Highlighting Soft Drinks Consumption in Lebanon

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Abstract

This paper aims to highlight the excess consumption of carbonated soft drinks among the Lebanese population and consequently present a call for moderation and reduced consumption (Controlled consumption). A quantitative analysis with a positivist philosophy and a deductive approach is adopted. A questionnaire was administered to 1,612 participants based on their willingness to provide input. Descriptive analysis is used based on the IBM SPSS version 26.0 software. In addition, cross-tabulations were run with Chi-square testing, and a nonparametric Kruskal-Wallis test was also applied to study differences in medians between selected variables. Results illustrate that compared to other nations, Lebanon is a less-than-average consumer of soft drinks (45.5 liters per person per year), with a large percentage of soft drink consumers being young adults and middle-aged adults in the range of 17 to 48 years. This research shows that women consume fewer soft drink glasses than men with averages of 3.82 glasses per week (49.66 liters/yr.) for men and 3.18 glasses per week (41.34 liters/yr.) for women. Results also show no statistically significant relationship between having a job or living status and consuming soft drinks with snacks or food at restaurants. However, the relationship between gender and consuming soft drinks with snacks or food at restaurants is significant (p < 5%). In addition, 17.1% of the participants declared they would never quit consuming soft drinks. Moreover, 85% of females and 79.4% of males have a very good level of health issues awareness about the harms soft drinks cause. Findings also show a significant relation (p < 5%) between gender and awareness.

Keywords: awareness, soft drinks, carbonated drinks, consumption, health issues, Lebanon

1. Introduction

Touyz and Afrshtefar (2016) reported in their article that tooth decay and weight gain are the two main effects of excessive soft drink consumption. Moreover, the same article suggests a controlled consumption plan stating "moderation to not more than one pop soda per week." Vartanian, Schwartz, and Brownell (2007) posit that "Further reason to advocate for a decrease in soft drink intake is the fact that these beverages replace other nutrient sources, provide energy with little nutritional value, and are connected to several serious health issues, including diabetes.

A soft drink is a non-alcoholic beverage, mostly carbonated, containing natural or artificial sweetening agents, edible acids, natural or artificial flavors, and sometimes juice (Nawab, Sheikh, Muzaffar, & Ali, 2021). The first commercial soft drinks were created in 1884 when a pharmacy owner in Lisbon Falls, USA, created a product named "Moxie" (Tahmassebi, Duggal, Malik-Kotru, & Curzon, 2006). According to Business Street (2023), the size of the global market for carbonated soft drinks was estimated at USD 243,671.59 million in 2022 and is projected to grow at a CAGR of 4.48% throughout the forecast period, reaching USD 316,977.47 million by 2028. Soft drinks contain a lot of sugar, so if a person drinks them too much, their weight will rise quickly. Sugar is bad for health, especially artificial sugar, as it can lead to overeating and obesity (which is the result of an imbalance between energy intake and expenditure) (Prihantini and Suryanegara, 2022).

The prevalence of daily soft drink consumption was linked to the prevalence of overweight and obesity among adolescent students in a study conducted across 107 countries and regions that included 405,528 school-age adolescents (Huan, Song, MacGregor, & He, 2023). The study's findings suggest that cutting back on soft drink consumption should be a top priority in the fight against adolescent overweight and obesity. Furthermore, a study conducted on 451,743 people from ten European countries (participants recruited between January 1, 1992, and

December 31, 2000) revealed a correlation between higher consumption of artificially sweetened soft drinks and deaths from circulatory and digestive diseases (Mullee, Romaguera, Pearson-Stuttard, et al., 2019).

Carbonated soft drinks are the most consumable drinks worldwide despite the growing concerns in the medical and scientific communities about their harmful effect. The global soft drink market increased by 88% from 2006 to 2020 (Wood, Baker, Scrinis, et al., 2021; Sampath and Krithaksha, 2021). The increase in the consumption of soft drinks is not a surprise since the manufacturers of soft drinks have spent billions of dollars in propaganda and advertisements to attract more and more consumers (Ministry of Healthcare & Nutrition, 2007).

According to Ashraf and Saeed (2021), the large amounts of sugar, artificial sweeteners, and food colors in soft drinks cause obesity and increase the chances of diabetes. Additionally, soft drinks lead to a risk of cancer and liver damage problems. The International Sugar-Sweetened Soft Drink Survey (2015) reported that the sugar content per 330 ml regular-size container ranges from 32 g (8 teaspoons) to 39 g (10 teaspoons) for Coca-Cola, 23 g (6 teaspoons) to 43 g (11 teaspoons) for Fanta Orange, 35 g (9 teaspoons) to 39 g (10 teaspoons) for Pepsi, 19 g (5 teaspoons) to 47 g (12 teaspoons) for Sprite, etc. The quantity of sugar in soft drinks varies in each country within the ranges abovementioned. For example, a regular 330 ml can of Fanta Orange in India contains 43 g (11 teaspoons) of sugar, while this number for the same drink drops to 23 g (6 teaspoons) in the UK (Fizzy Drinks Global Survey, 2015).

The majority of soft drinks from the 1970s were manufactured with sucrose, a naturally occurring sugar that may be found in different forms in plants such as fruits, vegetables, and nuts. Commercial sucrose is also made from sugar cane and sugar beets; however, high-fructose corn syrup has taken its place since the 1990s. The National Institutes of Health (NIH) states that eating fructose may raise your chance of developing nonalcoholic fatty liver disease. The body retains an excessive amount of fat in the liver cells when this syndrome occurs (Xavier, Sreeramanan, Diwakar, & Sivagnanam, 2007).

There is evidence that fructose consumption compared to sucrose, has a significantly larger effect on the indicators of health (Anderson, Catherine, Woodend, & Wolever, 2002; Teff et al., 2004).

Whether it's excessively high levels of sugar or high fructose corn syrup, the carbonated drink has more calories than the typical consumer needs. This sugar can lead to weight gain, a high rate of dental cavities, and uncontrollable behavior in those with attention-deficit hyperactivity disorder (ADHD) or attention deficit disorder (ADD) (Thamizharasan & Krithaksha, 2021).

Moreover, the aforementioned authors suggested that, as indicated on a cigarette pack, a warning should be printed on soft drink containers to indicate that it is injurious to health.

Besides sugar, another ingredient found in soft drinks is carbon dioxide, the same gas expelled by humans from their bodies through their lungs. Carbon dioxide makes soda fizzy. It happens to be beneficial to plants but harmful to humans (Mishra & Mathur, 2022). In addition, the Pediatrics Dental Health site states that most soft drinks contain acids like phosphoric, citric, or carbonic acid that can cause erosion of the teeth' enamel (Jandt, 2006).

Only 19% of respondents to research conducted in Nellore, India, with a sample of 100 people said they didn't like soft drinks, while 81% said they did. Additionally, according to the same survey, 33% of participants consumed soft drinks daily, 20% more frequently than four times a week, 10% between two and four times a week, and 37% once a week. Surprisingly, nobody mentioned that they don't drink them. "Do you think taking too many soft drinks could cause health problems?" was the question posed. According to the statistics, 28% of respondents were unaware of the health dangers connected to soft drinks, 14% had no view, and 58% of respondents were fully aware of them (Somavarapu & Mubeena, 2017).

Eating habits and the foods people consume directly affect human health, causing obesity, diabetes, cancer, hypertension, and coronary diseases (Amas, 2006). Perin et al. (2005) stated that the most frequent barrier to obesity management is the consumption of fast food and soft drinks. The consumption of soft drinks with their high amount of free sugar not only leads to overweight and obesity but also impairs the control of blood sugar which leads to diabetes mellitus (a metabolic disease involving inappropriately elevated blood glucose levels). A notorious finding in a study of 91,249 women followed for eight (8) years was that those who consumed one or more servings of soft drinks per day (a standard serving of soft drink is 8 ounces) were at twice the risk of developing diabetes as those who consumed less than one serving per month (Schulze et al., 2004).

Metta et al. (2022) studied a sample of 204 dental students from Saudi Arabia aged 18-26 years. The study indicated that 97.3% of boys and 97.9% of girls consume soft drinks weekly. Likewise, 198 (97.1%) indicated that soft drink consumption damages health, while only 6 (2.9%) individuals argued that soft drinks are good for

health. However, the majority (148 individuals, 72%) reported that they enjoy consuming soft drinks, and only 27.5% (56 individuals) reported that they don't enjoy them. Moreover, 175 respondents (85.8%) informed that they prefer drinking soft drinks with meals, and 29 (14.2%) would drink them without a meal.

In addition, a study done on a random sample of 208 respondents in Karachi, Pakistan (Nawab, Sheikh, Muzaffar, & Ali, 2021) revealed that 85.79% of the population consumes soft drinks, with the majority of those consumers were teenagers with ages ranging from 15 to 25 years.

Furthermore, a 2004–2018 study on 1,324 adult Mexicans found that consuming soft drinks raises blood pressure. It was also discovered that during ten years, a one-serving increase in soft drink intake was linked to increases in systolic blood pressure of 2.08 mm Hg (95% CI: 0.21, 3.94) and diastolic blood pressure of 2.09 mm Hg (95% CI: 0.81, 3.36).

It is worth mentioning and highlighting that worldwide in general, and in Lebanon in particular, the consumption of dried fruits has been decreasing over the years. Dried fruits like figs, dates, grapes, apricots, plums, and apples, consumed alone or with water as drinks, used to be a significant nutrient source. MVMT (2023) asserts that infusions made of dried fruit provide a healthy substitute for soda in terms of hydration, assisting in the preservation of a balanced fluid intake without sacrificing overall health. Today, soft drinks have replaced this significant source.

This paper aims to highlight and assess the excess consumption of carbonated soft drinks among the Lebanese population. Consequently, this presents a call for moderation and reduced consumption (Controlled consumption).

2. Materials and Methods

This study employed positivism, defined by Hejase and Hejase (2013) as "when the researcher acts as an impartial analyst who is not influenced by the research's subject or interferes in any way" (p. 77). Positivists produce testable research questions. At the same time, this study's technique is rational, deductive, and grounded in scientific ideas. Data validity is achieved by employing controls to describe the cause-and-effect relationships between the variables. Using primary data to operationalize the concepts aids in achieving definition clarity. Ideas are evaluated, elucidated, and put to the quantitative test. In addition, this research employed a survey strategy. That results in a standard questionnaire administered to a chosen sample of individuals. To collect unprocessed data for statistical analysis is the aim. Since the research is conducted at a specific period, the temporal horizon is a cross-sectional time frame.

2.1 Sampling and Sample Size

Sampling in this work is non-random, convenient, and purposeful. Respondents are those willing to participate with free will to stop at any moment they desire. The targeted participants belong to the Lebanese population aged from 10 to 90 years old. The total population constitutes more than a million individuals, and the final sample size is 1612 persons. The sample size of about 1600 respondents (Actually 1612 were collected) was calculated using the classical Cochran's formula $n = [p(1-p)Z^2]/[e^2]$ (Cochran, 1977), with a probability of consumption of soft drinks is 50%, a confidence level of 99.7% (Z=3.00), and a maximum error of ±3.75%.

The questionnaires were administered one-on-one in schools, hospitals, malls, street walks, and parks.

Using reliability error estimates extracted from Hardwick's (2022), the authors herein used a similar approach implemented by Masoudi and Hejase (2023), Hejase et al. (2023a, b), Nasser et al. (2022), El Takach et al. (2022), and Chehimi and Hejase (2024) with a total population of over one million. In a case where the population is over one million, Table 1 indicates that the sample size would be greater than 800 (at 95% confidence) and a target reliability error of 5%. Therefore, at the 95% confidence level, the 1612 sample size in this study provides an exceptional reliability error of less than ±3.6%.

In 96.4 out of 100 survey repetitions, the results will not differ by more than 3.6% if a maximum reliability error of ±3.6% is assumed. Such a reliability would be quite appropriate for this kind of exploratory study.

Table 1. Statistical reliability versus sample size at 95% confidence

	[50/50% proportion characteristics]					
	Population					
Sample Size	100	500	1000	10000	100000	1 million +
200		±5.4%	±6.2%	±6.9%	±7.0%	±7.1%
300		±3.6%	±4.7%	±5.6%	±5.7%	±5.8%
-					-	-
725			±1.9%	±3.4%	±3.5%	±3.6%
800			±1.6%	±3.4%	±3.5%	±3.6%

Source: Modified from Hardwick's (2022) Research.

2.2 Survey Design

There are two components to the survey. The first is a set of nine questions designed to evaluate respondents' attitudes and behaviors around carbonated soft drinks using a dyadic and multiple-choice format. In the second section, five dyadic and multiple-choice questions about sex, age, education, living arrangement (with family or alone), and employment status are used to gather demographic information about the respondents.

The respondents were informed to mark the most appropriate subjective answers from the list of closed-ended type questions. The questionnaire was initially prepared in English and later translated to Arabic following a two-way approach to validate the translation. Also, two professionals reviewed it for validity reasons.

2.3 Data Analysis

Giving data a purpose generates insightful data (Hejase and Hejase, 2011). In addition, descriptive statistics use simple, illustrative numbers or visuals to try and make sense of a set of data (Hejase & Hejase, 2013, p. 272). Tables illustrated means, standard deviations, frequencies, and percentages for clarity. Data evaluation was done using IBM's Statistical Product and Service Solutions (SPSS) version 26.0 package. Chi-square cross-tabulation procedures and nonparametric Kruskal-Wallis test performed on the medians of different groups are further inferential statistical analysis methods.

3. Results and Findings

3.1 Demographics

The sample studied had an average age (at last birthday) of 26.21 years with a standard deviation of 12.74 years. Additionally, the median age was 21 years, and the range of ages extended from a minimum of 12 to a maximum of 83 years. The histogram of ages is depicted in Figure 1 showing the positive skewness (Skewness = 1.54) and the 20-year mode. As for the living status of the 1612 respondents, 94.4% lived with families, and the remaining 9.6% lived alone. Moreover, the gender distribution of the respondents was slightly higher for females, such that 49.4% for males (796 out of 1612) and 50.6% for females (816 out of 1612).

Figure 2 presents the educational level of the respondents where: 2.98% (48) had achieved elementary (primary) education, 5.83% (94) got middle high school education, 28.23% (455) reached high school, 4.28% (69) completed a vocational degree, 52.54% (847) attained university undergraduate studies, and 6.14% (99) accomplished university graduate studies. It is clear from the abovementioned percentages and Table 2 that most of respondents belong to a highly educated social sector. Finally, when respondents were asked about their current working status, 47.3% (761 respondents) indicated that they are currently working, while 52.7% (849 respondents) affirmed that presently they have no jobs (2 respondents did not answer the question). Table 2 presents a summary of the respondents' demographic characteristics.
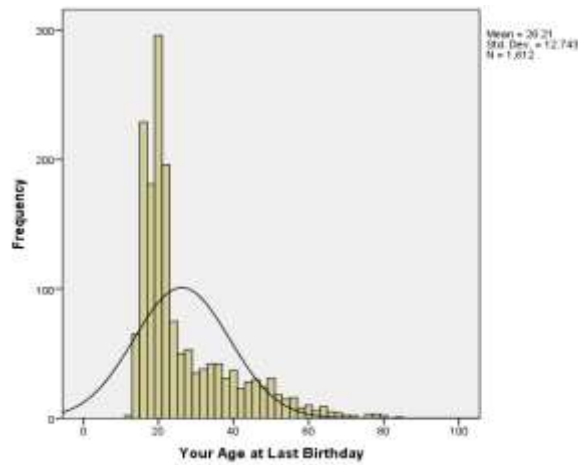
Figure 1. Histogram of respondents' ages

Table 2. Summary of Respondents' Demographics

Age at Last Birthday (years)	Mean=26.21		Median=21	Mode=20	Std. Dev.=12.74	
Living Status	1458 With Family (90.4%)			154 Alone (9.6%)		
Gender	796 Males (49.4%)			816 Females (50.6%)		
Educational level	142 (8.81%) Elementary + Middle	69 (4.28%) Technical + Vocational		455 (28.23%) High School	946 (58.68%) University	
Working	761 Currently Working (47.3%)			849 Currently not Working (52.7%)		

3.2 Consumption of Alcoholic and Soft Drinks

Table 3 presents the overall results of participants' responses on what relates to the consumption of alcoholic and soft drinks. The results showed that 11.9% of the people consumed liquor, and 65% of the people believed that they needed to have a soft drink with certain foods. 36.4% of the participants indicated that soft drinks are always available in their refrigerators, 30.3% of the people offer soft drinks for their guests, and 74.9% have the habit of consuming soft drinks whenever they are in snacks or restaurants.

Table 3. The consumption of liquor and soft drinks

Do you drink liquor?	192 Yes (11.9%)	1420 No (88.1%)
Are soft drinks needed with certain foods?	1047 Yes (65.0%)	565 No (35.0%)
Are soft drinks always available in your fridge?	586 Yes (36.4%)	1026 No (63.6%)
At home, do you offer soft drinks to your guests?	488 Yes (30.3%)	1124 No (69.7%)
Do you consume soft drinks with snacks or with your food at restaurants?	1208 Yes (74.9%)	404 No (25.1%)

Figure 2 shows that 84.4% of respondents consumed soft drinks daily. They consumed from one to eleven glasses in a week. In this figure, 15.3% of the people consume one glass a week, 14.6% two glasses, 12.4% three glasses, 8.8% four glasses, 8.1% five glasses, 4.5% six (6) glasses, and 19.7% seven glasses or more per week. Only 16.6% of the respondents indicated they consume no soft drinks during the week.
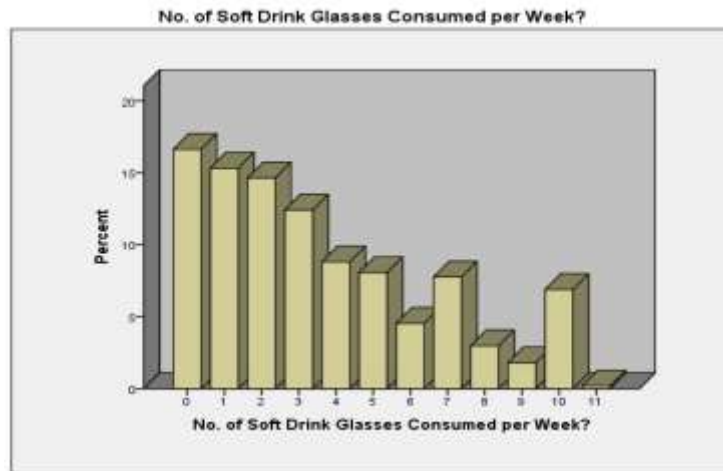
Figure 2. Weekly percentages of people who consume soft drink glasses

3.3 Participants' Habits in Soft Drink Consumption

The soft drink consumption among all the participants was an average of 3.5 ordinary glasses with a standard deviation of 2.993 glasses. Upon studying the average consumption of soft drinks among the different age groups, the analysis presented in Table 4 shows that teenagers with age less than 16 years consume an average of 3.55 glasses per week, those whose ages are between 17 and 32 years consume a higher average of 3.65 glasses per week, likewise, the age category 33 to 48 years consumes an average of 3.56 glasses per week. Soft drink consumption begins to decrease for higher ages, with an average of 2.39 for the age category 49 to 64 years and an average of 1.14 glasses for ages 65 to 80. The abovementioned analysis shows that a significant percentage of soft drink consumers are young adults and middle-aged adults (from 17 to 48 years) (Table 4). To confirm that there is a statistically significant difference in the medians, a nonparametric Kruskal-Wallis test was performed on the medians of the five (5) groups (the five age categories). The differences among the rank totals of 809.19 (Ages 1-16), 836.97 (Ages 17-32), 802.21 (Ages 33-48), 627.55 (Ages 49-64), and 404.88 (Ages 65-80) were statistically significant, $H (4, n = 1611) = 36.94$, $P = 0.000 < \alpha = 1\%$).

Table 4. Number of soft drink glasses consumed per week for each age category

Age Category	Statistic	
Ages 1-16	Mean	3.55
	Median	3.00
	Std. Deviation	3.065
Ages 17-32	Mean	3.65
	Median	3.00
	Std. Deviation	2.951
Ages 33-48	Mean	3.56
	Median	3.00
	Std. Deviation	3.180
Ages 49-64	Mean	2.39
	Median	2.00
	Std. Deviation	2.516
Ages 65-80	Mean	1.14
	Median	1.00
	Std. Deviation	1.459

3.4 Having a Job and Consumption

Is there any relation between having a job and consuming soft drinks with snacks or food at restaurants? The cross-tabulation for this question is shown in Table 5, and the resulting χ2 test provides that χ^2 (1, N = 1610) = 1.084, P = 0.298 > α = 5%), i.e., the relation between having a job and consuming soft drinks with snacks or food at restaurants is not statistically significant. Those who answered yes were 73.7% (561 out of 761) of those who work and 76.0% (645 out of 849) of those who do not work, and this difference is not statistically significant.

Table 5. Cross-tabulation: Work status and consuming soft drinks with snacks or food at restaurants

		Currently, do you work?		Total
		Yes	No	
Do you consume soft drinks with snacks or with your food at restaurants?	Yes	561	645	1206
	No	200	204	404
Total		761	849	1610

3.5 Living Status and Consumption

Is there any relation between living status and consuming soft drinks with snacks or food at restaurants? Table 6 shows the cross-tabulation for this question, and the resulting χ2 test provides that χ^2 (1, N = 1612) = 0.014, P = 0.907 > α = 5%), i.e., the relationship between living status and consuming soft drinks with snacks or food at restaurants is not statistically significant. Those who answered yes were 74.9% (1092 out of 1458) of those who live with family and 75.3% (116 out of 154) of those who live alone, and such a difference is not statistically significant.

Table 6. Cross-tabulation: Living status and consuming soft drinks with snacks or food at restaurants

		Living status?		Total
		Living With Family	Living Alone	
Do you consume soft drinks with snacks or with your food at restaurants?	Yes	1092	116	1208
	No	366	38	404
Total		1458	154	1612

3.6 Gender and Consumption

As for the consumption of soft drinks among genders, Table 7 shows that women, on average, consume fewer soft drink glasses than men, where the averages are 3.82 glasses per week for men and 3.18 glasses per week for women. Moreover, the medians are three (3) glasses for men and two (2) glasses for women.

Table 7. Number of soft drink glasses consumed per week for each gender

Gender	Statistic	Male	Female
Male	Mean	3.82	3.18
	Median	3.00	2.00
	Std. Deviation	3.067	2.885

3.6.1 Gender Cross-tabulations

Is there any relation between gender and consuming soft drinks with certain foods? A Pearson's χ2 test is performed to answer this question. We can determine whether a crosstab's results are statistically significant using Pearson's Chi-square test, i.e., testing if there is a lack of relationship, or independence, between two categorical variables. Table 8 shows the cross-tabulation, and the resulting χ2 test provides χ^2 (1, N = 1612) = 2.789 and P = 0.095 > α = 5%, implying that the relation between gender and "Are soft drinks needed to be consumed with certain foods?" is statistically insignificant.

Table 8. Cross tabulation between gender and "Are soft drinks needed to be consumed with certain foods?"

		Gender		Total
		Male	Female	
Do soft drinks need to be consumed with certain foods?	Yes	533	514	1047
	No	263	302	565
Total		796	816	1612

Is there any relation between gender and consuming soft drinks with snacks or food at restaurants? Table 6 shows the cross-tabulation for this question, and the resulting χ2 test provides χ^2 (1, N = 1612) = 12.288, P = 0.000 < α = 1%), i.e., the relationship between gender and "Do you consume soft drinks with snacks or food at restaurants?" is statistically significant. It is worth highlighting that those who answered yes were 78.8% (627 out of 796) of the males compared to 71.2% (581 out of 816) of the females, and this difference is significant (Table 9).

Table 9. Cross tabulation between gender and "Do you consume soft drinks with snacks or food at restaurants?"

		Gender		Total
		Male	Female	
Do you consume soft drinks with snacks or with your food at restaurants?	Yes	627	581	1208
	No	169	235	404
Total		796	816	1612

3.7 Health Issues upon Consumption of Soft Drinks

When the participants were asked if they were aware of the health damages caused by soft drinks, surprisingly 1326 (82.3%) responded that they were aware, and only 286 (17.7%) indicated that they were unaware of health damages. Moreover, 17.1% of the participants declared that they would never quit consuming soft drinks, and 15.1% informed that they do not consume soft drinks. The participants' responses to the question: "If you are a consumer of soft drinks, will you quit drinking them one day?" are presented in Table 10. Likewise, Figure 3 depicts the graphical representation of the same question.

Table 10. Responses for: Will you quit drinking soft drinks one day?

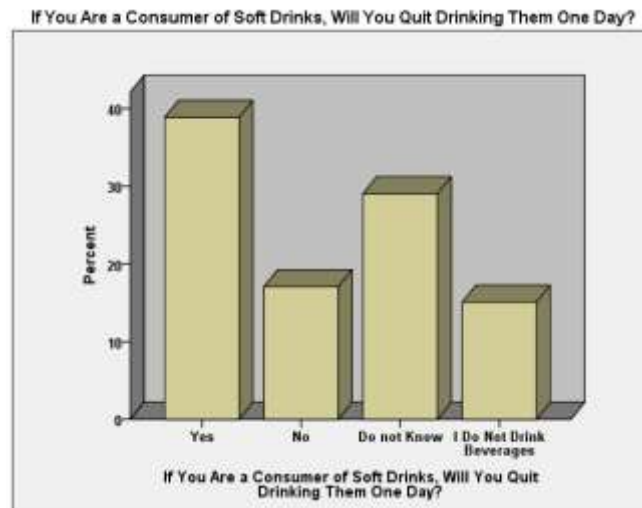|	Frequency	Percentage
Yes	626	38.8%
No	275	17.1%
Do not Know	468	29.0%
I Don't Drink Soft Drinks	243	15.1%
Total	1612	100.0

Figure 3. Responses for: Will you quit drinking soft drinks one day?

3.7.1 Awareness Level of Health Damage by Gender

One may ask if both genders have the same awareness level about the health damages that can occur due to the consumption of soft drinks. The topic of where females have a higher awareness level is answered in Table 11, where 85.0% of the ladies and 79.4% of the males were aware. The relationship between gender and awareness was investigated using the Chi-square test of independence. At $\chi2$ (1, N = 1612) = 8.82, p = 0.003 < α = 1%), there was a statistically significant relation between these factors. Females were more aware than males of what relates to health damages caused by consuming soft drinks.

Table 11. Gender Crosstabulation for: Are you aware of the health damage due to soft drinks?

		Gender		Total
		Male	Female	
Yes	Count	632	694	1326
	% within Gender	79.4%	85.0%	82.3%
No	Count	164	122	286
	% within Gender	20.6%	15.0%	17.7%
Count		796	816	1612

Is there any relation between gender and planning to quit drinking soft drinks one day? Table 12 shows the cross-tabulation for this question, and the resulting $\chi2$ test provides that χ^2 (3, N = 1612) = 29.374, P = 0.000 < α = 1%), implying that there is a significant relation between gender and "If you are a consumer of soft drinks, will you quit drinking them one day?"

Table 12. Crosstabulation: Gender and "If you are a consumer of soft drinks, will you quit them one day?"

		Gender		Total
		Male	Female	
If you are a consumer of soft drinks,	Yes	293	333	626
will you quit drinking them one	No	171	104	275
day?	Do not know	236	232	468
	I do not drink soft drinks	96	147	243
Total		796	816	1612

3.7.2 Level of Education and Soft Drinks' Health Threats

Is there any relation between being aware of soft drinks' health threats and level of education? Table 13 shows the cross-tabulation for this question, and the resulting χ2 test provides that χ^2 (5, N = 1612) = 57.233, P = 0.000 < α = 1%), implying that there is a statistically significant relation between the level of education and awareness about health threats due to consuming soft drinks. Those who were more aware of the soft drink's health threats had higher levels of education.

Table 13. Crosstabulation: Educational level and being aware of soft drinks' health threats

		Level of Education						Total
		ES	SS	HS	T-V-S	B	GS	
Are you aware of the health threats caused by drinking soft drinks?	Yes	37	59	346	55	739	90	1326
	No	11	35	109	14	108	9	286
Total		48	94	455	69	847	99	1612

Note: Elementary schooling: ES; Secondary schooling: SS; High School: HS; Tech./Voc. Schooling: T-V-S; Bachelor: B; and Graduate Studies: GS.

4. Conclusion

The outcomes of this research show that Lebanon, like many other countries, consumes soft drinks (though each to a different extent). This study, the first in Lebanon about the subject, constituted 1612 respondents with an average age of 26.21 years with a standard deviation of 12.74 years and a range of ages extended from a minimum of 12 years to a maximum of 83 years. 52.54% (847) attained university undergraduate studies, 6.14% (99) accomplished university graduate studies, and the remaining are high school and vocational students. 47.3% (761 respondents) indicated that they are currently working. 65% of the people believe that they need to have a soft drink with certain foods, and 74.9% have the habit of consuming soft drinks whenever they are in snacks or restaurants. About 85% of the people consumed from one to eleven glasses of soft drinks in a week. The soft drink consumption per week among all the participants was (on average) 3.5 ordinary glasses with a standard deviation of 2.993 glasses, that is, a minimum average of 0.507 glasses to a maximum of 6.493 glasses. In Saudi Arabia, Aldhirgham, Almutairi, Alraqea, et al. (2023) reported an average consumption of 3.43±0.62 glasses per week. However, most statistics on the subject refer to a consumption measure in per capita liters per person yearly. Therefore, according to javaTpoint (2021), "A liter is equivalent to 1,000 milliliters or 33.8 fluid ounces" (para 2), and "A glass of water is an average-sized drinking glass that holds around 250 milliliters or 8.45 fluid ounces" (ibid, para 3). Hence, for the sake of comparison with the reported data, the Lebanese sample of respondents consumes an average of 45.5 liters per person per year. Consequently, based on the World Population Review's (2024) statistics, Lebanon is an average world consumer of soft drinks. Exhibit 1 illustrates reported data with Lebanon's data resulting from this work.

Exhibit 1. World consumption of soft drinks (2024)

Country	Consumption in liters per person per year
Argentina	155
United States of America-USA	154
Chile	141
Mexico	137
Uruguay	113
Belgium	109
United Arab Emirates-UAE	103*
Saudi Arabia	89*
Canada	51
Lebanon	45.5*
Indonesia	23

Note: * Modified by the authors to include missing data.

Exhibit 1 shows that Lebanon is a less-than-average consumer of soft drinks with a large percentage of consumers of soft drinks being young adults and middle-aged adults, whose ages range from 17 to 48 years. The Arab countries UAE and Saudi Arabia are considered high consumers (most studies involve tertiary education students). In addition, this research shows that women, on average, consume fewer soft drink glasses than men, i.e., the averages are 3.82 glasses per week (49.66 liters/yr.) for men and 3.18 glasses per week (41.34 liters/yr.) for women.

Results also showed no statistically significant relationship between having a job or living status and consuming soft drinks with snacks or food at restaurants. However, the association between gender and consuming soft drinks with snacks or food at restaurants is statistically significant.

As for health concerns and consuming soft drinks, 1326 (82.3%) of the participants responded that they were acquainted with the health damages caused by soft drinks, and 286 (17.7%) indicated that they were unaware of health damages. Moreover, 17.1% of the participants declared they would never quit consuming soft drinks. In general, females have a higher awareness level (85.0% of the females were aware compared to 79.4% of males). Results of the chi-square test of independence showed that the relationship between gender and awareness was statistically significant. Results also showed that the relationship between gender and planning to quit drinking them one day is statistically significant. Finally, there is a statistically significant relation between the level of education and awareness about health threats as a result of soft drink consumption. Those who were more aware of the soft drink's health threats had higher levels of education.

To the best of the researchers' knowledge, virtually little research on drinking water versus soft drink habits was conducted in Lebanon. For example, Abi Haidar, Lahham-Salameh, and Afifi (2011) quoting the 'Global School-based Student Health Survey (2005)' reported that "in Lebanon, 33% of students in grades 7-9 (13 to 15 years old) drink carbonated soft drinks two or more times per day" (para 1). In addition, the authors conducted quasi-quantitative research about water versus soft drink consumption for grades 3 to 4, finding that "Students who drank less than one can of soft drink per day rose from 25.5% to 57.6% (p = 0.000), while the percentage of students who drank six or more cups of water grew from 27.7% to 59.1% (p = 0.000)" (para 4). This research has merit since it provides new facts about Lebanese soft drink consumers based on highly reliable sample size. Researchers from Saudi Arabia and the United Arab Emirates (UAE), among others, conducted several studies (Benajiba and Mahboub, 2019; Islam, Al-Karasneh, Hussain, et al., 2020; Aldhirgham, Almutairi, Alraqea, et al., 2023; Nassar, Islam, Hasan, et al., 2023). In Egypt, Al-Askalany, Sadden, & Mohamed (2018) experimented with the impact of soft drinks on blood and liver in rats. However, the reported studies had different objectives that are more inclined toward health issues versus calories and sugar intake, among other health issues. Nevertheless, these studies reported high consumption of soft drinks by the Saudi and UAE populations. Aljaadi, Turki, Gazzaz, et al. (2023) found that "About 67% reported consuming soft drinks at least once a week, with more males than females reporting weekly consumption." Exhibit 1 shows the UAE and Saudi Arabia's high consumption of soft drinks with a rate of 103 and 89 liters per person per year, respectively.

4.1 Limitations of the Study

The sample size of 1612 respondents illustrated in this paper's sampling section is highly reliable. However, respondents may have introduced the "general bias of self-reported recall beverage assessment" reported by Shim, Oh, and Kim (2014, p. 4). Also, this research's scope is limited to characterizing the consumption of soft drinks without adding the specific health damage consequences. That encourages other researchers to seek future research that will enrich comparative analyses with other nations.

4.2 Recommendation

The outcomes of this research are commensurate with the general objective, i.e., to assess and quantify the consumption of soft drinks in Lebanon. So, the generated empirical results may help establish an objective and reliable research platform for further research on the topic, for example, by adding the different health damage consequences across the age hierarchy of consumers. As for the health dimension, when investigated, helps to mitigate consumer patterns and supports Lebanese policymakers in suggesting legal actions that could lead to lower consumption like the case of Mexico's record in 2019, scoring the highest carbonated soft drink consumption, namely over 630 8-ounce servings or 149 liters per capita per year (Ridder, 2022). Mexico introduced taxation on sugar affecting soft drinks (Sánchez-Romero et al., 2020) that resulted in a decreasing trend of soft drinks consumption as shown in Exhibit 1, which reports 137 liters per capita per year in 2024. Concerned educational institutions, medical institutions, and academic researchers are called upon for the immediate management of future research programs directed at influencing the status quo of soft drinks and energy drinks consumption and to motivate purposeful change for the sake of future generations and the future

leaders of the nations.

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