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ENERGY AND SUGAR CONTENT OF READY-TO-DRINK TEA AND COFFEE MARKETED IN SOUTH TANGERANG, INDONESIA

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ABSTRACT

Excessive sugar consumption, primarily through sugar-sweetened beverages, has been linked to the occurrence of type 2 diabetes mellitus (T2DM). The Ministry of Health of Indonesia recommends that the maximum sugar consumption for the general population not exceed 50 g per day. One type of sugar-sweetened beverage that has been massively distributed in Indonesia is ready-to-drink (RTD) tea and coffee. This study examined the energy and sugar content of the RTD coffee and tea marketed in the modern retail market and their contribution to the Indonesian recommended dietary allowance. This study was conducted in June 2022. Ready-to-drink (RTD) coffee and tea were purchased from five supermarkets and three minimarkets in South Tangerang City, Banten, Indonesia. Data obtained from the product label was recorded and then analysed descriptively. 47 coffee (17 brands) and 58 tea (20 brands) products were obtained during the survey. Most coffee (55.3%) and tea (86.2%) products are distributed in plastic bottles. The median serving size of coffee (240 mL) is slightly smaller than that of tea (250 mL). On average, one serving size of coffee and tea products contributes to 35.7% and 34.8% of the recommended dietary allowance of sugar, respectively. Consumers are advised to take caution while consuming RTD coffee and tea products as they might contribute to excessive sugar consumption. The government must impose regulations to limit sugar content in food and beverage products and increase consumer education to reduce sugar consumption, especially sugar-sweetened products.

Keywords: sugar-sweetened beverages, coffee, sugar, tea

INTRODUCTION

Diabetes mellitus (DM) is a chronic, non-communicable disease that has emerged as a new threat to public health in the past few years. The American Diabetes Association (ADA) defines DM as a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both (American Diabetes Association, 2010). The World Health Organization stated that worldwide, 8.5% of adults aged 18 years and older had DM in 2014 (WHO, 2023). In Indonesia, the prevalence of DM diagnosed by healthcare professionals increased from 1.1% in 2007 to 1.5% in 2018 (KEMENKES, 2007, 2018). The International Diabetes Federation reported that in 2021, Indonesia will have approximately 19.5 million people with diabetes (International Diabetes Federation, 2021).

DM impacts the quality of human life and overall life expectancy. DM is associated with macrovascular complications such as coronary heart disease, cardiomyopathy, arrhythmias, sudden death, cerebrovascular disease, and peripheral artery disease (Viigimaa et al., 2020). DM also leads to microvascular complications such as diabetic nephropathy, retinopathy, neuropathy, and sexual dysfunction (Faselis et al., 2020). DM was reported as a direct cause of 1.5 million deaths, and 48% of all deaths due to diabetes occurred before the age of 70 years worldwide (WHO, 2023). DM also puts a financial burden on the national health system. BPJS Kesehatan claimed that the cost of DM treatment has increased from IDR 6.5 trillion in 2018 to IDR 7.5 trillion in 2022 (CNN Indonesia, 2023).

Excessive sugar intake, primarily through sugar-sweetened beverages (SSB), has been linked to the occurrence of type 2 diabetes mellitus (T2DM). Sugar-sweetened beverages contain high amounts of added sugar and induce low satiety, which leads to increased energy intake, hence their contribution to weight gain (Yoshida & Simoes, 2018). The uncontrolled weight gain will lead to overweight and obesity, which are risk factors for T2DM and other chronic diseases (Lean & Te Morenga, 2016; Malik & Hu, 2022). A recent meta-analysis of prospective cohort studies concluded that increased consumption of SSB and artificially

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sweetened beverages are associated with the risk of T2DM (Meng et al., 2021). The Ministry of Health of Indonesia recommends that the maximum sugar intake for the general population not exceed 50 g daily to prevent diabetes and cardiovascular disease (Kemenkes, 2014).

One type of sugar-sweetened beverage that has been massively distributed in Indonesia is ready-to-drink (RTD) tea and coffee. According to Statista Market Insight, the RTD coffee and tea market value in Indonesia in 2022 will be approximately IDR 30 trillion (USD 2 billion) (Statista Market Insight, 2023). Statistics Indonesia reported that Indonesian purchased RTD coffee, milk coffee, and tea more than any other beverages (Badan Pusat Statistik, 2022). Ready-to-drink (RTD) coffee and tea are convenient and can be easily purchased in many modern retail markets in urban areas. Coffee and tea have been widely known to contain many phytochemicals that show various health functions such as antioxidant, anti-inflammatory, immuno-regulator, anticancer, cardiovascular-protective, anti-diabetic, anti-obesity, and hepatoprotective effects (Barrea et al., 2023; Tang et al., 2019). However, RTD coffee and tea products in Indonesia usually contain added sugar, which may undermine the health benefits. Currently, there is limited data regarding the sugar content of RTD coffee and tea distributed in modern markets in Indonesia. This data could be used as a basis for consumer education on RTD coffee and tea consumption. Therefore, this paper aims to examine the energy, sugar, and other nutrient content of RTD coffee and tea and their contribution to the recommended dietary allowance in Indonesia.

METHODS

This observational study was conducted through a market survey in June 2022. The survey locations were modern retail markets consisting of five supermarkets and three minimarkets around the UIN Syarif Hidayatullah Jakarta campus in Ciputat, South Tangerang City, Banten Province, Indonesia. South Tangerang City is an urban area situated very close to Jakarta, the current capital of Indonesia; hence, it is considered one of the supporting areas of the capital city.

The definition of RTD coffee and tea products was adopted from the Indonesian Food Category (BPOM, 2019). A coffee drink was defined as a drink made from coffee powder, instant coffee, and/or coffee extract and drinking water, with or without added sugar or other food ingredients. A tea drink was defined as a drink made from the brewing process of tea leaf and/or tea extract in water, with or without added sugar and/or other food ingredients and packaged hermetically.

The data was collected by purchasing samples of RTD coffee and tea products in the markets. Products with identical brands and variants in different markets were only obtained once to prevent data duplication. The product label information, namely brands, variants, type of packaging, serving size, energy, and nutrition contents, was then recorded using the Google Forms application. Data cleaning and editing were performed to ensure its completion and validity. Data analysis was conducted using descriptive statistics.

RESULTS AND DISCUSSION

Products Characteristics

This survey collected 105 RTD product variants from 8 modern markets in South Tangerang City, consisted of 47 coffee and 58 tea products. Almost all tea products were marketed in plastic bottle packaging (86.2%), while most coffee products were either packed in plastic bottle (55.3%) or can (34.0%) (Table 1). Plastic PET bottle packaging was reported to be as effective as glass packaging in retaining the antioxidant capacity during cold storage in RTD green tea products compared to retort pouches (Kim et al., 2011). However, sunlight exposure to plastic packaging should avoided to prevent contamination of heavy metals from bottle material (Umoafia et al., 2023).

The tea products mostly have a larger serving size of 250–299 mL (46.6%) than coffee, which is served in a 200–249 mL size (55.3%) (Figure 2). The serving size is proposed to influence the consumption of foods or beverages, and the impact depends on whether the total energy per serving or the number of servings is emphasised on the label

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Table 1. Characteristics of the RTD coffee and tea products packaging

Characteristics	Coffee		Tea	
	n	%	n	%
Type of packaging				
Glass bottle	3	6.4	0	0.0
Plastic (PET) bottle	26	55.3	50	86.2
Can	16	34.0	2	3.4
Carton box	2	4.3	6	10.3
Serving size				
< 200 mL	7	14.9	5	8.6
200 – 249 mL	26	55.3	22	37.9
250 – 299 mL	9	19.1	27	46.6
≥ 300 mL	5	10.6	4	6.9
Product Origin				
Locally manufactured	32	68.1	56	96.6
Imported	15	31.9	2	3.4

(Bucher et al., 2018). The Indonesian government has mandated food producers to include nutrition facts on most processed foods and beverages, such as RTD coffee and tea. Both total energy per serving and number of servings are required to be printed in bold (BPOM, 2021). As much as 68,1% of RTD coffee products were manufactured locally, while 31,9% were imported. Meanwhile, almost all tea products (96,6%) were manufactured locally (Table 1).

Energy, Sugar, and Other Nutrient Content of Coffee Products

Table 2 lists the energy, sugar, and other nutrients found in the nutrition facts label of coffee products. The information on energy, sugar, total fat, protein, carbohydrate, and sodium content was found in all of the coffee products, which is in line with the government regulation that the inclusion of that information is mandatory in a nutrition fact label (BPOM, 2021)Additional information on saturated fat, cholesterol, and fiber is not mandatory and is only found in several products.

The average energy content of the coffee products is 135 kcal per serving, contributing to 6.3% of the recommended dietary allowance. The average sugar content of coffee products is 17.9 g, contributing to nearly one-third of the maximum sugar intake recommendation. Some products contain 42 g of sugar, almost the maximum recommendation. The energy and sugar content of coffee products marketed in Indonesia are higher than those found in other countries such as Slovenia (Zupanič et al., 2019), Australia (Pinho-Gomes et al., 2023), and Taiwan (Yen et al., 2022).

Coffee naturally contains a trace amount of fat and protein. However, several products list fat, saturated fat, cholesterol, and protein content on their nutritional facts label. The amount of saturated fat was also quite high, which comes from the additional dairy or non-dairy creamer in the ingredients for products such as latte, cappuccino, milk coffee, etc.

Energy, Sugar, and Other Nutrient Content of Tea Products

The energy, sugar, and other nutrients found in the nutrition facts label of tea products are listed

Table 2. Energy, sugar, and other nutrient content of coffee products and its contribution to nutrient reference value

Nutrients	n	Reference value	Mean	SD	Min	Max	Contribution per serving size
Energy (kcal)	47	2150[1]	135	47	15	280	6.3%
Sugar (g)	47	Max 50[2]	17.9	6.6	0	42	35.7%
Total fat (g)	47	67[1]	3.5	3.4	0	22.5	5.2%
Saturated fat (g)	40	Max 30[2]	2.9	2.0	0	10	9.5%
Cholesterol (mg)	14	Max 300[2]	3.8	3.5	0	10	1.3%
Protein (g)	47	60[1]	2.7	2.0	0	12	4.4%
Carbohydrate (g)	47	325[1]	24.7	8.2	2	46	7.6%
Fiber (g)	14	30[1]	3.9	3.3	0	12	13.1%
Sodium (mg)	47	Max 2000[2]	107.2	54.6	5	290	5.3%

[1] Regulation of Head of National Agency of Drug and Food Control of Republic of Indonesia Number 9 Year 2016 on Nutrient Reference Value (BPOM, 2016)
[2] Health Ministerial Decree Number 41 Year 2014 on Nutritional Guidelines (KEMENKES, 2014)

Table 3. Energy, sugar, and other nutrient content of tea products and its contribution to nutrient reference value

Nutrients	n	Reference value	Mean	SD	Min	Max	Contribution per serving size
Energy (kcal)	58	2150[1]	83	45	0	210	3.8%
Sugar (g)	58	Max 50[2]	17.4	7.6	0	34	34.8%
Total fat (g)	58	67[1]	0.5	1.5	0	6	0.8%
Saturated fat (g)	43	Max 30[2]	0.4	1.2	0	5	1.4%
Cholesterol (mg)	5	Max 300[2]	0.8	1.8	0	4	0.3%
Protein (g)	58	60[1]	0.3	0.8	0	4	0.4%
Carbohydrate (g)	58	325[1]	19.2	8.8	0	36	5.9%
Fiber (g)	2	30[1]	1.0	0.0	0	1	3.3%
Sodium (mg)	58	Max 2000[2]	44.9	46.2	0	190	2.2%
Vitamin C (mg)	3	90	0.9	0.1	0	1	1.0%

[1] Regulation of Head of National Agency of Drug and Food Control of Republic of Indonesia Number 9 Year 2016 on Nutrient Reference Value (BPOM, 2016)

[2] Health Ministerial Decree Number 41 Year 2014 on Nutritional Guidelines (KEMENKES, 2014)

in Table 3. The information on energy, sugar, total fat, protein, carbohydrate, and sodium content was found in all of the tea products, in line with the government regulation on nutrition facts labels (BPOM, 2021)Several products' nutrition facts labels include additional information on saturated fat, cholesterol, fiber, and vitamin C, which is not mandatory.

The average energy content of the tea products is 83 kcal per serving, contributing to 3.8% of the recommended dietary allowance. The average sugar content of the tea products is 17.4 g, contributing to nearly one-third of the maximum sugar intake recommendation. Although the total energy content of tea products is slightly lower than coffee, the sugar content is quite similar. The energy and sugar content of tea products marketed in Indonesia are also higher than those found in other countries such as Slovenia (Zupanič et al., 2019) and Taiwan (Yen et al., 2022).

Similar to coffee, tea contains a negligible amount of fat and protein. Additionally, milk is the primary source of fat and protein in products such as milk tea, Thai tea, and teh tarik. However, the variation of dairy ingredients in tea products is not as significant as in coffee products; hence, the energy content of coffee products tends to be higher.

In contrast to coffee products, vitamin C is found in tea products. Three products list vitamin C in their nutritional facts label, which comes from additional lemon or other fruit extracts in their ingredient list. Fruit-flavored tea variants are pretty common in Indonesia. However, most fruit was only available as artificial flavoring, not the original extract.

Current Regulation and Possible Impact of RTD Consumption

Indonesian, especially Javanese, are known to have a preference for sweetness in their food and drinks. Sartika et al. (2022) explained that this could be traced back to the cultural, or cultivation system, era during Dutch colonization when the mass production of sugarcane was enforced. The people incorporated sugarcane juice into their food and drink recipes, possibly giving people more preferences for sweetness after a long term of repetitive exposure (Sartika et al., 2022).

The Indonesian government has declared that Indonesian maximum free sugar intake should not exceed 50 g daily, according to the Nutritional Guidelines or *Pedoman Gizi Seimbang* (KEMENKES, 2014). However, based on the Total Diet Study conducted by the Ministry of Health in 2014, 77 million people, or 29.7% of the Indonesian population, consumed more than 50 g of sugar daily (Atmarita et al., 2017). The obligation to include information on sugar content in the nutrition facts label of processed foods has been declared mandatory by Kemenkes (2015) and BPOM (2021). However, based on several studies, consumer behavior in reading the food label, including the nutrition fact label, is considered

low (Badriyah & Syafei, 2019; Yayasan Lembaga Konsumen Indonesia, 2019). Some determining factors associated with consumer behavior on food label reading are sex, knowledge, and attitude towards food label reading (Huda & Andrias, 2018; Melinda & Farida, 2021; Sinaga & Simanungkalit, 2019). Family support is especially needed for children to ensure that they provide good nutrition for their children (Rizona et al., 2022). Therefore, consumer education is essential to increase their awareness regarding the sugar content on the food label.

Several recommendations on how to lower the sugar consumption from RTD products have been proposed. From the supply side, it is recommended that the government enforce the regulation to limit the sugar content of the products and provide nutritional information, especially for total sugar content. It is also suggested that the availability of less sugary products at the market counter be promoted, the distribution of products with high sugar content should be restricted, and further studies should be conducted on the sugar consumption policy at the population level. (Sartika et al., 2022). It is also recommended that the government impose a sugar tax on sugar-containing foods and a sugar import tax (Kusnali et al., 2019). On the demand side, an educational approach to altering Indonesian preferences for sweet taste should be taken, with an emphasis on the benefits of reducing sugar intake and the promotion of healthier eating habits from an early age (Sartika et al., 2022).

CONCLUSION

The sugar content of RTD coffee and tea products distributed in Indonesia's modern market is relatively high. Consumers must exercise caution when purchasing and consuming the products, as they may contribute to excess sugar consumption. The government must take several actions to reduce sugar consumption in RTD products by enforcing solid regulations to limit sugar content in food and beverage products and increasing consumer education to reduce sugar consumption, especially in sugar sweetened RTD products. Further studies are needed to examine the energy and sugar content of products marketed in traditional markets since they might have different distribution channels.

REFERENCES

American Diabetes Association. (2010). Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care*, *33*(Supplement_1), S62–S69. https://doi.org/10.2337/dc10-S062

Atmarita, A., Jahari, A. B., Sudikno, S., & Soekatri, M. (2017). ASUPAN GULA, GARAM, DAN LEMAK DI INDONESIA: Analisis Survei Konsumsi Makanan Individu (SKMI) 2014. *GIZI INDONESIA*, *39*(1), 1. https://doi.org/10.36457/gizindo.v39i1.201

Badan Pusat Statistik. (2022). *Rata-rata Pengeluaran Perkapita Seminggu di Daerah Perkotaan Menurut Komoditi Makanan dan Golongan Pengeluaran per Kapita Seminggu, 2018-2021*. https://www.bps.go.id/indicator/5/2090/1/rata-rata-konsumsi-perkapita-seminggu-di-daerah-perkotaan-dan-pedesaan-menurut-komoditi-makanan-dan-golongan-pengeluaran-per-kapita-seminggu.html

Badriyah, L., & Syafei, A. (2019). Persepsi dan Perilaku Membaca Label Pangan dan Informasi Gizi pada Siswa SMK Wijaya Kusuma. *Jurnal Ilmu Kesehatan Masyarakat*, *8*(04), 167–174. https://doi.org/10.33221/jikm.v8i04.401

Barrea, L., Pugliese, G., Frias-Toral, E., El Ghoch, M., Castellucci, B., Chapela, S. P., Carignano, M. D. L. A., Laudisio, D., Savastano, S., Colao, A., & Muscogiuri, G. (2023). Coffee consumption, health benefits and side effects: A narrative review and update for dietitians and nutritionists. *Critical Reviews in Food Science and Nutrition*, *63*(9), 1238–1261. https://doi.org/10.1080/10408398.2021.1963207

BPOM. (2016). *Peraturan Kepala Badan Pengawas Obat dan Makanan Republik Indonesia Nomor 9 Tahun 2016 tentang Acuan Label Gizi*. https://tabel-gizi.pom.go.id/regulasi/4_Peraturan_Kepala_BPOM_Nomor_9_Tahun_2016_tentang_Acuan_Label_Gizi.pdf

BPOM. (2019). *Peraturan Badan Pengawas Obat dan Makanan Nomor 34 Tahun 2019 tentang Kategory Pangan*. https://jdih.pom.go.id/download/product/827/34/2019

BPOM. (2021). *Peraturan Badan Pengawas Obat dan Makanan Nomor 26 Tahun 2021 tentang Informasi Nilai Gizi pada Label Pangan Olahan*. https://standarpangan.pom.go.id/dokumen/peraturan/202x/PERATURAN_BADAN_

PENGAWAS_OBAT_DAN_MAKANAN_NOMOR_26_TAHUN_2021_TENTANG_INFORMASI_NILAI_GIZI_PADA_LABEL_PANGAN_OLAHAN.pdf

Bucher, T., Murawski, B., Duncanson, K., Labbe, D., & Van Der Horst, K. (2018). The effect of the labelled serving size on consumption: A systematic review. *Appetite*, *128*, 50–57. https://doi.org/10.1016/j.appet.2018.05.137

CNN Indonesia. (2023). *BPJS Kesehatan Gelontorkan Rp7,5 T untuk Penderita Diabetes*. https://www.cnnindonesia.com/ekonomi/20230208180210-78-910621/bpjs-kesehatan-gelontorkan-rp75-t-untuk-penderita-diabetes

Faselis, C., Katsimardou, A., Imprialos, K., Deligkaris, P., Kallistratos, M., & Dimitriadis, K. (2020). Microvascular Complications of Type 2 Diabetes Mellitus. *Current Vascular Pharmacology*, *18*(2), 117–124. https://doi.org/10.2174/1570161117666190502103733

Huda, Q. A., & Andrias, D. R. (2018). SIKAP DAN PERILAKU MEMBACA INFORMASI GIZI PADA LABEL PANGAN SERTA PEMILIHAN PANGAN KEMASAN. *Media Gizi Indonesia*, *11*(2), 175. https://doi.org/10.20473/mgi.v11i2.175-181

International Diabetes Federation. (2021). *IDF Diabetes Atlas 2021, 10th Edition*. https://diabetesatlas.org/idfawp/resource-files/2021/07/IDF_Atlas_10th_Edition_2021.pdf

KEMENKES. (2007). *Laporan Nasional Riset Kesehatan Dasar 2007*.

KEMENKES. (2014). *Peraturan Menteri Kesehatan Republik Indonesia Nomor 41 Tahun 2014 tentang Pedoman Gizi Seimbang*. http://hukor.kemkes.go.id/uploads/produk_hukum/PMK%20No.%2041%20ttg%20Pedoman%20Gizi%20Seimbang.pdf

KEMENKES. (2018). *Laporan Nasional Riset Kesehatan Dasar 2018.*

Kim, Y., Welt, B. A., & Talcott, S. T. (2011). The Impact of Packaging Materials on the Antioxidant Phytochemical Stability of Aqueous Infusions of Green Tea (*Camellia sinensis*) and Yaupon Holly (*Ilex vomitoria*) during Cold Storage. *Journal of Agricultural and Food Chemistry*, *59*(9), 4676–4683. https://doi.org/10.1021/jf104799y

Kusnali, A., Puspasari, H. W., & Rustika. (2019). Kemitraan Pemerintah-Swasta dalam Industri Pangan untuk Menurunkan Kandungan Gula, Garam dan Lemak dalam Pangan Olahan. *Jurnal Kedokteran Dan Kesehatan*, *15*(2), 102–117.

Lean, M. E. J., & Te Morenga, L. (2016). Sugar and Type 2 diabetes. *British Medical Bulletin*, *120*(1), 43–53. https://doi.org/10.1093/bmb/ldw037

Malik, V. S., & Hu, F. B. (2022). The role of sugar-sweetened beverages in the global epidemics of obesity and chronic diseases. *Nature Reviews Endocrinology*, *18*(4), 205–218. https://doi.org/10.1038/s41574-021-00627-6

Melinda, A., & Farida, E. (2021). Faktor-faktor yang Mempengaruhi Perilaku Mahasiswa FIK UNNES Dalam Membaca Label Informasi Nilai Gizi. *Indonesian Journal of Public Health and Nutrition*, *1*(3), 491–498.

Meng, Y., Li, S., Khan, J., Dai, Z., Li, C., Hu, X., Shen, Q., & Xue, Y. (2021). Sugar- and Artificially Sweetened Beverages Consumption Linked to Type 2 Diabetes, Cardiovascular Diseases, and All-Cause Mortality: A Systematic Review and Dose-Response Meta-Analysis of Prospective Cohort Studies. *Nutrients*, *13*(8), 2636. https://doi.org/10.3390/nu13082636

Pinho-Gomes, A.-C., Dunford, E., & Jones, A. (2023). Trends in sugar content of non-alcoholic beverages in Australia between 2015 and 2019 during the operation of a voluntary industry pledge to reduce sugar content. *Public Health Nutrition*, *26*(1), 287–296. https://doi.org/10.1017/S1368980022002300

Rizona, F., Appulembang, Y. A., & Rahmawatif, F. (2022). IMPROVING FAMILY SUPPORT ON PREVENTING OBESITY CHILDREN THROUGH FOCUS GROUP DISCUSSION. *Proceeding B-ICON*, *1*(1), 201–204. https://doi.org/10.33088/bicon.v1i1.35

Sartika, R. A. D., Atmarita, A., Duki, M. I. Z., Bardosono, S., Wibowo, L., & Lukito, W. (2022). Consumption of Sugar-Sweetened Beverages and Its Potential Health Implications in Indonesia. *Kesmas: Jurnal Kesehatan Masyarakat Nasional*, *17*(1). https://doi.org/10.21109/kesmas.v17i1.5532

Sinaga, C., & Simanungkalit, S. F. (2019). Faktor-Faktor yang Berhubungan dengan Perilaku Membaca Label Informasi Gizi. *Jurnal Endurance*, *4*(1), 192. https://doi.org/10.22216/jen.v4i1.3890

Statista Market Insight. (2023). *Non-alcoholic drinks report Indonesia*. https://www.statista.com/outlook/cmo/non-alcoholic-drinks/indonesia

Tang, G.-Y., Meng, X., Gan, R.-Y., Zhao, C.-N., Liu, Q., Feng, Y.-B., Li, S., Wei, X.-L., Atanasov, A. G., Corke, H., & Li, H.-B. (2019). Health Functions and Related Molecular Mechanisms of Tea Components: An Update Review. *International Journal of Molecular Sciences*, *20*(24), 6196. https://doi.org/10.3390/ijms20246196

Umoafia, N., Joseph, A., Edet, U., Nwaokorie, F., Henshaw, O., Edet, B., Asanga, E., Mbim, E., Chikwado, C., & Obeten, H. (2023). Deterioration of the quality of packaged potable water (bottled water) exposed to sunlight for a prolonged period: An implication for public health. *Food and Chemical Toxicology*, *175*, 113728. https://doi.org/10.1016/j.fct.2023.113728

Viigimaa, M., Sachinidis, A., Toumpourleka, M., Koutsampasopoulos, K., Alliksoo, S., & Titma, T. (2020). Macrovascular Complications of Type 2 Diabetes Mellitus. *Current Vascular Pharmacology*, *18*(2), 110–116. https://doi.org/10.2174/1570161117666190405165151

WHO. (2023). *Diabetes*. https://www.who.int/news-room/fact-sheets/detail/diabetes

Yayasan Lembaga Konsumen Indonesia. (2019). *Survei YLKI: Efektivitas Penandaan Kandungan Pemanis Buatan pada Label Pangan.* https://ylki.or.id/2019/10/survei-ylki-efektivitas-penandaan-kandungan-pemanis-buatan-pada-label-pangan/

Yen, C., Huang, Y.-L., Chung, M., & Chen, Y.-C. (2022). Sugar Content and Warning Criteria Evaluation for Popular Sugar-Sweetened Beverages in Taipei, Taiwan. *Nutrients*, *14*(16), 3339. https://doi.org/10.3390/nu14163339

Yoshida, Y., & Simoes, E. J. (2018). Sugar-Sweetened Beverage, Obesity, and Type 2 Diabetes in Children and Adolescents: Policies, Taxation, and Programs. *Current Diabetes Reports*, *18*(6), 31. https://doi.org/10.1007/s11892-018-1004-6

Zupanič, N., Hribar, M., Fidler Mis, N., & Pravst, I. (2019). Free Sugar Content in Pre-Packaged Products: Does Voluntary Product Reformulation Work in Practice? *Nutrients*, *11*(11), 2577. https://doi.org/10.3390/nu11112577.