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Review Article

Review Article: Health Benefits and Risk of Sugar Consumption and the Alternative Use of Stevia

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Abstract

Sugar is one of the most important beloving ingredients in food products in today's life and almost everyone enjoys it every day. It's an essential structural component of living cells and a source of energy in many organisms. Although consumption of sugar activates the "feel-good hormone" of the brain on the other side it can even make you addicted to it. As sugar consumption grew in the latter part of the 20th century worldwide, different researchers from many countries examined the excessive use of sugar in our daily diet, especially refined sugar, as damaging to human health. This review thought could be concluded that we are in a sugar crisis, therefore, the alternative use of sweetens like stevia, making small dietary changes, and eliminating sugar from our diets as much as possible.

Keywords: sugar; stevia; health benefits; risk

Introduction

All green plants manufacture sugar through photosynthesis, the process by which plants transform sunlight into their food and energy supply. Of all plant types, sugar beets and sugar cane have the greatest quantities of sugar, which is why they make the most efficient choices from which to extract sugar. Many types of sugars are found in the diet daily. These include example, glucose, fructose, sucrose, and lactose. When the term 'sugar' is used, people are referring to 'sucrose' (table sugar). Sugars make up a nutrient called carbohydrate (makil et al., 2010; yong et al., 2014). This instant energy is fulfilled by the intake of sugars. Besides this, a therapy used for overcoming chronic back pain termed Prolotherapy indulges sugar (glucose or dextrose) in injections for relieving pain. In addition, many drugs consist of glycans (a type of sugar) as an essential ingredient. Drugs such as heparin (used for treatment and prevention of blood clots in veins, arteries, or lungs), erythropoietin, some anti-flu drugs, and drugs treating cancer contain glycans (Varucha et al., 2016). Even though there are many uses of sugar but yet the fight of sugar being a friend or a foe, irresolvable, continues to be. In certain aspects, sugar is considered to be a foe, yet its complete absence in our diet will affect our health to a great extent. Thus, this review highlights the effect of sugar intake (beneficial or harmful) on human health and the alternative use of stevia.

Methodology

This review paper was taken from different literature, books, websites, and scientific journals which are related to the health benefits and risks of sugar consumption and stevia.

History of Sugar

Since ancient times, sugar has been produced in India; it was expensive at first so honey was more often used for sweetening in the world. Sugarcane was a native of tropical South Asia and Southeast Asia, and people chewed it to extract it (Miller et al., 2009). In Europe, sugar was found by the 1st century and used as an imported medicine, not as a food (Galloway, 2005). Sugar stayed relatively unimportant until the Indians discovered methods to turning sugarcane juice into granulated crystals which is easier to store and transport around the 5th century (Adas, 2001). In the 15th century, Venice was the chief sugar refining and distribution center in Europe (Rolph, 1917). China established its first sugarcane plantations in the 17th century. Chinese documents confirm at least two missions to India, initiated in 647 AD, to obtain technology for sugar refining (Davis and Novotny, 1989). When Arab armies conquered the region, they carried away the knowledge of sugar manufacture and love of sugar as a food, condiment, and medicine. In the early 700s Islamic armies had conquered much of Spain, bringing the culture of sugar with them (Cohen, 2014). In the 19th century, sugar became more widely available, popular, and considered a necessity. This evolution of taste and demand for sugar as an essential food ingredient unleashed major economic and social changes (Mintz, 1986).

Health Benefits of Sugar Consumption

Carbohydrates are one of the most plentiful biomolecules on Earth, sugar and starch are the essential part of food in most places of the world (Margaret et al., 2018). Sugar is one of the most important ingredients in food products in today's life (Figure 1). Although consumption of sugar activates the "feel-good hormone" of the brain. Realization of their sweetness was earlier as compared to its use as an energy source and an important dietary component. Although sugar is vital for defraying many

physiological functions of our body properly. By providing energy currency, ATP, and some other beneficial physiological activities of the body, the carbohydrates have earned the sake of macronutrients which are found in several foods and beverages. The main function of carbohydrates is to offer energy to the body for its functioning and physical activities, utilizing glucose as its source (Varucha et al., 2016).

(Varucha et al., 2016). The primary function of sugar in food products is to provide sweetness and energy, in addition, sugar plays a very important role in preservation, fermentation, color, and texture (Rosa et al., 2009), it is also, used as an antioxidant Function, and Flavor (Margaret et al., 2018).

Figure 1. Sugar

Health Risk of Sugar Consumption

We hear so often that we should avoid sugar as much as possible because it is not good for our health. It is important to understand the reasons WHY and HOW it is detrimental to our health. Before sugar (sucrose) enters the bloodstream from the digestive tract, it is broken down into two simple sugars called glucose and fructose. Glucose is in every living cell, and if we don't get it from our diet, our bodies produce it. Fructose is different because our bodies do not produce it in any significant amount, and there is no physiological need for it. Fructose can only be metabolized by the liver in large amounts, which is usually not a problem if it is eaten in moderate amounts. It will be turned into glycogen and stored in the liver until it is needed. However, if the liver is overloaded with glycogen, then consuming more fructose will turn it into fat. For people who are inactive and eat a Western diet, large amounts of fructose from added sugars get turned into fat in the liver (Healthline, 2017 cited by Kristen, 2018).

Recently, several research studies have observed that excess sugar consumption is related to an excess calorie accumulation, and may lead to a substantial number of health concerns. Among these health problems are increased risk of obesity (Bermudez, 2010; Bray et al., 2004; Kohli et al., 2010; Ludwig et al., 2001), cardiovascular disease (Johnson et al., 2009; Angelopoulos et al., 2009), type 2 diabetes mellitus (Schulze et al., 2003; Lana et al., 2014), nonalcoholic fatty liver disease (Hung et al., 2014), and cancer occurrence in the colon (Wang et al., 2014), pancreas (Nöthlings et al., 2007), breast (Wong, 2015) and ovaries (. King, 2013; Silvera et al., 2007). In 2013, Han E. and Powell M. concluded that added sugar intake has increased in the United States and worldwide over the past fifteen years in all age groups, with the most significant increase in young adults (Han and Powell, 2013).

With the results of recent research, it is not surprising that in March 2015, the World Health Organization (WHO) (Figure 1) called for decreasing added sugar consumption to less than ten percent of daily caloric intake, noting that further reduction to less than 5% of daily caloric intake would provide additional health benefits. These health benefits include decreasing the prevalence of overweight, obesity, and tooth decay (WHO, 2015). The American Heart Association (AHA) recommends limiting the consumption of added sugar to 5% of the daily caloric intake. Specifically, women and men should limit their added sugar consumption to no more than 100 calories and 150 calories respectively (Johnson et al., 2009). Also, the 2015-2020 Dietary Guidelines recommend limiting added sugar consumption to less than 10% of the daily calorie intake. For a 2000 daily calorie diet, this is approximately 200 calories, which is about the amount of added sugar in just one regular 12 oz. soda beverage (U.S. DHH and A, 2017).

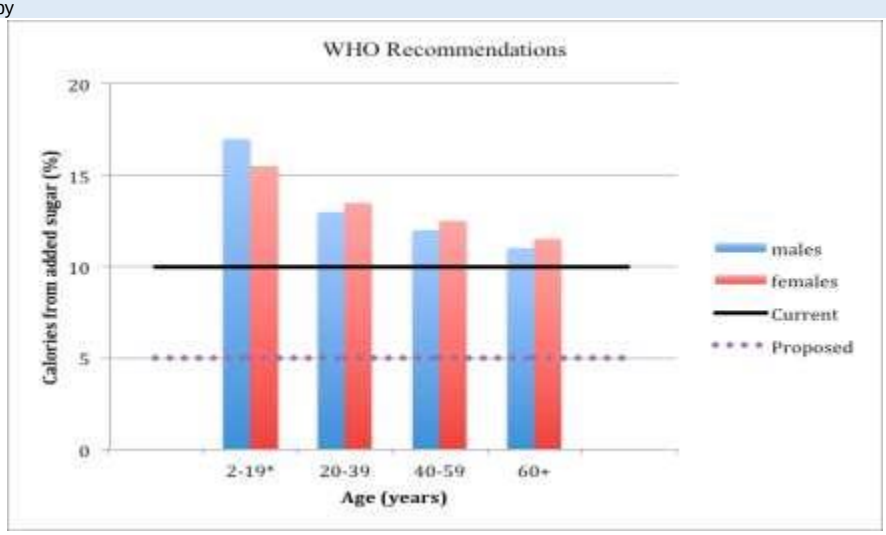

Figure 2: Current added sugar consumption level and WHO recommendations (Sources: WHO, 2015)

Diets that are high in simple sugars may result in decreased HDL cholesterol (Mensink et al., 2003; Appel et al., 2005) and elevated fasting triglycerides (Aeberli et al., 2011; Antar et al., 1970) which are established risk factors for cardiovascular disease. In 2013, the American Health Association (AHA) claimed that sugar-sweetened beverages including sodas, sports drinks, and fruit drinks might be associated with approximately 180,000 deaths around the world each year (AHA et al., 2013). The study calculated the quantities of sugar-sweetened beverages consumed by age and sex, the effects of this consumption on obesity and diabetes rates; and the impact of obesity and diabetes-related deaths. By using data collected as part of the 2010 Global Burden of Diseases Study, the researchers linked the intake of sugar-sweetened beverages to 133,000 diabetes deaths, 44,000 deaths from cardiovascular diseases, and 6,000 cancer deaths (AHA, 2013). Moreover, 78% of these deaths were over-consuming sugary drinks in low and middle-income countries, rather than in high-income countries (AHA et al., 2013).

Presently, social media and social life can have a significant influence on food and beverage choices. Social media marketing has been increasing, and sugar-sweetened soda and energy drink brands represented 84% of these Facebook likes, 86% of Twitter followers, and 95% of YouTube views (Pelletier et al., 2014). Moreover, young adults' dietary patterns appear to be affected by social norms. Young adults' dietary behaviors and attitudes appear to reflect their perceptions of normative behavior, particularly among friends. However, sugar-sweetened beverages consumption among young adults is significantly associated with the consumption of sugar-sweetened beverages among family and friends (Pelletier et al., 2014). Young people are particularly susceptible to the consumption of excess added sugar. Thus, it is important to identify attitudes toward added sugar and consumption trends so that 16 public health educators and an awareness campaign can address this issue. It can also help in increasing the awareness of health issues associated with added sugar, and informing the population how added sugar consumption can be controlled.

Alternative Use of Stevia

Stevia is a natural sweetener plant that is grown commercially in many parts of Brazil, Paraguay, Central America, Thailand, Korea, China, India, and other African countries. The leaves of stevia are the source of sweet glycosides (Figure 2). It is mainly used as a sweetener and flavor enhancer in the food and beverage industry. The chemical compound obtained from stevia is considered to be the best alternative source of sugar, especially for diabetes patients (Hossain et al., 2017). The leaves of this popular plant are sweet and ideal for people who are conscious of sugar and carbohydrate intake. With zero calories, the plant is being recognized as a great replacement for sugar and other sweeteners (SSKF, 2015). Stevia is a plant with carbohydrate-based compounds that are 200-300 times sweeter than sugar. It is reported that steviosides have insulinotropic effects in pancreatic beta cells because it increases insulin secretion and thereby decreases blood glucose level. It can be extracted and used as alternative sweeteners for sugars (Midmore and Rank, 2020). Non-caloric, natural sweeteners, which can save people from diabetes, may receive greater focus in the future. There is an immediate focus on this plant now as a natural alternative to artificial sweeteners (Cuervo et al., 2012).

Figure 3. Stevia leaves

Medicinal Use of stevia

According to World Health Organization (WHO) findings, stevia regulates blood pressure, fights cavities, induces pancreas to produce more insulin, and acts as bactericidal agent (Bhosle, 2004). No negative clinical reports have appeared in any of the countries where stevia is readily available (Mahmud et al., 2014). Medicinal plants are becoming very popular for the treatment of different diseases all over the world (Mostofa et al., 2010). Stevia is suited for diabetic and obese persons. It may later be advantageous in the prevention of type 2 diabetes. It also showed antibacterial, antiseptic, anti-inflammatory, anti-fertility, hypotensive, diuretic, and cardiotonic properties. It has shown good results in clearing up skin problems like dermatitis, eczema, wrinkles, skin blemishes, acne outbreaks, scarring, rashes, and itchiness. Steviol regulates blood glucose levels by enhancing not only insulin secretion but also insulin utilization in insulin-deficient animals and is also used as a digestive tonic. It is expected to bring hope to diabetic people who have craving for sweets (Ranjan et al., 2011). Its leaves contain approximately 10% of steviosides which are intensely sweet compounds with particular benefits to diabetics (Midmore and Rank, 2002).

Stevia raw stuff works as a synthesizer of oral contraceptives, cholesterol suppressing medicine, antitumor activity against prostrate tumors, and activity against rheumatism. Its medicinal uses include regulating blood sugar, preventing hypertension, treatment of skin disorders, and preventing tooth decay. The compound obtained from stevia is considered to be the best alternative sweetener source for diabetes patients. The added value for this new crop can go up to a considerable extent. Statistics indicate that in some countries up to 30 % of their needed sugar is replaced by stevioside-like sweetness products. The leaves of stevia (Figure 2) are the source of steviol glycosides, stevioside, and rebaudioside, which are estimated to be 300 times sweeter than sugar but also have no effect on blood sugar, so it is helpful for hypo glycaemia and type-2 diabetes (Soejarto, 2002; Ramesh et al., 2006). It nourishes the pancreas and thereby helps to restore its normal function. Furthermore, stevia contains a high percentage of phenols andflavonoids, which cause stevia to have a high antioxidant activity (Tadhani et al., 2007; Shukla et al., 2009). Phenols are the secondary metabolites that cause the cardiac and cancer diseases to decrease (Tadhani, 2007).

The plant may have cardio tonic actions, which normalize blood pressure and regulate the heartbeat (Ranjan et al., 2011). The plant displays vasodilator actions in both normotensive and hypertensive animals. Stevia has also helped to reduce blood pressure cases and has increased diuretic and natriuretic effects in rats (Ranjan et al., 2011). Dietary sucrose has been implicated to cause dental caries. It is believed that sugar substitutes can reduce the incidence of dental caries. Stevioside has been found to reduce dental caries. It may exert its action in three different ways: antibacterial effect, production of low acidic condition, and anti-plaque activity (Basu, 2012). In addition to their use in calorie control and for diabetics, alternative sweeteners offer another benefit in maintaining good dental health by reducing the intake of sucrose (Grenby, 1997). Stevia possesses anti-fungal and anti-bacterial properties in addition to its other versatile uses. It can safely be used in herbal medicines, tonics for diabetic patients, and also in daily usage products such as mouthwashes and toothpastes. Mild stevia leaf tea also offers excellent relief for an upset stomach (Goyal et al., 2010). Stevia rebaudiana sweeteners are used sparingly and there seems to be no threat to public health, although caution should be exercised at higher daily intake levels (Schardt, 2000). Despite their widespread use in several different parts of the world, no evidence of adverse reactions due to the ingestion of S. rebaudiana extracts of stevioside by humans has appeared in the biomedical literature (Kinghorn, 2020). Food and Agriculture Organization of the United Nations, the World Health Organization, and the Food & Drug Administration (FDA) have determined that high purity stevia extract is safe for consumption by the general population when consumed within the recommended levels.

Final Note

In view of the above, Sugars are the basic building blocks of carbohydrates found in nature. All green plants providing foodstuffs, including fruits and vegetables, grains, as well as milk and honey, contain naturally-occurring sugars. Sugars are a source of energy. Some types of sugar (e.g., glucose) are needed by organs such as the heart and brain to function properly. The World Health Organization's (WHO) sugar guideline, issued in March 2015, recommends that adults and children restrict their sugar intake to less than 10% of total energy intake per day, which is the equivalent of around 12.5 teaspoons of sugar for adults and suggests a further reduction to below 5% of total energy intake per day. Worldwide, many populations consume sugars at levels that exceed the WHO's sugar guidelines, such as Brazil, Canada, South Africa, the UK, the USA and other countries. Sugar consumption is growing, especially in low- and middle-income countries. A growing body of evidence indicates that excessive sugar consumption is driving epidemics of obesity and related non-communicable diseases (NCDs) around the world. Also, excessive consumption of added sugars in the human diet has been associated with type-2 diabetes (T2D), coronary heart disease (CHD), cancer, dental caries, and other elements of metabolic syndrome. Especially in developing countries like Ethiopia no one follows the sugar consumption guideline and affecting by so many diseases. Therefore, the aim of this paper teaches people that future food habits to reduce sugar consumption to less than 5-teaspoons intake per day and the alternative use of stevia could provide additional health benefits and reduce risks.

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