Soft Drink Consumption: Innocent Indulgence or Dangerous Drinking Habit?

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ABSTRACT

Many carcinogenic substances are known. Recently, soft drinks (pop, soda, lolly water) have been implicated in research as causing esophageal and other pre-cancerous changes. Many carcinogenic substances are known, among which carbon dioxide in gassy-drinks is becoming more and more into contention. However, gassy sugar sweetened drinks are generated on an industrial scale and its increasing production, promotion and consumption progresses unbound. This article warns about excess consumption of soft drinks as a cofactor in many conditions, such as osteoporosis, dental abfractions and diabetes, but particularly for dysplastic esophagitis, which often precedes neoplastic transformation. Moderation of imbibing soft drinks is advised.

KEYWORDS

Carbonated Beverages, Carcinogens, Neoplastic Cell Transformation, Diabetes Mellitus, Esophagitis, Osteoporosis.

BACKGROUND

Although some causes of cancer are known, the exact causes of most cancers remain obscure. For example, human papilloma viruses (HPVs) are strongly associated causatively with most head and neck cancers, as well as cervical and genitourinary neoplastic changes.[1-3] Other oncogenic viruses are well known in research biomodels.[4] Neoplastic-inducing substances like asbestos[3] and the cyclic-carbon substance di-methyl-benzanthracene (DMBA) are also known carcinogens.[5,6]

Neoplastic change is usually a multistage reaction sometimes preceded by, and often detectable with clinical changes. This change is often influenced by predisposing factors. For example, AIDS-sufferers are more prone to developing oncological lesions because HIV infection reduces natural immunity.[7-9] Also DNA alterations induced by tobacco smoke and excess use of ethanol alone, or agonistically in combination with tobacco use, are acknowledged as conditioning habits, which facilitate a cellular oncogenic transformation.[10,11]

The transformation from a healthy state to frank carcinoma is reflected clinically by early noticeable changes, often visible to the naked eye, but often only possible to be confirmed histologically.[12] Macroscopically, a lump is first noted with the appearance of a rolled edge, an ulcer, bleeding or painless swelling as a lump or papule. Additionally, changes of epithelium to fixed white patches (i.e. leukoplakia), red macules (i.e. erythroplakia), or combinations of the two (i.e. erythro-leukoplakia) are early putative changes, which when biopsied will show various stages of histological dysplasia. Dysplasia may be mild, moderate or severe, the latter being definitively diagnostic and close to mutations of early carcinogenesis.[12,13]

Experimentally in rats, esophageal dysplasia has been induced by drinking pop.[14] In humans, the erythroplasia of Queyrat on mucous membranes (i.e. Bowen Disease),[15] and Barret esophagitis[16,17] are two forms of dysplasia found in the penis and esophagus, respectively. It is noteworthy that the prevalence of the latter seems to be increasing.[18,19]

The causes of dysplasia are varied, and range from actinic and X-ray radiation to chemical genetic mutagenesis to viruses and changes in immunity.[4] Among the many known conditioners for carcinogenic change indicated by animal research is the excessive exposure to carbon dioxide (CO_2) gas release from soft drinks (pop, soda, lolly water).[17]

The objective of this appraisal is to highlight the implications of the global increase in consumption of soft drinks, and a call for its moderation.

RECENT INSIGHTS

Post World War II, with the introduction of pop in cans instead of glass, and marketing larger plastic containers up to two liters, encouraged a vast increase in daily pop consumption. Although adolescents periodically do consume tea, coffee, milk and fruit juices, their preference for sugar sweetened pop-sodas remains a significant part of their diet and increased caloric intake, which contributes to the prevalence of obesity.[20,21] Traditional colas (*Coca-Cola® and PepsiCo®*) are the most frequently drunk sodas; each 360ml can contribute 43 kcal/100ml (or 110 calories (cal) in 360ml, up to 310 cal in 960ml cola).[21-24] Newer pop manufacturers, who use organic contents with cranberry or maple syrup as sweeteners, claim it is tastier and more natural.[22] *Bec Soda Inc.* (Montreal, QC), a newcomer to the pop-beverage scene in North America, is manufactured with maple syrup in dissolved CO_2 to give it sparkle. Maple syrup is mainly carbohydrate and water and has high caloric value at 252 kcal per 100ml syrup, with constituent monosaccharides like fructose and glucose.[23] In a few years Bec Soda, as a start-up company, produces over 100000 350ml bottles annually and cannot meet the consumers demand.[22] From 1970 to 1996, consumption of soft drinks increased from 22.2 gallons to 56 gallons per person per year. It is estimated that 95% of Americans drink soda, and 27% of all beverages consumed are sodas. CO_2 gas dissolves in water to form carbonic acid, which enhances flavor, intensifies sweetness of fermentable acid-producing carbohydrate molecules and delivers the tingle on the tongue when consumed in sugary acidulated drinks.[25]

DISCUSSION

Pop consumption is a multimillion dollar industry, globally valued at $55 billion dollar per year. Even though non-nutritive sweeteners and low calorie drinks are also available and consumed, vast quantities of sugar sweetened pop-sodas are regularly consumed as a cheap source of calories, for hunger satiation and a substitute for nutritious foods. There are ten teaspoons (about 29 Grams) of carbohydrates in 12 ounces of pop (a 360ml can), and because one can of pop gives 110 cal, 3 to 4 cans per day adds between 430 to 440 cal daily extra to a diet. Consequently, this is considered a major contributor to childhood obesity. [22-25]

Previous reports have warned against excess consumption of gassy pop and increased prevalence of Barrett esophagitis.[16,17] There are also other unwanted side effects like pancreatic cancer formation,[26,27] and decreased osteogenesis which leads to bone fractures among young healthy physically active women.[28] Moreover, increased dietary consumption of carbohydrate and diet low-calorie pop is also significantly associated with a higher risk of having a stroke.[29] An increased intake of sugar-sweetened beverages may increase the likelihood of developing diabetes mellitus, and all the sequelae from this, like pancreatic cancer, cardiovascular pathologies, neuropathies and ophthalmic changes.[28-30]

Tooth decay and dental erosion are the main deleterious effects on teeth of drinking soda.[31-37] For instance, the acids in soft drinks reduce the surface hardness of the enamel leading to erosion. Soft drinks can also affect dentin and resin composite fillings leading to cavities. When poor oral hygiene and bruxism are present, tooth loss risk considerably increases.

Ad libitum consumption of soft drinks carries consequences. It is noteworthy that experimental evidence in animals, backed up by epidemiological data, strongly suggests esophagitis is on the increase from quaffing modern over-sized ingestion of pop-sodas. With regular consumption of acidic sugar sweetened pop drinks as a major source of dietary calories, damage to both soft and hard tissues through calcium deprivation occurs over a period of time. The effects of nascent release of dissolved CO_2 will induce cellular genetic changes leading to early epithelial dysplasia. This is a serious effect as under continual oncogenic stimulation, early dysplasia predisposes to developing epithelial changes which become irreversible and precede invasive forms of carcinoma.

CONCLUDING REMARKS

The effects of uncontrolled consumption of soft drinks on soft tissue has focused mainly on weight gain and tooth decay, however, early warnings about the possible carcinogenic effects may be absurd to ignore. Moderation to not more than one pop-soda a week or replacement of sugary-sweetened-pop with plain water, unsweetened tea, coffee, milk, soups, vegetable or fruit beverages, is strongly advised.

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