

Energy drinks: a potentially overlooked obesity correlate

Overview

The term obesity refers to having too much body fat, rather than being overweight due to the presence of high volumes of muscle mass, bone mass, or water. A rapidly growing epidemic in the United States and in developing countries, obesity literally affects millions of citizens, including children worldwide.¹ Associated with unquestionable health risks which increase incrementally in magnitude and severity as an individual's obesity level increases, obesity is a complex condition, with serious social and psychological dimensions, affecting virtually all ages and socioeconomic groups.² Attributed in part to excess eating and poorly devised diets, unlike traditional epidemics, current evidence shows this epidemic cannot be defeated with either a pill or a vaccine. In addition to access to affordable, nutritious foods, preventing overweight and obesity commonly requires some form of change in an individual's behavior to avert the increased risk of illness, disability and premature death.^{3,4}

Sugar sweetened drinks, a daily fixture in American life, are highly linked to obesity and other health problems such as type 2 diabetes and heart disease.⁵ Consequently, there are many campaigns being launched to reduce consumption of soda and sugar sweetened beverages in cities and communities.⁶ To create healthier choices for citizens many hospitals and organizations have banned sugary drinks including fruit juices in addition to sugary soda drinks.⁷

One area that is not well documented as a source of excess sugar and that can increase obesity risk are energy drinks such as Red Bull, Monster, or NOS-which interestingly is produced by Coca Cola. Another is the overlapping problem identified by Rampersaud et al.,⁸ who found only 40% of 3361 adults over 18years of age identified sugars as a primary concern when choosing beverages and that there was considerable consumer confusion about types of sugars in beverages.⁸ Since young people who may consume these products for non-health reasons may derive as much as 12% of their sugary drink intake from energy drinks⁹ and are found to consume energy drinks at high rates on a weekly basis¹⁰ many may inadvertently be harming themselves in the long run, even if they actively avoid traditional sugary beverages. This is because these drinks, which are commonly derived from high fructose corn syrup, are increasingly consumed by youth, despite high levels of sugar ingredients.¹¹

Keywords: energy drinks and adolescents, energy or sports drinks and sugar, energy and sports drinks and obesity

Objective

This brief literature review was designed to examine if enough is being done in the public health realm to address this potential potent contributor to obesity among youth and young adults. The ultimate goal was to examine the importance of discussing and researching this topic and its possible solutions.

Methods

PUBMED and Academic Search Complete were scanned for

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articles detailing information on energy drinks and obesity. Only those that discussed the sugar content of sports or energy drinks, those that were published in the last 15 years and those that focused on adolescents were selected. Excluded were reviews focused on energy drinks and caffeine, alcohol and sugary drinks in general. Most of the salient points in this limited literature base were extracted from the publications deemed relevant and are reviewed or discussed here. All reports on the topic regardless of methodology were examined and discussed in narrative form, since research on this topic is very limited and highly diverse.

Results

Using the key words listed above more than 600 publications were generated in the data bases accessed. Yet, most of this literature failed to even discuss sugar content and largely focused on adverse effects due to the link between energy drinks and caffeine consumption, energy drinks and risk-taking behavior, in general, or sugary drinks excluding energy or sports drinks. However, in addition to the aforementioned points about energy drinks and the possible link between excess usage and obesity and among research focusing on the present topic of interest, a recent report by Park et al.,¹¹ found that a high intake of regular soda, sweetened coffee or tea, fruit drinks, milk and alcohol were associated with a greater odds for drinking sports and energy drinks, which may not be acknowledged as sources of sugar. According to one report,¹² this may be because, while energy and sports drinks may have fewer calories and less sugar than regular soda, they enjoy health 'halos' that are not warranted due to an advertising focus on their cognitive benefits. Moreover, even though pediatricians recommend no energy drinks for kids, as Dr. Sandeep Gupta states it is easy to be misled by drink labels, especially those related to energy or sports drinks.

In this respect, Dr. Gupta said some labels do not convey how much sugar is actually in the product, or what the effect of 27 grams of carbohydrate in one Monster Energy Drink might imply for the individual consumer. For example, in addition to the fact that energy drinks have large amounts of sugar, which gives the body a temporary boost of quick energy, after this burst of energy wears off, this can cause a "sugar crash," which leaves the drinker feeling less energized

than before. Because young people in particular and others are drinking energy drinks to keep them focused, they may feel a need to take in more of these fluids when they feel a waning of their energy. Moreover, the excess caffeine in unsweetened or sweetened versions of energy products can also have harmful effects, independent of sugar content, such as headaches, causing sedentary rather, than calorie burning active behaviors.¹² According to another report,¹³ the glucose found in Monster is a simple carbohydrate, meaning it travels through the stomach walls and is dispersed into the bloodstream immediately. This provides an almost instant sugar high once consumed, but one 'crashes' when the sugar depletes. Too much glucose, as found in Monster, can adversely affect memory, concentration and other forms of mental activity, thus failing to achieve the intended outcome and making decisions about other health behaviors more challenging.¹³⁻¹⁶

Breda et al.,¹⁷ conducted a review of the risks, adverse health effects and policy options for responding to this risky situation of increased energy drink consumption by youth.¹⁷ This group noted however, that the risks of heavy consumption of energy drinks among young people have largely gone unnoticed. This finding was observed even though these drinks and their contents are predicted to become a significant public health concern. Pomeranz et al.,¹⁸ too stated that the risks of heavy consumption of energy drinks among young people have unfortunately gone largely unaddressed in general.¹⁸ Moreover, even though sugar-free versions of these energy drinks are being marketed, the continuing widespread consumption of sugar enhanced energy drinks may be increasing the risk for multiple health problems, including obesity due to its effect on fibroblast growth factor 19 linked to the etiology of diabetes¹⁰ and the added sugar intake as a result of ignorance, or inconsistent labeling practices.¹²

Pomeranz et al.,¹⁸ specifically reported that they found the median sugar content of sugar-sweetened energy drinks was 17g per 8 oz serving.¹⁸ This was higher than sports drinks and comparable to sodas. As well, with only one exception, their analysis of 15 brands showed all drinks were contained in non-reusable containers, thus providing excess sugar in a single serving. Unfortunately, although added intake of sugar from commonly available sugar sweetened beverages and fruit juices has dropped, in general according to recent data, the added sugar intake from energy drinks has increased along with its negative impact on cardiometabolic disease and associated relationship to reduced sleep duration. Although these dangers are clearly apparent, several manufacturers of these products continue to target youth through media, to the extent that they may be exposed to at least one advert every 3 days. Youth are also more likely as well to visit Monster and Rockstar energy drink websites, Facebook is replete with these adverts and the drinks are advertised at sports competitions and others.¹⁹ In 2014 a study by Kumar et al.,²⁰ who detailed the growing popularity of energy drinks among youth due to their stimulant qualities found 9% of youth ages 12-17 drank energy drinks, almost 20% felt these were safe for teens and 12.5% agreed these were types of sports drinks.²⁰ The highest consumption rates were among 16-17 year olds. This group did not specifically discuss the sugar content of these drinks, but concluded youth may be unaware or misinformed about the potential health effects and nutritional content of energy drinks.

In addition to the direct effect on calorie consumption, very few publications focus on the other outcomes of consuming energy drinks, which are associated with short sleep durations, a risk factor for obesity and that energy drinks may play a role in cardio-metabolic diseases²⁰ associated with obesity.¹⁹ In addition, rigorous review and analysis of

the available literature clearly reveals that frequent or excessive intake of caloric sports and energy drinks can substantially increase the risk for overweight or obesity in children and adolescents.²¹

Unfortunately, Rush et al.²² affirm that the consumption of energy drinks containing sucrose and caffeine is increasing worldwide.²² This group who examined the impact of a standardized dose of sucrose either as an "energy" drink (containing sucrose and caffeine) or lemonade found energy drink consumption apparently caused increased carbohydrate oxidation ($P=0.004$) and reduced lipid oxidation ($P=0.004$) compared to lemonade. That is, the researchers found that the combination of sucrose and caffeine could cause actually foster insulin resistance and lipogenesis. In light of their results, the authors indicated more research on the combined effect of caffeine and sucrose on fat metabolism and body fatness appeared warranted.

In other research, Cinteza et al.,²³ have confirmed that the health risks posed by soft drinks, sports drinks and energy drinks to children and young adults in the U.S is substantial.²³ The specific health risks enumerated by this group who may be exposed to the excess carbohydrate content of these drinks are obesity, dental cavities, arterial hypertension and type II diabetes.

Gimba et al.,²⁴ who examined the content of selected energy drinks noted the average concentration of caffeine, aspartame and sugar in the analyzed beverages ranged from 1.11ppm (parts per million)-237.95ppm, 283.84ppm - 956.82ppm and 91.05ppm - 1686.73ppm, respectively.²⁴ But although they stated frequent consumption of such energy drinks could increase dental caries risk, they failed to carefully discuss the implications of the sugar content observed for childhood and adult obesity. They also showed that the sugar content across brands is inconsistent suggesting the amount is not guided by any legal limits and that the potential synergistic effect of the contents they examined were not clearly outlined in any broad way.

In sum, while most of the current articles in PubMed and Academic Search Complete on the topic of energy drinks and adolescents did not discuss the implications of their varying degrees of sugar content, a small body of diverse literature strongly implies energy drink consumption is an increasingly dangerous, yet overlooked health issue for a variety of reasons, especially among young people where consumption is widespread.^{9,23,25} This added sugar content in the form of sucrose, glucose, or high fructose corn syrup ranges in quantity from 21-34g per oz²⁵ and is a potential contributor to the ongoing obesity problem in this age group. Yet, the fact that most energy drinks contain sugar derivatives is not clearly highlighted in the related literature, nor well identified as an additional public health concern for energy drink users. As well, although interventions to combat their use in light of the obesity epidemic are clearly desirable, given the rising consumption of these drinks, few strategies exist to counter this risk. Moreover, according to Gimba et al.,²⁴ the sugar content in energy drinks does not violate the current legal limits set by the United States Food and Drug Administration food and beverage regulations.²⁴

Conclusion

Although many young people today ingest energy drinks to the same degree in some cases as soda,²⁶ they often remain unaware of the sugar content of several popular brands, which range from 21-34grams per 8 oz serving, in the form of sucrose, glucose, or high fructose corn syrup. They may be equally unaware 2-3 servings a day of these

drinks are equal to 4-6 times the maximum recommended sugar intake for adolescents and others.²⁵ As well, even if they are aware of the dangers of excess sugar and their presence in energy drinks, they may continue to ingest energy drinks or sports drinks regardless of sugar content,²⁷ with 11.5% of adults, especially 18-24-year-olds consuming sports and energy drinks three or more times per week. In addition, the many young people who continue to ingest regular soda, sweetened drinks and fruit drinks, may be more likely to also choose to drink sports and energy drinks on a weekly basis than those who don't, as well as suffering possible sleep loss, an obesity determinant.¹¹ Yet, despite the magnitude of the obesity problem among youth and adults and the possibility that energy and sports drinks may be compounding this, there are very few active solutions discussed or reported in the available literature about what should be done to combat this threat. Indeed, very few articles on this topic as a whole exist given that what has been published has raised highly significant concerns about the role of energy drinks in general and its sugar content in particular in a society where obesity is rampant and product consumption is encouraged through intense targeted marketing and has been increasing rapidly over the past 7-10 years.²⁵ In the years 2014 and 2015, the published papers included the following re-occurring themes: energy drinks and their adverse health effects, in general;²⁸ correlational linkages to unhealthy beverage consumption patterns and screen media use;²⁹ risk taking behaviors among adolescents and young adults;³⁰⁻³² dangers of excess ingestion of sugary drinks with no mention of energy drinks³³ and energy drinks and substance use.³⁴ Almost none focused on the possible adverse impact of excess sugar ingestion from energy or sports drinks or both, especially in relation to obesity in young adults and adolescents, or confusion about how much sugar is present in energy drinks and what the different values mean for one's personal health.

Possible solutions

As well as more research and public health campaigns, strategies offered in the literature and other sources for combating excess sugar intake from energy drinks include:

- Encouraging medical care providers and public health officials to identify adults in need of encouragement to avoid or limit the use of sports and energy drinks and encourage an increased intake of healthier beverages.¹¹
- Educating students and others who are clearly targets for marketers of energy drinks, about their negative effects early on^{21,35} and who may be unaware or misinformed about the content of energy drinks and their actual health effects.²⁰
- Placing limits on the marketing of these less than healthy products to youth, while increasing the labeling and information about these to adolescents and adults.³⁶
- Advocating for laws against false advertising, limiting sugar volumes in energy drinks and prohibiting the sale of these potentially harmful products to minors.
- Trying to understand why youth consumption of energy and sports drinks is widespread.^{21,27}
- Encouraging school and college age students to do well in exams by studying hard and completing assignments by being physically fit, by getting enough sleep and by following sensible nutritional practices.
- Placing less emphasis on exam outcomes and more emphasis on

wellbeing as an important correlate of academic achievement, changing the food environment, fostering a supportive studying and learning environment.

- Helping students and others to understand water or 100 percent fruit, vegetable juice or low fat milk may not produce the same buzz as energy drinks, but will be more beneficial to the body in the long term [36], because drinks designed as energy boosters that contain caffeine and simple sugars may also increase fatness and insulin resistance in relation to the frequency of consumption.²²

A chart describing the sugar content of energy drinks and others such as that available at <http://www.caffeineinformer.com/sugar-in-drinks>²⁵ and <http://www.thehealthsite.com/fitness/a-can-of-energy-drink-10-teaspoons-of-sugar/>³⁷ may be very revealing and useful as an educational and teaching tool. It should be noted though that since large serving sizes of energy drinks may contain similar sugar contents to smaller serving sizes, simply reducing the drink size may be just as dangerous as drinking large size volumes as far as sugar content goes. Education stressing energy drinks can contain up to 14 teaspoons of sugar, which is more than twice the recommended daily limit of 6 teaspoons and in addition to causing sudden spikes in blood glucose levels, may mean extra calories³⁸ and overall obesity³⁹ is thus imperative. Students who already have health conditions should be especially cautious in this respect. In addition, media advocacy efforts to raise the public's awareness about the dangers of consuming excess amounts of energy and sports drinks and that their 'lurid' logos and fancy names and promises may well result in a multitude of long term irreversible health impairments is indicated.⁴⁰

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Conflict of interest

The author declares no conflict of interest.

References

- Centers for Disease Control and Prevention. Overweight and obesity. *Centers for Disease Control and Prevention*. 2013.
- World Health Organization (WHO). *Obesity*. World Health Organization; 2013.
- Balentine JR. Obesity. *Medicine Net*. 2013.
- Gavin ML. Overweight and Obesity. *Kids Health*. 2012.
- 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):537-543.
- Kmietowicz Z. Sugary drinks in schools increase the risk of obesity in adolescents, study finds. *BMJ*. 2014;348:g2319.
- Thomas P, Cavan D, Kerr D. Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomized controlled trial. *BMJ*. 2004;328:1237.
- Rampersaud GC et al. Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *J Am Dietetic Assoc*. 2005;105:743-760.
- Gómez-Miranda LM, Bacardi-Gascón M, Caravali-Meza NY, et al. Consumption of sweetened, energy and alcoholic beverages among college students in the México-US border. *Nutr Hosp*. 2014;31(1):191-195.

10. Styer AM, Roesch SL, Argyropoulos G. Modulation of fibroblast growth factor 19 expression by bile acids, meal replacement and energy drinks, milk, and coffee. *PLoS One*. 2014;9(1):e85558.
11. Park S, Onufrak S, Blanck HM, et al. Characteristics associated with consumption of sports and energy drinks among US adults: National Health Interview Survey, 2010. *J Acad Nutr Diet*. 2013;113(1):112–119.
12. Park M. *Half of Americans sip sugary drinks daily*. 2011.
13. Livestrong.com. *Diet and Academic Performance*. 2012.
14. Livestrong.com. *NOS Energy Drink facts*. 2012.
15. *Negative effects of Monster energy drinks*. 2012.
16. Thelin N. *Monster energy drink effects*. 2012.
17. Breda JJ, Whiting SH, Encarnação R, et al. Energy drink consumption in Europe: a review of the risks, adverse health effects, and policy options to respond. *Front Public Health*. 2014;2:134.
18. Pomeranz JL, Munsell CR, Harris JL. Energy drinks: an emerging public health hazard for youth. *J Public Health Policy*. 2013;34(2):254–271.
19. Grandner MA, Knutson KL, Troxel W, et al. Implications of sleep and energy drink use for health disparities. *Nutr Rev*. 2014;72(Suppl 1):14–22.
20. Kumar G, Park S, Onufrak S. Perceptions about energy drinks are associated with energy drink intake among U.S. youth. *Am J Health Promot*. 2015;29(4):238–244.
21. Committee on Nutrition and the Council on Sports Medicine and Fitness. sports drinks and energy drinks for children and adolescents. Are they appropriate? *Pediatr*. 2011;127(6):1182–1189.
22. Rush E, Schulz S, Obolonkin V, et al. Are energy drinks contributing to the obesity epidemic? *Asia Pac J Clin Nutr*. 2006;15(2):242–244.
23. Cinteza E. Update in pediatrics: to take or not to take soft drinks, sports or energy drinks. *Maedica*. 2011;6(2):157–158.
24. Gimba CE, Abechi SE, Abbas NS, et al. Evaluation of caffeine, aspartame, and sugar contents in energy drinks. *J Chem Pharm Res*. 2014;6(8):39–43.
25. Sifferlin A. *What's in your energy drink?* 2013.
26. Delorey D. Got energy drink? *The Naval Safety Center's Aviation Mag*. 2010;55:12–13.
27. Zytneck D, Park S, Onufrak SJ, et al. Knowledge of sugar content of sports drinks is not associated with sports drink consumption. *Am J Health Promot*. 2015;30(2):101–108.
28. Ali F, Rehman H, Babayan Z, et al. Energy drinks and their adverse health effects: a systematic review of the current evidence. *Postgrad Med*. 2015;127(3):308–22.
29. Larson N, Dewolfé J, Story M, et al. Adolescent consumption of sports and energy drinks: linkages to higher physical activity, unhealthy beverage patterns, cigarette smoking, and screen media use. *J Nutr Educ Behav*. 2014;46(3):181–187.
30. Arria AM, Bugbee BA, Caldeira KM, et al. Evidence and knowledge gaps for the association between energy drink use and high-risk behaviors among adolescents and young adults. *Nutr Rev*. 2014;72(Suppl 1):87–97.
31. Striley CW, Khan SR. Review of the energy drink literature from 2013: findings continue to support most risk from mixing with alcohol. *Curr Opin Psychiatry*. 2014;27(4):263–268.
32. Azagba S, Langille D, Asbridge M. An emerging adolescent health risk: caffeinated energy drink consumption patterns among high school students. *Prev Med*. 2014;62:54–59.
33. Kumar GS, Pan L, Park S, et al. Sugar-sweetened beverage consumption among adults— 18 states, 2012. *MMWR Morb Mortal Wkly Rep*. 2014;63(32):686–690.
34. Terry-McElrath YM, O'Malley PM, Johnston LD. Energy drinks, soft drinks, and substance use among United States secondary school students. *J Addict Med*. 2014;8(1):6–13.
35. Galemore CA. Sports drinks and energy drinks for children and adolescents—are they appropriate? A summary of the clinical report. *NASN Sch Nurse*. 2011;26(5):320–321.
36. Boukley B. *French safety agency ANSES warns of energy drinks exercise risk*. 2013.
37. Kholi M. *A can of energy drink=10 teaspoons of sugar*. 2013.
38. Howard P. *Dr Oz: energy drinks vs coffee caffeine & energy drinks sugar content*. 2015.
39. No authors listed. Energy drinks fuel the obesity epidemic. *Br Dent J*. 2015;118(6):345.
40. *Sugar in drinks*. 2014.