

Added sugar content in products sold in a large-scale chain supermarket in Ankara

Esra Uçar^{1*} , M. Merve Tengilimoğlu-Metin² 

Received: 22.06.2026 • Accepted: 30.06.2026

ABSTRACT

Aim: Added sugar refers to sugars added to foods during processing or preparation. Excessive consumption of added sugar is associated with negative health outcomes such as obesity, cardiovascular disease, tooth decay, diabetes, and metabolic syndrome. The World Health Organisation recommends that adults and children limit their added sugar intake to less than 10% of their recommended energy intake. The Turkish Nutrition Guidelines make similar recommendations. This study aims to investigate the added sugar content in packaged foods in Ankara. **Materials and Methods:** This study analysed the presence, amount, and types of added sugar in packaged foods sold in a large-scale chain supermarket in Ankara, Türkiye. Information on product name and type and nutritional values was obtained from the labels of all products in the store. **Results:** The study found that 1,554 packaged products (60.2%) contained at least one type of added sugar. The most commonly used types of added sugar were white sugar and syrups. The highest proportion of added sugar was observed in carbohydrate- and fat-rich products, where 952 out of 1,048 items (91%) contained added sugar. **Conclusion:** This study highlights the high consumption of added sugar in Türkiye and emphasizes the need for consumers to make informed choices. The profound presence of added sugars in packaged foods and the extensive use of diverse sugar derivatives need attention and careful consideration for healthy food preferences.

Keywords: Added sugars, food label, packaged food, sugar, sugar type

^{1*}**Esra Uçar (Corresponding Author).** Dicle University, Faculty of Ataturk Health Sciences, Department of Nutrition and Dietetics, Diyarbakir, Türkiye, ucares@hotmail.com, ORCID: 0000-0002-6971-543X

²**M. Merve Tengilimoğlu-Metin.** Hacettepe University, Faculty of Health Sciences, Department of Nutrition and Dietetics, 06100, Sıhhiye, Ankara, Türkiye, tengilimoglu@hacettepe.edu.tr, ORCID: 0000-0003-0363-5645

INTRODUCTION

There is substantial evidence suggesting a strong association between sugar consumption and obesity (1). Excessive sugar intake, especially in liquid form, contributes to weight gain by disrupting energy balance and promoting overconsumption of energy (2). Foods containing higher amounts of sugar are less satiating than foods containing lower amounts of sugar, leading to incomplete compensatory reductions in energy intake at subsequent meals, which can result in a positive energy balance and weight gain (3).

Mechanistically, high sugar consumption, particularly fructose, has been linked to increased *de novo* lipogenesis, where sugar is converted into fat in the liver. This process contributes to fat accumulation and metabolic disturbances, which are precursors to obesity (1,4). Fructose, a common component of added sugars, is metabolized differently from glucose, bypassing regulatory mechanisms like insulin and leptin signalling, which are critical for appetite and weight regulation. This unique metabolic pathway may further exacerbate weight gain (4,5). While some studies argue that the evidence linking sugar to obesity is circumstantial or inconsistent, the majority of robust epidemiological and experimental studies support the association (6,7). The World Health Organization (WHO) recommends that free sugars contribute less than 10% of total energy intake, with a conditional recommendation to reduce intake below 5% for additional health benefits, while the American Heart Association (AHA) recommends limiting added sugar intake to no more than 100 kcal/day (approximately 25 g) for women and 150 kcal/day (approximately 36 g) for men (8,9).

Added sugar is widely used in the food industry due to its multifunctional properties, which go beyond simply enhancing sweetness. Key reasons for its use include taste enhancement, preservation, texture and physical properties, fermentation and economic viability (10). As mentioned above, despite its functional benefits, the overuse of added sugar has raised significant public health concerns. Excessive consumption is linked to obesity, diabetes, cardiovascular diseases, and other health issues, prompting global recommendations to limit its intake. However, its versatility and consumer preference for sweetness ensure its continued prevalence in the food industry (11).

World sugar production is approximately more than 160 million tons annually and consumption is growing at about 1.4% annually, driven by rising living standards in densely populated countries like China and India (12). In high-income countries, added sugar from beverages has

decreased by 22%, while it has increased by 13-40% in middle-income countries (13). Packaged food sales globally saw a 9% increase in added sugar content (13). Governments worldwide implement policies like sugar taxes, front-of-pack labelling, and public awareness campaigns to reduce added sugar consumption. These measures have shown some success in reducing sugar content in beverages and foods (14,15). In conclusion, while added sugar usage varies globally, middle-income countries experience rising trends, whereas high-income countries observe reductions due to policy interventions.

Although a definite data is not known about the sugar content of packaged foods in Türkiye, it is known that cakes, biscuits, carbonated/energy drinks, chocolates, candies, ready-made sauces, breakfast cereals, jams, marmalades, honey, and molasses sold in supermarkets tend to contain high levels of added sugar. This study aimed to examine the added sugar content in packaged foods sold in a large-scaled chain supermarket in Ankara.

MATERIALS AND METHODS

Experimental Protocol

Data was collected from a large-scaled chain supermarket store in Ankara, Turkey, over a two-month period between March 2024 - May 2024. Information on product name and type, nutritional values (energy, carbohydrate, protein, total fat, saturated fat, trans fat, sugar, and salt content per 100g), and serving sizes was obtained from the labels of all products in the store. This data was then transferred to Excel by final year students from the Department of Nutrition and Dietetics, Hacettepe University. Seven students from Hacettepe University's Department of Nutrition and Dietetics participated in data collection.

Data Management

The collected data were transferred from the computers to a table prepared in Microsoft Excel 2010 at the end of each data collection day. All ingredients listed on the labels of each product were transferred. To identify added sugars in packaged foods, it was first necessary to determine the terms in the ingredient list that referred to these components. For this purpose, all ingredients listed on product labels were extracted into a database and systematically screened to identify terms corresponding to added sugars. The classification of added sugar ingredients was based on the Turkish Food Codex Regulation on Food Labelling and Consumer Information (16) and scientific literature addressing added sugar nomenclature and definitions

(17-19). Ingredient terms identified on product labels were subsequently categorized according to their characteristics into sugars, maltodextrin, natural sweeteners, syrups, spreadable desserts and jams, and others, as presented in Table 2. Sugar alcohols (e.g., sorbitol and maltitol) and functional ingredients with sweetening properties (e.g., inulin) were identified separately from added sugar ingredients and are presented independently in Table 2 for completeness. These ingredients were not included in the calculation of added sugar prevalence. Packaged foods were classified into eight food groups according to similarities in their nutritional composition, as defined by the Turkish Food Codex Regulation on Food Labelling and Consumer Information (16). These were products in which carbohydrates and fats were the main energy sources; *fruits, fruit juices, syrups, and beverage mixes*; milk and dairy products; meats and eggs; sauces, dressings, ready-made spices, broths, soups and ready-to-eat meals; canned vegetables; baked goods, bread, cereals, legumes, roots, tubers and related products and vegetable oils, fats and nuts. To ensure data quality, all data entries were reviewed for completeness and consistency after transfer to the Excel database. Ingredient lists and nutritional information were cross-checked against the original product labels, and any discrepancies were resolved through consensus between the researchers before finalizing the dataset.

RESULTS

A total of 2,582 packaged food products were evaluated across eight food groups. The distribution of products across food groups was heterogeneous, with carbohydrate- and fat-rich products representing the largest category ($n = 1,048$), followed by milk and dairy products ($n = 471$), whereas vegetable oils, fats, and nuts constituted the smallest category ($n = 42$) (Table 1).

The highest proportion of added sugar was observed in carbohydrate- and fat-rich products, where 952 out of 1,048 items (91%) contained added sugar. Similarly, sauces, dressings, ready-made spices, broths, soups, and ready-to-eat meals showed a high prevalence, with 68 out of 82 products (82.9%) containing added sugar. In contrast, minimal presence of added sugar was found in meats and eggs (3.6%), canned vegetables (3.7%), and vegetable oils, fats, and nuts (2.4%), indicating that these categories are generally less likely to contain added sugars (Table 1).

Fruit-related products, including fruit juices, syrups, and beverage mixes, also demonstrated a considerable rate, with 142 out of 219 products (64.8%) containing added sugar. Moderate levels of added sugar were identified in baked goods, bread, cereals, legumes, and related products, where 151 out of 253 items (59.7%) included added sugar. Milk and dairy products also showed notable inclusion, with 223 out of 471 products (47.3%) containing added sugar (Table 1).

Table 1. Characterization of packaged foods according to food groups and the presence of added sugars.

Food groups	Total products analysed (n)	Products with added sugar (n)	Products with added sugar (%)	Example products
Products in which carbohydrates and fats were the main energy sources	1048	952	91	Chocolates, cakes, jams, cookies
Fruits, fruit juices, syrups, and beverage mixes	219	142	64.8	Fruit juices, fruit-flavored carbonated and non-carbonated drinks
Milk and dairy products	471	223	47.3	Milk, yogurt, ice cream, milk-based desserts
Meats and eggs	194	7	3.6	Salami, sausage, meatballs
Sauces, dressings, ready-made spices, broths, soups and ready-to-eat meals	82	68	82.9	Ketchup, mayonnaise, pomegranate molasses, mustard sauce
Canned vegetables	273	10	3.7	Tomato paste, boiled beans, peas
Baked goods, bread, cereals, legumes, roots, tubers and related products	253	151	59.7	Pastries, cakes, desserts, crackers-grissini, breads, pastry ingredients, frozen bakery products
Vegetable oils, fats and nuts	42	1	2.4	Margarine

Analysis of ingredient lists revealed a wide variety of added sugar derivatives used in packaged foods (Table 2). The most common forms were conventional sugars, including sucrose, glucose, fructose, dextrose, and lactose. In addition, maltodextrin and malt extract were frequently identified. Various syrups were also widely used, such as glucose syrup, glucose-fructose syrup,

invert sugar syrup, fructose syrup, and corn syrup. Natural sweeteners like honey and molasses were present, alongside ingredients derived from fruits, including fruit juice concentrates, purees, and dried fruits, particularly in spreads and jams.

Sugar alcohols (sorbitol and maltitol) and inulin were identified on some product labels; however, these ingredients were recorded separately because they are not classified as added sugars under current regulatory definitions and therefore were not included in the added sugar prevalence estimates. Other compounds contributing to added sugar content included barley malt, praline, dates, and products such as dark chocolate and grape molasses. These findings indicate that added sugar is incorporated into packaged foods under diverse names and forms, potentially complicating consumer awareness and identification (Table 2).

Table 2. Added sugar derivatives identified from the list of ingredients

Added sugar derivatives	Samples
Sugars	Sugar, granulated sugar, beet sugar, dextrose, fructose, malt sugar, invert sugar, caramelized sugar, lactose, sucrose, powdered sugar
Maltodextrin	Maltodextrin, malt extract
Natural sweeteners	Honey, molasses
Syrups	Glucose syrup, glucose-fructose syrup, partially invert brown sugar syrup, invert sugar syrup, caramelized sugar syrup, fructose syrup, corn syrup (glucose-fructose)
Spreadable desserts and jams	Desserts and jams made from fruits and/or vegetables, fruit and/or vegetable juice concentrates, crushed fruit and/or vegetables, dried and/or dehydrated fruits
Others	Organic grape molasses, dark chocolate, dates, praline, barley malt
Non-sugar sweeteners and functional ingredients	Sorbitol, maltitol, inulin

DISCUSSION

This study provides a comprehensive overview of the prevalence and diversity of added sugars in packaged foods, revealing a strikingly high occurrence across multiple food categories. The findings demonstrate that added sugars are not only widespread in traditionally sweet products but are also frequently present in foods that are not typically perceived as sugar-rich, highlighting a critical challenge for consumers attempting to make informed dietary choices (Table 1) (20,21).

The most notable finding is the exceptionally high prevalence of added sugars in products where carbohydrates and fats constitute the primary energy sources, with 91% of items containing added sugar (Table 1). This is consistent with the nature of ultra-processed foods such as chocolates, cakes, and cookies, where sugar plays a central role in palatability, texture, and shelf life (22). Similarly, the high proportion observed in sauces, dressings, and ready-to-eat meals (82.9%) underscores the often-overlooked contribution of “hidden sugars” in savory products. Previous research has shown that processed savoury foods can contribute substantially to total sugar intake due to added sugars used for flavour enhancement and preservation (23,24).

Fruit-based products also showed a considerable prevalence of added sugars (64.8%), despite being commonly perceived as healthy options. The addition of sugars to fruit juices and flavoured beverages may diminish the nutritional benefits of fruit, and such products have been shown to contain sugar levels comparable to sugar-sweetened beverages (17,25). Likewise, nearly half of milk and dairy products (47.3%) contained added sugars, particularly in flavoured yogurts and desserts (Table 1). This finding is concerning given that dairy products are often recommended as part of a healthy diet, especially for children, yet flavoured varieties are known to contribute significantly to added sugar intake (26,27).

In contrast, minimal use of added sugars was observed in meats and eggs, canned vegetables, and fats and oils, indicating that these food groups remain relatively unprocessed with respect to sugar addition (Table 1). However, even the limited presence of added sugars in such categories suggests that sugar incorporation can occur in unexpected contexts, further complicating dietary assessment and consumer awareness (21,28).

Another important contribution of this study is the identification of a wide variety of added sugar derivatives listed in ingredient labels (Table 2). Beyond conventional sugars (e.g., sucrose, glucose, fructose), manufacturers frequently use alternative forms such as syrups, maltodextrin, and natural sweeteners like honey and molasses. Previous studies have highlighted that the use of multiple terms for added sugars on labels can obscure their presence and make it difficult for consumers to identify and limit intake (18,29). Ingredients such as fruit juice concentrates and sugar alcohols may also function as sweetening agents, contributing to overall sugar exposure despite being perceived as healthier alternatives (19).

The widespread use of various sugar derivatives has important public health implications. High intake of added sugars has been consistently associated with obesity, type 2 diabetes, and

cardiovascular diseases (30). Moreover, the presence of sugars under multiple names may lead to underestimation of sugar intake and reduce the effectiveness of dietary recommendations aimed at limiting consumption (18,30). These findings reinforce the need for clearer labeling regulations and improved consumer education to enhance transparency and support healthier food choices.

This study has several strengths, including the large number of products analysed and the detailed classification of both food groups and sugar derivatives. However, certain limitations should be acknowledged. The analysis was based on ingredient lists rather than quantitative sugar content, preventing precise estimation of total added sugar intake. Additionally, consumption patterns were not assessed, which limits the ability to evaluate actual dietary exposure. Therefore, although this study demonstrates the presence of added sugars in packaged foods, the findings do not directly reflect population-level exposure to added sugars and should be interpreted as an assessment of their availability in the packaged food supply. Finally, the findings may not be generalizable beyond the sampled market. Future studies should combine product composition data with consumption frequency and dietary intake data to provide a more comprehensive assessment of population exposure to added sugars.

In conclusion, the results highlight the pervasive presence of added sugars in packaged foods and the extensive use of diverse sugar derivatives. These findings emphasize the need for improved labeling policies, reformulation strategies by the food industry, and increased consumer awareness. Future research should focus on quantifying added sugar content and evaluating the impact of labeling interventions on consumer behavior and health outcomes (21,30). Future studies should also investigate the distribution and frequency of individual added sugar derivatives across different food groups to better characterize patterns of added sugar use in the food supply.

Acknowledgement: Authors kindly acknowledge the final year Department of Nutrition and Dietetics students of year 2024 for the data collection.

Ethics approval: No ethical approval is needed for the current study

Conflict of interest: The authors declare that they have no conflict of interest.

Author contributions: Study design: EU, MMTM; Data collection: MMTM; Data analysis: EU, MMTM; Draft preparation: EU; Critical review for content: MMTM; Final approval of the version to be published: EU, MMTM.

REFERENCES

- Schwarz JM, Clearfield M, Mulligan K. Conversion of sugar to fat: is hepatic de novo lipogenesis leading to metabolic syndrome and associated chronic diseases? *J Am Osteopath Assoc*. 2017;117(8):520-527.
- Shay CM, Dennison-Farris ME. Does sugar-sweetened beverage consumption influence cardiovascular risk independent of weight gain and obesity? an update of the epidemiologic evidence. *Current Cardiovascular Risk Reports*. 2013;7(3):166-172.
- Skryabin V, Sanjari Mijan M, Mehryar N, Farzadkia B, Mahmmod M, Savari S, et al. Sugar addiction at the crossroads of reward, metabolism, and culture. *Behav Brain Res*. 2026;506:116147.
- Bray GA, Nielsen SJ, Popkin BM. Consumption of high-fructose corn syrup in beverages may play a role in the epidemic of obesity. *Am J Clin Nutr*. 2004;79(4):537-43.
- van Buul VJ, Tappy L, Brouns FJ. Misconceptions about fructose-containing sugars and their role in the obesity epidemic. *Nutr Res Rev*. 2014;27(1):119-30.
- Faruque S, Tong J, Lacmanovic V, Agbonghae C, Minaya DM, Czaja K. The dose makes the poison: sugar and obesity in the United States - a review. *Pol J Food Nutr Sci*. 2019;69(3):219-233.
- Drewnowski A. The real contribution of added sugars and fats to obesity. *Epidemiol Rev*. 2007;29:160-71.
- World Health Organization. Guideline: Sugars intake for adults and children. Geneva: World Health Organization; 2015.
- Johnson RK, Appel LJ, Brands M, Howard BV, Lefevre M, Lustig RH, et al. Dietary sugars intake and cardiovascular health: a scientific statement from the American Heart Association. *Circulation*. 2009;120(11):1011-20.
- Popkin BM. Sugar consumption in the food and beverage supply across the globe. in: dietary sugars and health. Boca Raton (FL): CRC Press; 2014. 127-138 p.
- Supthanasup A, Cetthakrikul N, Pramono A, Kelly M. An unhealthy start: the nutritional composition, processing, and on-pack claims of commercial foods for infants and toddlers in Thailand. *Matern Child Nutr*. 2026;22(2):e70187
- Solomon S. Sugarcane production and development of sugar industry in India. *Sugar Tech*. 2016;18(6):588-602.
- Russell C, Baker P, Grimes C, Lindberg R, Lawrence MA. Global trends in added sugars and non-nutritive sweetener use in the packaged food supply: drivers and implications for public health. *Public Health Nutr*. 2023;26(5):952-964.
- Bridge G, Groisman S, Bedi R. Sugar-sweetened beverage taxes in Brazil: past, present, and future. *J Public Health Policy*. 2022;43(2):281-291.
- Popkin BM, Hawkes C. Sweetening of the global diet, particularly beverages: patterns, trends, and policy responses. *Lancet Diabetes Endocrinol*. 2016;4(2):174-86.
- Republic of Türkiye Ministry of Agriculture and Forestry. Turkish Food Codex Regulation on Food Labelling and Consumer Information. Official Gazette. 2017 Jan 26;(29960).
- Hess J, Latulippe ME, Ayoob K, Slavin J. The confusing world of dietary sugars: definitions, intakes, food sources and international dietary recommendations. *Food Funct*. 2012;3(5):477-86.
- Marshall TA. Nomenclature, characteristics, and dietary intakes of sugars. *J Am Dent Assoc*. 2015;146(1):61-64.
- Grembecka M. Natural sweeteners in a human diet. *Rocz Panstw Zakl Hig*. 2015;66(3):195-202.
- Giosuè A, Vitale M, Riccardi G. A critical evaluation of the 2025-2030 dietary guidelines for Americans. *Nutr Metab Cardiovasc Dis*. 2026;36(4):104614.
- Zhang Y, Walker RW, Kaplan RC, Qi Q. Added sugars, gut microbiota, and host health. *Gut Microbes*. 2025;17(1):2592431.
- Popkin BM, Miles DR, Taillie LS, Dunford EK. A policy approach to identifying food and beverage products that are ultra-processed and high in added salt, sugar and saturated fat in the United States: a cross-sectional analysis of packaged foods. *Lancet Reg Health Am*. 2024;32:100713
- Llalla Vidal TM, Macnab G, Mitchell S, Flavel M. Sugar cane extracts as natural taste modulators: potential for sugar reduction in beverages and beyond. *Front Nutr*. 2025;12:1603101.
- Lê KA, Robin F, Roger O. Sugar replacers: from technological challenges to consequences on health. *Curr Opin Clin Nutr Metab Care*. 2016;19(4):310-315.
- Musicus AA, Jensen ML, Mita C, Winters DRH, Roberts MT, Mancini S, et al. The relationship between fruit drink front-of-package claims, fruit imagery, and ingredient disclosures and consumer perceptions, intentions, and behavior: a systematic review. *J Acad Nutr Diet*. 2025;125(10):1557-1582.e4.
- Ramsing R, Santo R, Kim BF, Altema-Johnson D, Wooden A, Chang KB, et al. Dairy and plant-based milks: implications for nutrition and planetary health. *Curr Environ Health Rep*. 2023;10(3):291-302.
- Wan Z, Khubber S, Dwivedi M, Misra NN. Strategies for lowering the added sugar in yogurts. *Food Chem*. 2021;344:128573.
- Adjei RR, Sarfo Boateng A, Owusu-Kwarteng J. Self-reported knowledge and understanding of added sugars by consumers in Ghana. *Heliyon*. 2024;10(10):e31243.
- Plaza-Díaz J, Martínez Agustín O, Gil Hernández A. Los alimentos como fuente de mono y disacáridos: aspectos bioquímicos y metabólicos [Foods as sources of mono and disaccharides: biochemical and metabolic aspects]. *Nutr Hosp*. 2013;28 Suppl 4:5-16.
- Ceballos D, Caba M, Almeida C, Crespo J. Sweet legacy, bitter outcomes: sugar, sweeteners, and the microbial origins of a modern syndrome. an evidence-based narrative review. *Rev Esp Enferm Dig*. 2026;Epub ahead of print. <https://doi.org/10.17235/reed.2026.11733/2025>