/day (min) category	
Non physically active	279 (49.82)
<45 min/day	151 (26.96)
45–60 min/day	81 (14.46)
>60 min/day	49 (8.75)
Frequency/week 1–7	Mean (SD): 3.52 (2.11)
Frequency/week category	
Non physically active	279 (49.82)
1–3 times/week	171 (30.54)
>3 times/week	110 (19.64)
Sleeping hrs. 2–17 hrs.	Med (IQR): 8 (2)
Sleeping category	
Short sleeper	23 (4.11)
Normal sleeper	325 (58.04)
Long sleeper	212 (37.86)

consumption among high school students in the Kurdistan Region, with discernible connections to factors such as gender, parental education, and the SSB consumption habits of peers.

SSB consumption has been reported in developed and developing countries, other countries as well. For example, a study was conducted among 60 school children in a developing country (Malawi). They reported that 50 out of the 60 children included in the study were consuming a broad range of SSB regularly on any day of the week. In addition, they added that one-third of the children were consuming up to 300 mL of many sweetened beverages/day.[19] A similar study conducted in Brazil reported that 62.10% of the children consume sugary drinks followed by sweets/candies by 42.23% of the children. The associated factors with sweets consumption included maternal aspects like age, marital status, schooling, and the presence of government assistance.[20] SSB intake has been reported in developed countries as well. For example, a study conducted in Canada showed that the prevalence of SSB in the southern part of Quebec was 14.9% for at least one SSB/day and 85.1% for less than one SSB/day. They reported that the schools with lower socioeconomic status or in a dense environment were more likely to consume SSB drinks. The students who were moving to schools with a higher ratio of SSB drinks were 52% more likely to consume SSB drinks/day. The findings supported that the dietary behaviors in children originate from the complex interactions between biological, social, and environmental factors.[21] The middle prevalence of SSB intake has been reported in some other developed countries,[22] but a higher prevalence of SSB has been reported in New Zealand (96% consumed ≥1 serving of SSBs/week and 62% consumed ≥5 servings.[23]

Table 2: Diet-related characteristics of high school children in Kurdistan Region

Diet-related characteristics (n=560)	No (%)
Breakfast	
No	183 (32.68)
Yes	377 (67.32)
Lunch	
No	94 (16.79)
Yes	466 (83.21)
Dinner	
No	59 (10.54)
Yes	501 (89.46)
Extra eating portion	
No	260 (46.43)
Yes	300 (53.57)
Junk food (fast food)	
No	48 (8.57)
Up to 3 times a week	289 (51.61)
>3 times a week	223 (39.82)
SSB/day 0–7	Med: 1 (IQR: 1)
SSB/day category	
No SSB consumer	193 (34.46)
1–3 times/day	342 (61.07)
>3 times/day	25 (4.46)
SSB/week 0–15	Med: 5 (IQR: 4)
SSB/week category	
Non-SSB consumer	57 (10.18)
1–3 times/week	150 (26.79)
>3 times/week	353 (63.04)
Consumption of Fat in food	
Mild Moderate	460 (82.14)
Too much	100 (17.86)
BMI percentage	
Underweight <5%	41 (7.32)
Normal healthy weight 5% – <85%	365 (65.18)
Overweight 85% – <95%	82 (14.64)
Obese >=95%	72 (12.86)
Father education	
Unable to read and write	68 (12.14)
Can read and write without formal education	149 (26.61)
Primary school	134 (23.93)
Intermediately school	74 (13.21)
Secondary (preparatory)	28 (5.00)
Institute or College and above	107 (19.11)
Mother education	
Unable to read and write	195 (34.82)
Can read and write without formal education	148 (26.43)
Primary school	93 (16.61)
Intermediately school	47 (8.39)
Secondary (preparatory)	20 (3.57)
Institute or College and above	57 (10.18)

This behavior has shown an alarming correlation with the escalating rates of overweight and obesity, as indicated in prior works.[24,25] The current state of affairs highlights that SSBs now account for a substantial portion, ranging from 10% to 15%, of the caloric intake of young individuals. Furthermore, they constitute the predominant source of added sugars in the diets of children and adolescents.[26]

A review study surveyed national SSB consumption estimates in children and adolescents aged 2–18, focused on regions grappling with diet-related chronic conditions. Inclusion criteria encompassed the latest data from 73 countries, detailing SSB consumption between January 2010 and October 2019. Discrepancies were evident, with China registering the highest daily intake and Australia the lowest. Upon amalgamating data from 51 nations, the averaged daily SSB consumption stood at 326.0 mL (95% CI [288.3, 363.8]), though significant heterogeneity persisted beyond subgroup analyses. This international panorama underscores the persistently high SSB intake among young individuals, warranting concerted public health endeavors to curtail this trend.[27] The synthesis of findings from this study highlighted pronounced disparities in SSB consumption among children and adolescents, delineated along national boundaries rather than generalized economic classifications. These variations likely mirror the diverse dietary policies implemented across countries.[28]

In less affluent nations, the imperative arises to implement nutrition policies that prioritize equitable food access for their populations.[29] Conversely, higher-income countries have predominantly directed their efforts toward combatting

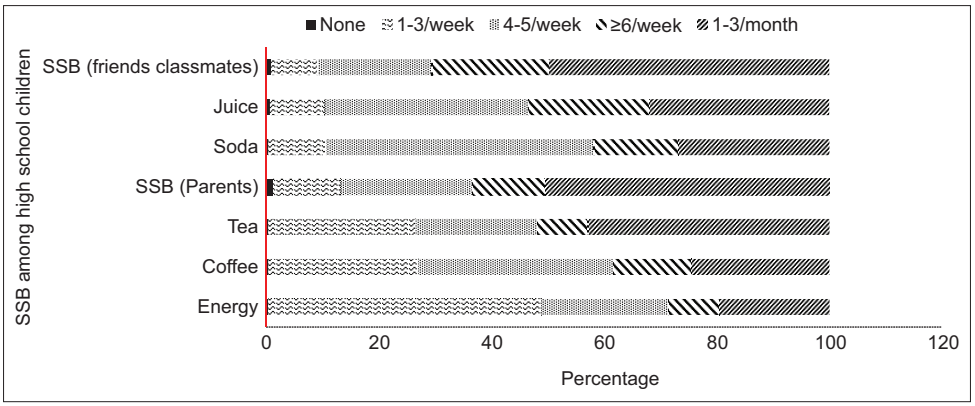

Figure 1: Frequency of SSB of high school children in Kurdistan Region

Table 3: Frequency and prevalence of sugar-sweetened beverages among high school children in Kurdistan Region

SSB (*n*=560)	Frequency no (%)				
	None	1–3/week	4–5/week	≥6/week	1–3/month
Energy	2 (0.36)	272 (48.57)	126 (22.50)	51 (9.11)	109 (19.46)
Coffee	2 (0.36)	149 (26.61)	194 (34.64)	78 (13.93)	137 (24.46)
Tea	2 (0.36)	147 (26.25)	121 (21.61)	50 (8.93)	240 (42.86)
SSB (Parents)	7 (1.25)	67 (11.96)	131 (23.39)	73 (13.04)	282 (50.36)
Soda	2 (0.36)	57 (10.18)	267 (47.68)	84 (15.00)	150 (26.79)
Juice	4 (0.71)	54 (9.64)	203 (36.25)	120 (21.43)	179 (31.96)
SSB (Friends/classmates)	5 (0.89)	46 (8.21)	114 (20.36)	117 (20.89)	278 (49.64)

Table 4: Prevalence of SSB consumption in school children with different characteristics

Factors (*n*=560)	None (*n*=2)	1–3/week (*n*=57)	4-5/week (*n*=267)	≥6/week (*n*=84)	1–3/month (*n*=150)	*P*
Energy drink						
Gender						
Male	2 (0.84)	86 (36.29)	60 (25.32)	30 (12.66)	59 (24.89)	<0.0001
Female	0 (0.00)	186 (57.59)	66 (20.43)	21 (6.50)	50 (15.48)	
Residence						
Urban	2 (0.40)	259 (51.49)	113 (22.47)	43 (8.55)	86 (17.10)	<0.0001
Rural	0 (0.00)	13 (22.81)	13 (22.81)	8 (14.04)	23 (40.35)	
Juice						
Gender	4 (1.69)	14 (5.91)	77 (32.49)	62 (26.16)	80 (33.76)	0.0014
Male	0 (0.00)	40 (12.38)	126 (39.01)	58 (17.96)	99 (30.65)	
Female						
Father education						
Unable to read and write	0 (0.00)	4 (5.88)	27 (39.71)	14 (20.59)	23 (33.82)	0.0159
Can read and write	0 (0.00)	15 (10.07)	40 (26.85)	41 (27.52)	53 (35.57)	
Primary school	0 (0.00)	13 (9.70)	57 (42.54)	24 (17.91)	40 (29.85)	
Intermediately school	1 (1.35)	8 (10.81)	35 (47.30)	14 (18.92)	16 (21.62)	
Secondary (preparatory)	1 (3.57)	0 (0.00)	5 (17.86)	10 (35.71)	12 (42.86)	
Institute or college and above	2 (1.87)	14 (13.08)	39 (36.45)	17 (15.89)	35 (32.71)	
Coffee						No factor
Tea						
Gender						
Male	2 (0.84)	57 (24.05)	39 (16.46)	27 (11.39)	112 (47.26)	0.0104
Female	0 (0.00)	90 (27.86)	82 (25.39)	23 (7.12)	128 (39.63)	
Soda						No factor

overweight and obesity, with certain strategies aimed at curbing SSB consumption.[30] The 2017 Global Nutrition Policy Review disclosed that about half of all countries had established standards for food and beverage offerings within schools,

while 27% had instituted fiscal measures, such as levies on unhealthy edibles and beverages like SSBs. Additionally, 30% had regulations governing the marketing of food and drink products aimed at children, albeit regional variations were noted.[28]

An investigation within Iraq illuminated marked disparities in dietary behaviors and activity patterns between boys and girls. Girls exhibited significantly higher frequencies of skipping breakfast and consumption of fruits, vegetables, French fries, sweets, and chocolates. Conversely, boys displayed a higher likelihood of partaking in fast foods, sugar-sweetened drinks, and energy beverages. Moreover, boys dedicated more time to physical activities and screen engagement in comparison to girls.[11] Notably, a considerable proportion of children in the Kurdistan Region forego breakfast, focusing primarily on lunch and dinner. Furthermore, a substantial percentage of these children were identified as either overweight or obese, hinting at a potential influence of the school environment on unhealthy dietary habits.

Broadly, factors such as knowledge, attitudes, norms, and media literacy are associated with SSB consumption, displaying anticipated trends.[31] To address SSB consumption among young individuals, a gamut of policy measures have been proposed to enhance public health nutrition, many of which are encompassed in the NOURISHING Framework.[32] The evidence substantiates the efficacy of numerous approaches in reducing SSB intake on a population scale. These include limitations on SSB availability in educational institutions, constraints on marketing such products to children and adolescents, and structural alterations in alternative food outlets to promote greater access to drinking water. Furthermore, the implementation of SSB taxes has seen adoption in various countries, yielding promising results. Notably, Chile's SSB tax led to a substantial reduction in unhealthy beverage purchases, by up to 27.6%.[27]

Initiatives to curb SSB consumption among children could be effectively launched through school-based programs integrating interactive learning processes, psychosocial theories, and active participation from parents or caregivers. Approaches that emphasize personal, behavioral, and environmental factors can enhance the efficacy of these interventions.[33]

Conclusions

The intake of SSB and breakfast skipping were high among high school children in the Kurdistan Region. The consumption of SSB among high school children was affected by SSB consumption by students' parents and friends/classmates.

Ethical approval

The ethical approval for this study was obtained from the Scientific Research Division of the Directorate of Planning at the Duhok Directorate General of Health. The protocol was registered on August 18, 2021 in reference number: 18082021-8-35. The Scientific Research Division is a joint ethics committee between the Duhok Directorate General of Health and the University of Duhok in this region. The school children were free to participate or not in this study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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