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Characteristics of Sweetened Beverage Consumption -The Case 0f Umm Al-Fahm

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Abstract

Objective: To examine personal and social predictors of Sugar-Sweetened Beverage (SSB) intake among adults in a low socioeconomic population in Israel, and to assess the association between knowledge, attitudes, and SSB consumption behaviors.

Methods: A cross-sectional telephone survey was conducted with 628 randomly selected adults from the population registry of Umm Al-Fahm, an Arab city in Israel. The survey assessed SSB consumption, sociodemographic factors, hospitality norms, and health risk awareness.

Results: SSB consumption was reported by 51.4% of respondents, a significant decrease from 95% in a 2014-2016 survey. SSB intake was negatively correlated with age (r=-0.26) and education (r=-0.23), and positively associated with being male. Hospitality norms favouring water over SSBs were strongly correlated with less frequent SSB consumption (r=-0.62). Greater health risk awareness predicted lower intake (r=-0.53). Regression models showed that norms and knowledge explained significant variance in consumption patterns (R2=0.32) beyond sociodemographic factors (R2=0.15).

Conclusion: The findings suggest that ongoing public policy promotion, education, and raising awareness can effectively reduce SSB consumption in high-risk communities. Social norms and health knowledge play a crucial role in shaping SSB consumption behaviours, highlighting the importance of targeted interventions addressing these factors.

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Introduction

Sugar-Sweetened Beverages (SSBs) and water are diet components of major public health interest. They are essential issues in consumer culture in Israel and worldwide [1]. The World Health Organization (WHO) [2], defines SSBs as all types of beverages containing free sugars, and these include carbonated or noncarbonated soft drinks, fruit/vegetable juices and drinks, liquid and powder concentrates, flavored water, energy and sports drinks, ready-to-drink tea, ready-to-drink coffee, and flavored milk drinks.

SSBs, which contain a large amount of sugar, are current significant sources of energy in our diet that substantially affects health and have been linked to weight gain, diabetes, metabolic syndrome, obesity, tooth decay, high blood pressure, heart disease, fatty liver, and more [1-3].

SSB consumption has been reported to be the highest amongst 18-39year-olds, men, adults with lower educational levels, lower socioeconomic status, those who are unmarried or divorced, ethnic minority groups and low-income individuals [1,4-6]. Lower socioeconomic groups are likely to be more vulnerable to policies that increase the prices of unhealthy foods or provide financial assistance to increase their ability to purchase healthy foods [7]. Due to generally less favorable daily living conditions of lower socioeconomic groups, individuals' abilities to make healthy food choices is often constrained. Moreover, lower socioeconomic groups may be more exposed to unhealthy food marketing, which influences food preferences due to specific elements in daily living conditions (e.g., social practices, habitus, media use).

Israel is a multiethnic country with a minority of Arab citizens. About 21% of Israel's population comprises Arabs, of them, about 85% are Muslims and 15% are mainly Christians and Druze. About 90% of the Arabs live in homogenous localities [8]. Generally, the Arab minority in Israel occupies the lowest strata of the socioeconomic hierarchy, with higher unemployment rates and lower wages [9]. Moreover, the Arab population in Israel has poorer health compared to the Jewish population [10]. This includes a sizable and persistent gap in life expectancy between Arabs and Jews, which can be partially explained by inequalities in access to health care, socioeconomic status and differences in health-related behaviors [9,11,12]. Arabs exhibit disparities in nutrition-related chronic diseases, and they have a higher incidence of diabetes, hypertension, and cardiovascular disease than Jews [13].

Dietary habits and their socio-demographic correlates may play an important role in chronic disease morbidity and mortality [14]. Improving dietary habits is crucial to improving health. Therefore, unpacking the factors behind SSBs consumption is crucial, as it allows developing strategies that promote healthier beverage choices.

Between 2014 and 2016, the Israeli Centre for Disease Control (ICDC) of the Ministry of Health (MOH) [15] conducted a national survey on health and nutrition in collaboration with the Nutrition Division. The survey revealed that obesity rate among Arabs aged 18 and older was higher than among Jews (37% compared to 30%, respectively). Additionally, data from the National Diabetes Registry, [16] indicated that about half of the Arabs aged 65 and older have diabetes. Health insurance data from 2014-2016 reported on 110.9 diabetics per 1000 residents aged 45 and older in the city of Umm Al-Fahm.

Umm Al-Fahm has been committed to promoting health since 1991, when it joined the Healthy Cities Network. Between 2014 and 2016, a survey conducted in Umm Al-Fahm as part of the city's health profile found that 95% of participants frequently drank sugary drinks with about 25% consuming them daily or almost every day, and another 18% consuming them several times a day. Umm Al-Fahm, the third largest city in the Arab community with 56,776 residents, is one of the 80% of Arab local authorities ranked in the four lowest socioeconomic status (SES) clusters according to the Israel Central Bureau of Statistics Characterization and Classification of Geographical Units by Socioeconomic Level [17]. The city ranked second in this report and shares similar social characteristics with other Arab Muslim cities, towns, and villages in Israel. Umm, Al-Fahm was the first and only city to join the Healthy Cities network in Israel in 1991. Later, the city was also the first Arab locality to join the National Program for an Active and Healthy Lifestyle - "Efsharibari" [18].

This study aims to examine the residents' drinking habits in Umm Al-Fahm and to identify factors that hinder or enable the reduction of SSBs and encourage water drinking. Moreover, it aims to assess knowledge and attitudes towards SSBs and to examine the association between knowledge, attitudes, socioeconomic variables and behaviors regarding consuming SSBs. As well as to test the ecological model for health promotion as an explanatory model for SSB consumption [19]. Ecological models have proven instrumental in categorizing factors that influence health behaviors on multiple levels (intrapersonal, interpersonal, organizational and environmental, and, policy and legislative) [19].

Material and Methods

This is a cross-sectional survey based on telephone interviews. An experienced research assistant contacted 700 adults from the Umm Al-Fahm municipality population registrar. The calls took place during afternoons and evenings on all days of the week. Follow-up calls were made to those who did not respond during the initial contact.

The questionnaire: The questionnaire is based on the MOH survey, [15] and was tailored to meet the specific needs of the research. It included four main topics:

Frequency of consuming SSBs, water, and soda: Respondents were asked to rate the frequencies on a scale ranging from several times a day to not at all. Later, a variable named 'Consumption pattern' representing SSBs consumption was built based on six kinds like Cola, energy drinks and more (excluding natural juice, soda, and water), with an internal reliability (Cronbach's alpha) of 0.75.

Attitudes towards norms of serving SSBs and water drinks: Participants were asked to indicate their level of agreement with two statements regarding hospitality social norms on a scale from strongly disagree to strongly agree. Internal reliability (Spearman correlation) was r=0.86.

Knowledge about the components and risks of SSBs: Respondents rated their answers on a scale measuring agreement with six statements, ranging from strongly disagree to strongly agree. Internal reliability (Cronbach's alpha) was α=0.86.

Background questions: These pertained to gender, age, income, and education.

We added two questions asking about enablers for reducing SSBs consumption, the responses included six possible factors

that could enable reduced consumption of SSBs. And asking about ways to promote water consumption and reduce sugary drink intake by the local authority.

Statistical Analysis: Data analysis was conducted using the IBM SPSS Statistics, version 28.0 (IBM Corp., Armonk, N.Y., USA). Pearson, Spearman correlation, and χ2 tests were used to examine relationships between study variables. Hierarchical regression analysis was performed to determine predictors of sugary beverage consumption.

Results

Demographic Characteristics: The study included 628 participants, 309 (49.5%) of whom were women and 311 (49.2%) men. Approximately half of the participants were < 37 years old and about a quarter adults > 49 years old; 45.5% had a high school education and 33% an academic education. Most (69.7%) participants earned an average level of income. Demographic characteristics are reported in Table 1.

A Missing: 8 (1.3%).

B Missing: 2 (0.3%).

C Missing: 3 (0.5%).

D Missing: 9 (1.4%).

Table 1: SNEDDS of piroxicam liquid composition (weight per weight percent).

		N	%
Gendera	Women	309	49.50%
	Men	311	49.20%
Ageb	17-26	161	25.60%
	27-37	148	23.60%
	38-48	154	24.50%
	49-59	113	18.00%
	60 and older	50	8.00%
Educationc	No formal education	23	3.70%
	High school	286	45.50%
	Professional training	104	16.60%
	Academic Education	207	33.00%
	Other	5	0.80%
Income Leveld	Much lower than average	21	3.30%
	Lower than average	57	9.10%
	Average	438	69.70%
	Higher than average	65	10.40%
	Much higher than average	38	6.10%

Characterization of Drinking Pattern: SSBs, diet beverages, energy drinks, flavored water and hot drinks with sugar (51.4%, 58.9%, 61.8%, 50.2% and 63.1%, respectively). A smaller proportion abstained from fruit juice (18.3%) and soda drinks (21.7%). It can also be seen that 91.4% of them consumed water several times a day and only 2.7% do not consume water at all. SSBs, diet beverages, energy drinks, concentrated sugar tasted juice, and hot drinks with sugar were consumed relatively often (several times a day or several times a week) by 33.1%, 24.8%, 29.8%, 25.3% and 27.9% of participants, respectively. Most participants were frequent fruit juice (56.2%) and soda (67.5%) drinkers. The results are presented in Table 2.

Table 2: Consumption Pattern of Different Types of Drinks among the Participants (N=628).

	No, consumption 1	Less than 1x/ month 2	Several times/ month 3	Several times/ week 4	Several times/day 5	Missing
1. Sugar-sweetened beverages	323 51.4%	0 0.0%	96 15.3%	100 15.9%	108 17.2%	1 0.2%
2. Diet beverages	370 58.9%	58 9.2%	44 7.0%	105 16.7%	51 8.1%	0 0.0%
3. Energy drinks	388 61.8%	29 4.6%	21 3.3%	87 13.9%	100 15.9%	3 0.5%
4. Fruit juice	115 18.3%	69 11.0%	88 14.0%	128 20.4%	225 35.8%	3 0.5%
5. Concentrated sugar tasted juice	227 36.1%	116 18.5%	125 19.9%	135 21.5%	24 3.8%	1 0.2%
6. Flavored water	315 50.2%	156 24.8%	85 13.5%	46 7.3%	21 3.3%	5 0.8%
7. Hot drink with sugar	396 63.1%	24 3.8%	29 4.6%	87 13.9%	88 14.0%	4 0.6%
8. Soda	136 21.7%	27 4.3%	38 6.1%	92 14.6%	332 52.9%	3 0.5%
9. Water	17 2.7%	1 0.2%	7 1.1%	23 3.7%	574 91.4%	6 1.0%

Correlations between Demographic Characteristics and Frequency of Beverage Consumption:

Next, we calculated Spearman correlations between frequency of beverage consumption and age, education, and income level. In addition, to examining differences in consumption patterns between women and men, we reduced the answers to three categories: No consumption, infrequent consumption (less than once a month and several times a month), and frequent consumption (several times a day or several times a week) and calculated χ2 Test. The results are presented in Table 3. Table 3 shows a significant negative correlation (small to medium effect size) between respondent's age and consumption of the following beverages: SSBs, diet beverages, energy drinks, and hot drinks with sugar, soda, and water. It was found that the older the respondent, the less they consumed these beverages. On the other hand, there is a significant positive correlation between age and fruit juice consumption (small effect size). The older the respondents are, the more fruit juice they drink. There was also a significant negative correlation (small effect size) between education and the consumption of the following beverages: SSBs, diet beverages, energy drinks and hot drinks with sugar. It was found that the more educated the respondent, the less they consumed these beverages. On the other hand, there is a significant positive correlation between education and consumption of fruit juice and water (small effect size). The more educated the respondents, the more fruit juice and water they drank. In the context of income level, there was a significant negative correlation (minimal effect size) between income level and consumption of soda and water. There was a

significant positive correlation (minimal effect size) between income level and the consumption of diet beverages. In addition, men drank significantly more than women the following drinks: SSBs, diet beverages, energy drinks, hot drinks with sugar, and soda. On the other hand, women drank more fruit juices and juices with concentrated sugar than men. No significant differences were found with regard to drinking water and flavored water between the genders.

Table 3: Correlations Between Demographic Characteristics and Frequency of Beverage Consumption (Spearman Correlations for Age, Education, and Income Level and χ2 Tests for Gender).

	Age	Education	Income Level	Gender
1. Sugar-sweetened beverages	-0.26***	-0.23***	-0.03	9.38**
2. Diet beverages	-0.26***	-0.17***	0.07*	6.68*
3. Energy drinks	-0.39***	-0.27***	0.00	25.14***
4. Fruit juice	0.12**	0.15***	-0.02	25.55***
5. Concentrated sugar tasted juice	-0.07	-0.05	-0.06	23.44***
6. Flavored water	-0.03	-0.06	0.00	2.13
7. Hot drink with sugar	-0.25***	-0.20***	-0.02	6.48*
8. Soda	-0.10**	0.06	-0.09*	19.54***
9. Water	-0.09*	0.09*	-0.10**	0.57

* p<0.05, ** p<0.01, *** p<0.001

Attitudes about Behavioral Norms of Serving Water as Part of Hospitality Habits: The participants were asked to rate their agreement with sentences related to hospitality habits in the context of drinking.

Most (55.8%) of the participants want to be served water rather than other drinks to a large or a very large extent. In addition, half (50.3%) of them prefer to serve their guests water rather than other drinks. When 20% and 22% did not wanted to be served water or to serve their guests.

Statistical Measures and Correlations between Study Variables: Table 4 shows statistical measures (means, standard deviations and range) and Pearson correlations between the study variables.

It was found that most respondents have a good knowledge of the health implications of consuming sugary and diet beverages (M=4.45, SD=0.96). A significant negative correlation (r=-0.62, p<0.001) was found between behavioral norms of serving water as part of hospitality habits and beverage consumption patterns. When norms to serve water were stronger, fewer sugary and diet drinks were consumed. In addition, a significant negative correlation was found between knowledge of the health implications of consumption of sugary and diet beverages and beverage consumption patterns (r=-0.53, p<0.001). The greater the knowledge, the less sugary and diet drinks were consumed. Finally, a significant positive correlation was found between knowledge of the health implications of consumption of sugary and diet beverages and behavioral norms of serving water as part of hospitality habits (r=0.46, p<0.001), implying that the higher the level of knowledge, the stronger the norm to serve water during hospitality.

Table 4: Statistical Measures and Pearson Correlations between Study Measures (N=609).

	M	SD	Range	1	2
1. Consumption pattern	2.18	0.97	1-5	1	
2. Hospitality norms	3.64	1.28	1-5	-0.62*	1
3. knowledge	4.45	0.96	1-5	-0.53*	0.46*

Abbreviations: M: Mean; SD: standard deviation; * p<.001.

Hierarchical Linear Regression Analysis for Predicting Consumption Patterns of Sugar-Sweetened Beverages and Sugar Substitutes: In order to examine which variables, predict the consumption pattern of SSBs, a hierarchical regression analysis was conducted. Step one included demographic variables that were found to be related to the consumption pattern: gender (1-woman, 0-man), age (1- 37 and over years, 0 - less than 37 years), and education (1-above high school, 0 - high school education or less). Step two included the following variables: knowledge of the health implications of consumption of sugary and diet beverages and behavioral norms of serving water as part of hospitality habits. The results are presented in Table 5. In step one, gender, age, and education were found to be significant predictors of consumption patterns of sugar-sweetened beverages and sugar substitutes, whereby men, young people, and those with low education consumed more sugary and diet drinks. The demographic variables explained 15% of the variance in consumption patterns. In step two, knowledge of the health implications of consumption of sugary and diet beverages and behavioral norms of serving water as part of hospitality habits were found to be significant predictors of consumption patterns of sugar-sweetened beverages and sugar substitutes. It was found that the greater the level of knowledge and the stronger the norm to serve water during hospitality, the fewer sugary and diet drinks were consumed. These research variables added 32% to the explained variance. Our model explained 47% of the variance of consumption patterns. Moreover, the model is statistically significant [F (5,605) = 109.15, p<.001].

Table 5: Hierarchical Linear Regression Analysis for Predicting the Consumption Pattern of Sugar-Sweetened Beverages and Sugar Substitutes (N=611).

Predictor Variable	B	S.E.	β	t	p	R2
Step 1: (Constant)	2.77	0.07		38.52	<.001	0.15
Gender (1= Woman)	-0.25	0.07	-0.13	-3.5	<.001	
Age (1= over age 37 years)	-0.53	0.07	-0.28	-7.37	<.001	
Education (1= above high school)	-0.43	0.07	-0.23	-5.99	<.001	
Step 2: (Constant)	4.87	0.14		35.64	<.001	0.47
Gender (1= Woman)	-0.1	0.06	-0.05	-1.67	0.095	
Age (1= over age 37 years)	-0.23	0.06	-0.12	-3.81	<.001	
Education (1= above high school)	-0.06	0.06	-0.03	-0.97	0.33	
Knowledge	-0.3	0.03	-0.3	-8.9	<.001	
Hospitality norms	-0.32	0.03	-0.43	-12.17	<.001	

Abbreviations: B: Unstandardized coefficient; SE: Standard Error; β: Standard coefficient.

Discussion

The current study results show that almost half of our participants reported drinking SSBs, as compared to 95% in the previous Israeli Healthy Cities network survey (2014-2016), indicating that there has been a significant decline in SSB consumption. Based on the ecological model, [20] an attempt to elucidate these findings reveals that behaviors can be influenced by three levels of influence cycles. The macro level encompasses actions at the policy level, the second cycle involves fundamental frameworks and social structures within the community where individuals reside, and the third cycle constitutes the personal sphere, encompassing individual background characteristics, knowledge levels, and attitudes. The discussion of the findings will be grounded in these three cycles.

Public policy - Local and National laws and policies: Since1990, numerous initiatives have been implemented, led by the MOH, to encourage a healthy lifestyle in Israel, notably the National Program for an Active and Healthy Lifestyle – Efsharibari [18]. It indicates the possibility of a positive correlation between these efforts and the decline of the SSBs consumption rates in the current study. Moreover, in January 2021, a tax was imposed on SSBs in Israel with the aim of reducing their consumption. This taxation led to an increase in the prices of these products [21]. Imposing taxes has already been shown to reduce consumption rates of SSBs [22-24]. Therefore, it can explain, to some extent, this decline in SSB consumption.

The consumption rates of the current survey are quite similar to data from nationwide surveys. According to the CBS survey, [25] 38% of Israeli adults reported drinking SSBs at least three times daily, and 17% consumed at least five cups daily, as compared to 37.6% of participants of the current study who reported drinking SSBs several times a day. Data from the MOH in 2014-2016 shows that 31% of adults aged 18-64 consumed SSBs [15].

Community Level - Social Networks and Community Leaders: Social norms in the study seem to be related to SSB consumption habits. In Arab society, as in many cultures, offering SSBs to guests is part of hospitality. The participants were asked to rate their agreement about changing this norm. Most of them wanted, to a large or very large extent, to be served water instead of SSBs, and half of them agreed to serve their guests water rather than soft drinks. In comparison to a survey conducted in 2014 among the Jewish population, [26] it was found that the majority of respondents (83%) considered serving SSBs as a very accepted norm in Israeli society.

On the other hand, 63% believed it is acceptable not to offer SSBs. Since this survey, 9 years have passed, during which numerous initiatives and programs were implemented that aimed at changing established norms in Israeli society. These interventions contributed to a shift in perceptions, as reflected in the current research findings. Based on the Theory of Planned Behavior (TPB), [27] prior observational research demonstrated that subjective norms and descriptive norms play significant roles in shaping intentions to decrease SSB consumption [28,29]. Additionally, two experiments conducted within the framework of this theory further revealed that messages based on norms affect both intentions and actual SSB consumption [30,31].

Intrapersonal level: Characteristics of the individual such as knowledge, attitudes, and socioeconomic status can be related to behaviors of the participants. In this study, 49% of the participants had an education level beyond high school, and almost 90% an income level at or above the national average. On the other hand, when conducting bivariate analyses, it is evident that the consumption level increased inversely with the education level. Similarly, water consumption tended to increase inversely with income levels, while the opposite trend was observed with regard to consumption of diet beverages. Umm, Al-Fahm is an Arab city with a low socioeconomic status, which is part of the Arab community that is also characterized by a low socioeconomic status and higher health disparities [17-32]. Low socioeconomic status was found to be a factor related to high rates of SSB consumption in other studies, [33,34] previous data in 2020 from the MOH also found that 79% of Arab and Ultra-Orthodox Jewish households purchased SSBs as compared to 57% of households among the entire population [35]. It appears that the current research sample may not adequately represent all segments of the Arab community, which could potentially result in biased or skewed data.

According to national survey data from the USA, intake of SSBs has declined modestly since the early 2000s, [36] but consumption levels remain high with higher intakes reported among youth and young adults, and non-Hispanic Black individuals and Hispanic men and women as compared with other demographics [37]. Similar declines or plateauing SSB intake trends have been observed in other high-income countries. By contrast, the intake of SSBs is increasing in many low-income and middle-income countries as widespread urbanization and economic development have increased availability of these beverages [38]. Male (gender) and younger age participants reported more SSB consumption. Data from the National Healthy Survey conducted in 2018 by the Australian Bureau [39] reported that younger people were more likely to consume sugar-sweetened drinks, with 61% of 18-24-year-olds consuming at least once per week and 14% consuming daily. It also shows that men were twice as likely (12%) as women (6%) to consume sugar-sweetened drinks daily. Additional surveys reported similar findings [40-41].

Another interpersonal factor contributing to SSB consumption was knowledge of the implication of those beverages on health. Participants with reported high levels of knowledge that correlated with norms of serving water as part of hospitality habits predicted beverage consumption patterns. As mentioned before, almost half of the participants had an education level beyond high school, which can explain these findings. Previous systematic reviews also found that high educational levels correlated with a healthier diet [42]. Education can shape individuals' diet choices by enabling them to understand and interpret health-related information through nutrition education materials or food packaging labels [43].

Strengths and Limitations: The main strength of this study is that in addition to providing information about the consumption habits of these beverages and the factors associated with them, it also served as a contributing evaluation for health promotion programs focusing on a healthy lifestyle that were implemented in Umm, Al-Fahm and many other cities across Israel. Nevertheless, it is subject to some limitations, including the fact that data were collected at one point at a time in a cross-sectional study; therefore, it was not possible to determine the order of time between the variables and determine causality. There seems to be social desirability bias mainly for knowledge; most of the participants reported the option "strongly agree". Another bias is selection bias, since almost half of the participants reported a

higher education level than high school. Moreover, the research focused on Umm Al-Fahm; even though most Arab localities are ranked in low socioeconomic status and share similar social norms, there can still be a selection bias in any research sample. Therefore, additional surveys that consider these limitations are recommended.

Conclusions

This study reaffirms that the factors influencing an individual's life are situated within three interconnected cycles: at the national level, communal/social level, and personal level. Interventions across these dimensions have seemingly yielded positive outcomes in the realm of healthy lifestyles, particularly concerning the consumption of SSBs. The subject of SSBs consumption serves as a case study for behavior with implications for health, warranting further exploration of behaviors within the domain of a healthy and active lifestyle. Additionally, Umm al-Fahm was selected as a representative city sharing characteristics with the majority of Arab communities in the central and northern regions. It is advisable to extend the research to include other Arab communities throughout Israel and conduct a comparative analysis between those engaged in health promotion initiatives and those that are not. Furthermore, a comparative analysis between Arab and Jewish communities is recommended to obtain a more comprehensive and inclusive understanding.

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