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The hidden danger in packaged beverages sold in supermarkets

[*1] RA Sümeyye Güzel, [2] Alev Keser, [3] Şükrü Hatun
[1] Department of Nutrition and Dietetics, Faculty of Health Sciences, Ankara University, Ankara, Turkey
[2] Assoc. Prof., Department of Nutrition and Dietetics, Faculty of Health Sciences, Ankara University, Ankara, Turkey
[3] Prof., Department of Pediatric Endocrinology and Diabetes, Faculty of Medical, Koc University, Istanbul, Turkey

Abstract
Obesity is an important public health problem that is becoming increasingly prevalent. It is thought that high-energy sugar sweetened drinks have a role in obesity reaching epidemic rates. Therefore, this study aimed to investigate nutritional values of some beverages sold widely in supermarkets. The study analyzed the energy, total fat, saturated fat, carbonhydrate and sugar contents 100 mL/per based on the label information on 237 different packaged beverages supplied by 6 hypermarkets located in Ankara/Turkey. the products in the scope of the study, the highest sugar contents were found in fruity beverages (11.5±1.22 g/100 mL). Fruit/cacao milks also had much higher sugar contents than many other beverage groups by 10.5±0.07 g/100 mL sugar. All drinks exceeded the sugar content amounts declared in the health statement included in the Turkish Food Codex Labeling Regulation. Sugar contents of the ready-to-consume drinks are very high. Therefore, producers should quit adding excessive amounts of sugar to these beverages.

Keywords: child, obesity, obesogenic environment, sugar, sugar sweetened beverages

Introduction
According to the data of the World Health Organization, while the excessive weight ratio in children under 5 was 4% in 1998, it rose up to 9.1% in 2004 and 10.9% in 2013 [1]. Obesity is a significant public health issue that occurs due to a combination of various factors [2], affects children in addition to adults and is increasingly prevalent [3]. One important component of these factors, obesogenic environment, frequently exposes children and adolescents to unhealthy foods and advertisements with children as the target audience [4]. It was reported that the increased acceleration of especially childhood obesity is greatly affected by high-sugar dietary patterns [5]. While there is natural sugar in nutritional sources such as fruits and milk, sugar is generally added onto some foods and drinks during preparation, processing or consumption. Fruit juices and soft drinks are among the most significant sources of added sugar. Sugar has many other names. Besides those ending in "-ose," such as maltose or sucrose, other names for sugar include high fructose corn syrup, molasses, cane sugar, corn sweetener, raw sugar, syrup, honey or fruit juice concentrates [6]. It was stated that 16% of the total energy intake of children and adolescents consisted of added sugar, and about 40% of this added sugar intake was obtained from beverages [7]. Increased free sugar intake especially by consumption of sugar sweetened beverages in early ages lowers diet quality [8] and paves the way for health problems such as cavities [9], type 2 diabetes [10] and coronary hearth diseases [11].
Until recently, it was thought that obesity is caused that disruption of homeostatic mechanisms. However, it was demonstrated than a large part of excessive energy intake causing obesity comes from the rewarding characteristics of foods that provide pleasure of consumption and are easily obtainable. While hedonic diet has different neurophysiological foundations than those of homeostatic controls [12], it has various similarities with drug addiction [13]. This similarity is caused by the parallel neurobiological effects of both hedonic diet and drug addiction on the dopaminergic and endogen opioid system [14]. This clearly explains the compulsive intake of liked foods in occurrence of childhood obesity, and creates a sort of addiction towards food [15]. A study found the rate of food addiction in the children of ages 5 to 12 as 22.7% and showed a significant relationship between food addiction and high body mass index (BMI)-Z scores [16].
Food addiction has an effect that may start in childhood and overtake a person's entire life. Especially children are exposed to products that may create food addiction by supermarkets and television advertisements. Therefore, the study aimed to analyze contents of energy and some nutrient elements in sugar sweetened drinks that may play a role in incidence of food addiction.

Material and Methods
The Place, Time and Sampling of the Study
This study included all sugar sweetened beverages except energy and sports drinks, light drinks and kefir that were available for consumption and sold in 6 hypermarkets with high sales capacities located in Ankara between June 2016 and September 2016.

The General Setting of the Study
In the scope of the study, the label information of a total of 237 packaged beverages from 27 different brands was

investigated. Beverages containing fruits were categorized based on their fruit contents according to the Fruit Juices and Similar Products Declaration of the Turkish Food Codex. Accordingly, beverages with 100% fruit content are fruit juices, those with 25-99% fruit content are fruit nectars, those with 10-25% fruit content are fruit-containing drinks, and those with fruit contents lower than 10% are flavored drinks [17]. Table 1 shows the numbers of drinks from different brands included as different types in the study.

Table 1: The number of brands and types of the beverages included in the study.

Type of beverage	Number of brand	Number of type
Fruit/cacao milks	8	25
Fruit juice	7	41
Fruit nectar	7	49
Fruit-containing drink	10	34
Flavored drinks	7	23
Mineral drink	6	45
Carbonated drink	8	13
Ready-coffee drink	2	7

The energy (kcal), total fat (g), saturated fatty acid (g), carbohydrate (g) and sugar (g) contents per 100 mL of the drinks were recorded for analysis. Additionally, the number of products here these nutritional elements are provided in label information was determined, and this number is shown in the tables as 'n'.

Statistical Analysis

The data obtained in the study were analyzed using the SPSS 15 package software. Number (N) and percentage (%) tables were formed for qualitative data. Arithmetic mean ($\bar{x}$), standard deviation (SD) and min-max values were given as descriptive statistics.

Results

Based on the information provided on the labels of the products in the study, the highest energy content was found by 67.8±5.36 kcal/100 mL in fruit/cacao milk products (Table 2). With 10.5±0.07 g/100 mL sugar content, fruit/cacao milk products contained more sugar than fruit juices (10.2±4.02 g/100 mL), flavored drinks (6.1±1.52 g/100 mL), mineral drinks (8.0±2.54 g/100 mL), carbonated drinks (8.5±3.59 g/100 mL) and ready-coffee drinks (7.3±1.08 g/100 mL) (Tables 2, 3).

Table 2: Mean ($\bar{x}$), standard deviation (SD) and min-max values for energy and some nutrient contents in types of fruit/cacao milks, mineral drinks, carbonated drinks and ready-coffee drinks (100 mL).

Type of beverage	Energy and some nutrient contents	Number (n)	$\bar{x}$ ±SD	Min-Max
Fruit/cacao milk				
	Energy (kkal)	25	67.8±5.36	52.6-76.9
	Total fat (g)	25	1.5±0.17	1.1-2.0
	Total fat (% energy)	25	20.6±1.46	17.5-23.6
	Saturated fatty acid (g)	2	0.8±0.00	0.8-0.8
	Saturated fatty acid (% energy)	2	10.4±0.00	10.4-10.4
	Carbonhydrate (g)	25	10.6±0.78	9.0-12.5
	Carbonhydrate (% energy)	25	62.9±2.87	58.0-73.0
	Sugar (g)	2	10.5±0.07	10.5-10.6
	Sugar (% energy)	2	61.1±0.40	60.8-61.4
Mineral drink				
	Energy (kkal)	45	36.0±10.99	14.1-58.6
	Carbonhydrate (g)	45	8.8±2.77	3.2-14.0
	Carbonhydrate (% energy)	45	97.1±3.57	88.8-101.4
	Sugar (g)	7	8.0±2.54	4.4-10.9
	Sugar (% energy)	7	96.5±4.45	89.4-101.4
Carbonated drink				
	Energy (kkal)	13	34.3±12.51	8.0-50.0
	Carbonhydrate (g)	11	8.4±3.12	2.0-11.7
	Carbonhydrate (% energy)	11	99.8±1.84	96.6-103.0
	Sugar (g)	9	8.5±3.59	2.0-12.4
	Sugar (% energy)	9	99.5±1.19	97.5-101.8
Ready-coffee drink				
	Energy (kkal)	7	53.0±13.65	25.0-67.0
	Total fat (g)	7	1.4±0.77	0.0-2.2
	Total fat (% energy)	7	22.6±10.88	0.0-31.4
	Saturated fatty acid (g)	4	0.6±0.45	0.0-0.9
	Saturated fatty acid (% energy)	4	11.5±7.72	0.0-16.2
	Carbonhydrate (g)	7	8.0±1.11	5.9-9.4
	Carbonhydrate (% energy)	7	63.7±14.51	52.0-94.4
	Sugar (g)	4	7.3±1.08	5.8-8.1
	Sugar (% energy)	4	68.2±16.41	58.9-92.8

Considering the drinks that have fruit content within themselves, fruit juices (48.1±7.29 kcal/100 mL), fruit nectars (49.0±5.58 kcal/100 mL) and fruit-containing drinks (48.9±5.11 kcal/100 mL) had similar energy contents, while flavored drinks had the lowest energy (28.3±7.58 kcal/100 mL). Fruit nectars had the maximum amount of sugar by 11.5±1.22 g/100 mL, while flavored drinks had the minimum amount by 6.1±1.52 g/100 mL (Table 3).

Tablo 3: Mean ($\overline{x}$), standard deviation (SD) and min-max values for energy and some nutrient contents in types of fruit juices, fruit nectars, fruit-containing drinks and flavored drinks (100 mL).

Type of beverage	Energy and some nutrient contents	Number (n)	$\overline{x}$ ±SD	Min-Max
Fruit juices				
	Energy (kkal)	41	48.1±7.29	30.6-63.0
	Carbonhydrate (g)	41	11.3±1.73	7.4-15.2
	Carbonhydrate (% energy)	41	94.2±3.32	86.2-100.0
	Sugar (g)	35	10.2±4.02	0.0-15.2
	Sugar (% energy)	35	83.0±30.41	0.0-100.0
Fruit nectars				
	Energy (kkal)	49	49.0±5.58	23.8-58.0
	Carbonhydrate (g)	49	11.9±1.36	5.8-14.0
	Carbonhydrate (% energy)	49	97.1±2.79	87.5-104.7
	Sugar (g)	35	10.9±2.42	5.1-14.0
	Sugar (% energy)	35	88.1±17.44	42.9-100.0
Fruit containing drinks				
	Energy (kkal)	34	48.9±5.11	32.4-56.2
	Carbonhydrate (g)	34	11.9±1.24	8.0-14.0
	Carbonhydrate (% energy)	34	98.1±1.95	92.6-100.8
	Sugar (g)	19	11.5±1.22	8.0-13.4
	Sugar (% energy)	19	97.2±3.41	85.0-100.8
Flavored drinks				
	Energy (kkal)	23	28.3±7.58	20.0-52.0
	Carbonhydrate (g)	23	6.5±1.52	3.0-9.1
	Carbonhydrate (% energy)	23	94.5±15.96	23.0-108.0
	Sugar (g)	19	6.1±1.52	3.0-9.0
	Sugar (% energy)	19	91.8±17.02	23.0-100.0

According to the Turkish Food Codex Labeling Regulation published by the Ministry of Food, Agriculture and Livestock, over 2.5 g of sugar in 100 mL of a drink is unhealthy [18]. Therefore, sugar contents of all 237 beverages included in this study were determined to be on unhealthy levels.

Discussion and Conclusions

In a study on 7-12 years of children that emphasized the large effect of sugar consumption on obesity development recently, a positive relationship was found between the children's BMI scores and sugar consumption [19]. Various studies showed that sugar sweetened drinks increased waist circumference [20, 21], BMI-Z scores [22, 23] and therefore adiposity in children and adolescents [24]. In a study based on ten tears of observation, the weight change in participants who liked sweet tastes was significantly higher than those who did not, and it was stated that preference of sweet foods may be an important risk factor in gaining weight [25]. In another study, 1696 children of 6 to 9 years of age were asked to consume low- and high-fat crackers with low- and high-sugar apple juice, and children's preference of high-fat cracker and high-sugar juice was found to be positively related to their status of weight [26].

The analysis on a total of 237 beverages from 27 different brands that are easily accessible in supermarkets, affordable, but not very nutritious showed that fruit nectars had the highest sugar content by 11.5±1.22 g/100 mL, while flavored drinks had the lowest by 6.1±1.52 g/100 mL (Table 3). It was also observed that all beverages exceeded the health notice limits in terms of sugar content included in the Turkish Food Codex. In a study investigating the sugar contents of a total of 203 beverages including 21 fruit juices, 158 juice drinks and 24 smoothies in supermarkets the target audience of which are children, it was found that smoothies had the highest sugar content by a mean of 13 g/100 mL, while juice drinks had the lowest by 5.6 g/100 mL [27]. A study conducted in the United Kingdom stated that carbonated drinks containing sugar have a mean sugar content of 30.1±10.7 g/330 mL, 91% of these contain higher than 11.25 g/100 mL of sugar, and therefore, are labeled in red [28]. There are also studies that demonstrated that packaged beverages which contain sugar lead to excessive consumption of sugar as a global problem [29, 30].

In a recent study conducted in Turkey, the mean consumption rates of packaged fruit juices and carbonated drinks in children younger than 24 months were found as 43.3% and 18.4% respectively [31]. Additionally, according to the research report of the Monitoring Growth in School Children in Turkey (TOCBI) Project, 11.5% of 6 to 10 years of children consumed sugar sweetened carbonated drinks every day [32]. This situation shows that a large part of the energy and carbohydrates that need to be taken by children daily, is obtained from beverages with low nutritional value.

As a result of recording advertisements in children's channels in Turkey, it was found that 344 of 775 advertisements were those of high-sugar foods [33]. In a study conducted in the

United States, after recording 7 shows watched by children for 32 hours, it was found that 13.75% of the advertisements were about foods/drinks, and 54.6% of these were related to high-energy/sugar and unhealthy products. In the same study, it was found that the target audience of these advertisements was children rather than adults, and 95.48% of these used persuasive methods such as special effects, gifts, cartoon characters to attract children [34]. Another study found a two-way relationship between television watching times of children and their tendency to gain weight [35]. It is known that dietary habits develop in early ages and sensory/hedonic responses increase with age [36]. Moreover, more frequent broadcasting of 'junk food' advertisements especially in time periods where children are in front of the television encourages consumption of these products and contributes to more increased prevalence of obesity. This creates the necessity for change in the consumption culture imposed on children. Therefore, it is an important requirement that all responsible stakeholders including the media and the food sector cooperate.

Public health campaigns have an important role in providing children with healthy dietary habits in the early periods of childhood [36]. Different countries have developed various policies to reduce consumption of sugar sweetened drinks and get attention to the harmful effects of sugar. For example, France and Mexico impose additional taxes on sugar sweetened and carbonated drinks [37]. In addition to such approaches, including the traffic lights system and various symbols on packaged products will make it easier for consumers to make healthier choices [38].

Consequently, the sugar contents of the packaged beverages sold in supermarkets were found to be high. The sugar contents of all 237 beverages included in the study exceeded the limits indicated in the health notice in the Turkish Food Codex Labeling Regulation. Harmful health effects of such drinks should be emphasized starting with the period of childhood, and precautions should be taken towards reducing the frequency and quantity of consumption.

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