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HEALTH IMPACTS OF DAILY CONSUMED BEVERAGES: ARTIFICIALLY SWEETENED VS NATURALLY SWEETENED

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ABSTRACT

This paper compares health outcomes associated with daily consumption of sugar-sweetened beverages and artificially sweetened beverages. It also contributes insights into whether artificially sweetened beverages are a good alternative to sugar-sweetened beverages and possible actions to be taken. The study focuses on obesity and weight gain, diabetes and insulin response, blood sugar levels, and cancer risks. Results show that artificially sweetened beverages might not be a suitable alternative for weight management benefits and can pose a potential risk of diabetes and cancer. Rather than finding alternatives, reducing sugar consumption should be focused on solutions including tax implementation of the beverages and switching to unsweetened beverages. This paper aims to contribute insights into making health decisions and enlighten individuals on the potential health implications of both sugar-sweetened beverages and ASBs.

KEYWORDS: Artificially Sweetened Beverages, Sugar-Sweetened Beverages, Weight Gain, Diabetes, Cancer

ABBREVIATIONS USED: Sugar-Sweetened Beverages (SSBs), Artificially-Sweetened Beverages (ASBs), Unsweetened Beverages (USBs), World Health Organization (WHO), Type 2 Diabetes (T2DM), Early-Onset Colorectal Cancer (EO-CRC)

INTRODUCTION

The daily consumption of SSBs has resulted in increased health issues like type 2 diabetes and obesity. In 2016, the WHO urged global action to reduce SSB consumption, recommending individuals limit their intake to less than 10% of total energy or reduce it further by 5% for additional health benefits (World Health Organization, 2016). As a result, there is a growing trend toward ASBs as an alternative in the United States (Sylvetsky et al., 2017). Artificial sweeteners are known to have low calories, resulting in lower calorie intake and weight control when consuming ASBs compared to SSBs. However, in 2023, WHO issued a new guideline stating that long-term consumption of artificial sweeteners does not help with weight control and negatively affects our health, including increased risks of type 2 diabetes, cardiovascular disease, and mortality (World Health Organization, 2023). With the rising trend, it is now a concern whether ASBs are a suitable alternative to SSBs and how they compare to health outcomes. In order to make healthy decisions, this research aims to compare the health effects of SSBs and ASBs and suggest ways to cut back on sugar intake.

METHODOLOGY

During the research process, information was gathered from different databases, such as Google Scholar, Google, WHO, and Pubmed. Keywords include sugar-sweetened beverages or sugary beverages, artificially sweetened beverages, and low-calorie sweeteners. The main focus of the research was on obesity, weight gain, diabetes, insulin response, blood sugar levels, and cancer. All sources were published between 2006 and 2023. The majority of the studies were prospective cohort studies and meta-analyses to gain insight into the effects of the consumption of SSBs or ASBs.

Results And Discussion

1. Obesity and Weight Gain

Obesity rates in the United States are on the rise, having more than doubled among children and adolescents between 1988-1994 and 2017-2018. Among adults, between 1999-2000 and 2017-2018 (Overweight & Obesity Statistics, 2021). A significant contributor to obesity is SSB, which is known to have a high-calorie content and no nutritional value. Studies show that increased calorie intake results from the low satiety of liquid foods, which is the main reason why there is insufficient compensation for the extra calories consumed in liquids when compared to solid foods (Malik et al., 2006; Calcaterra et al., 2023). As an alternative, artificial sweeteners are low in calories while having a sweet taste. However, evidence shows different types of artificial sweeteners can increase weight gain. Higgins and Mattes (2019) randomized controlled trial showed results showing the consumption of sucrose led to higher total mass fat among the other artificial sweeteners, with results of ($\Delta = +1.35 \pm 0.25$ kg, $P < 0.001$). In its 12-week trial, sucrose consumption increased energy intake significantly ($P = 0.007$) compared to saccharin, aspartame, rebA, and sucralose groups ($P \leq 0.04$). Furthermore, saccharin sweeteners had higher hunger ratings in comparison to other groups

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($P \leq 0.03$). Higher hunger rates can result in overeating and an increased appetite, which can prevent reducing calorie intake. The results raise concerns about weight control benefits, eating behaviors, and specific artificial sweeteners being used in beverages. Professionals should consider these findings, and it is critical to recognize the limitations of artificial sweeteners in beverages in studies pertaining to human health when conducting experiments.

2. Diabetes, Insulin Response, and Blood Sugar Levels

When SSBs are consumed, blood glucose and insulin levels rise. Increased consumption of SSBs causes the pancreas to produce more insulin, allowing blood sugar to enter body cells for energy. By constantly increasing insulin production, the pancreas is forced to work harder, and the cells can develop insulin resistance, resulting in high blood sugar levels. It also contributes to a high dietary glycemic load, which raises levels of inflammatory biomarkers like C-reactive protein, which are associated with a higher risk of T2DM (The Insulin Resistance–Diabetes Connection, 2022; Malik et al., 2010). In contrast, with artificial sweeteners in beverages, blood sugar will not be affected unless consumption increases. When servings per day were higher than 0.50 in Drouin-Chartier et al.'s (2019) cohort studies, there was a correlation with an 18% higher risk of diabetes (95% CI 2%, 36%) over a following 4-year period compared to the reference category. Additionally, the findings of an umbrella review conducted by Diaz et al. (2023) provide highly suggestive evidence that ASBs are associated with a higher risk of type 2 diabetes (RR, 1.39; 95% CI: 1.22, 1.57). In two meta-analyses, results show a higher intake of SSBs leads to a 26% increased risk of developing T2DM and a similar result with a 30% higher risk associated with developing T2DM (Malik et al., 2010; Meng et al., 2014). More than 0.50 servings of SSBs consumed daily were associated with higher risks of diabetes of 9% (95% CI 3%, 17%) and 15% (95% CI 7%, 23%), respectively (Drouin-Chartier et al., 2019). By contrasting the health outcomes of SSB and ASB, it is evident that both have significant implications for the likelihood of T2DM.

3. Cancer

Both SSB and ASB have conflicting evidence, so a firm conclusion cannot be drawn. Various risk factors, such as obesity and diabetes, can be linked to different types of cancer. While there was no correlation in ASB, younger women who consumed more SSB had a 2.2-fold increased risk of EO-CRC (Hur et al., 2021). A prospective cohort study found a positive association between the risk of overall cancer and breast cancer when SSB intake increased. Colorectal cancer and prostate cancer risks were not detected. For ASBs, there was no risk of cancer observed (Chazelas et al., 2019). Another study showed positive results for colorectal cancer and postmenopausal breast cancer with SSB intake (Hodge et al., 2018). An umbrella review of ASB found weak evidence of colorectal cancer, pancreatic cancer, gastrointestinal cancer, and cancer mortality (Diaz et al., 2023). However, it should be noted that different types of artificial sweeteners cause different types of cancer. No significant evidence was found for saccharin, aspartame, neotame, and advantame related to cancer. There was conflicting evidence for aspartame with some studies showing no association with risk of cancer and other studies showing high amounts of its consumption are likely to develop cancer overall, breast cancer, obesity-related cancers. Evidence of liver cancer was found, while some studies showed no risk of it (Artificial Sweeteners and Cancer, 2023). Although these results offer important information about possible associations with cancer risks, it is crucial to keep in mind that each study's methodology, including study design, sample size, and assessments, can result in inconsistent findings.

RECOMMENDATIONS

Increased SSB and ASB consumption have negative health effects. ASBs as an alternative lower the risks, but they still pose a concern for an individual's health. It is preferable to reduce our overall sugar consumption and switch to USBs rather than find substitutes. USBs can lower the sweetness threshold, which may encourage low-sugar diets and shift dietary preferences toward healthier options (Ebbeling et al., 2020). Furthermore, replacing SBBs with water, coffee, tea, or 0-2% reduced-fat milk can lower the risk of diabetes by 2-10% (Drouin-Chartier et al., 2019). In addition, the WHO suggests that nations impose taxes on SSBs in order to lower demand and consumption (World Health Organization, 2022).

CONCLUSION

Comparing the health outcomes of SSBs and ASBs has both similar and contradictory results. Evidence of ASBs shows that they may not be a suitable alternative for SSBs as certain artificial sweeteners can cause high hunger rates and can increase weight gain. A positive association with T2DM was found for ASBs, where there is a lower risk in comparison to SSBs and it remains a significant concern. Moreover, the relationship between SSBs and ASBs and cancer remains ambiguous, with contradictory findings from various studies. It is important to focus on reducing our sugar consumption and preventing the risk of diseases linked to sugary beverages. Switching to USBs has the potential to alter taste preferences and encourage lower-sugar diets. Substituting SSBs with water, coffee, tea, or low-fat milk can lower diabetes risk. Implementing taxes can further reduce SSB intakes. In conclusion, ASBs as a substitute for SSBs are not a reliable solution. While ASB has lower risks, it should not be considered a healthier alternative.

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