

Popularity of Soft Drinks: Colored versus Non-Colored and Risks Associated with their Prolonged Use

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Author's Contribution

All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: The current study was conducted to evaluate the rate of consumption of cold drinks, preference of colored versus non-colored drinks among youth, effects produced by these drinks in youth and reason of consumption. With passing years, the consumption of cold drinks in youth has shown high increase. This high rate of consumption of carbonated soft drink may lead to different disease conditions like anemia, bones weakness as well as unexpected increase in blood sugar level and body weight.

Methodology: It is survey-based study carried on young generation N= 200 age 15-25 years both male and female from different colleges and universities in Karachi. The survey consisted of 10 questions, the answers were recorded as open and close ended. The experimental study was carried out on 5 groups comprising of 6 Rabbits each weighing 1-2.5 kg. Blood sugar levels were tested before administration of cold drink and 2 hours after administration of drink.

Result: From our data we found that 90% of younger generation consumes soft drinks. The frequency of consumption was 51% daily. Black colored drink is most preferred (39%) among different brands and white soft drink is liked by 28% youth. 62% of youth prefer colored drinks. Black drink had the highest sugar content, followed by green, orange and white. Our experimental study showed highly significant ($p < 0.001$) increase in blood glucose levels in animals given black colored drink.

Conclusion: Youth are addicted to cold drinks and they preferred colored cold drink over non-colored which can lead to different health problems.

INTRODUCTION

Soft drink belongs to class of non-alcoholic beverages which contains artificial flavorings, sweetening agents, edible acids and sometimes includes juice as well. In the 17th century the Europeans produced carbonated drinks and waters to imitate the effervescent waters found in springs which had therapeutic value [1]. Nowadays carbonated drinks are commonly referred to as "Soft drinks". Pop and soda are some other names which are commonly used in United States and Canada for carbonated Beverages [2].

Rates of soft drink utilization has expanded everywhere throughout the world amid most recent couple of decades [3,4]. Its utilization has extended quickly, to such an extent that soft drinks are right now the biggest single benefactors to vitality consumption [5]. Norway has the highest soft drink consumption around 115 liters/ inhabitant/year [6]. Soft drinks are commonly said to comprise of caffeine which has addictive property. Also, family propensities [7] accessibility of soft drinks at home [8] TV watching [9] taste inclination, fast food utilization

[10]. Skipping breakfast [11] and family suppers [12] have been appeared to be connected with young peoples' soft drink utilization.

Taste can also be one of the reasons of increased consumption of soft drinks. Taste sensations are classified as sweet, sour, salty and bitter. Complex flavors refer to those experiences that additionally include a retro nasal olfactory part, for example, substantial, smoldered, flower, fruity, citrusy, etc. [13]. Diseases such as Type II diabetes mellitus, metabolic syndromes, osteoporosis, and dental caries are some of the common conditions that can occur due to excessive use of cold drinks [14-16]. Excessive popularity of soft drinks in younger population has led to adolescent obesity as well as childhood obesity [5]. Popularity of Soft drinks has increased due to excellent campaigning by the companies; advertisements are placed in stores, eateries, petrol pumps, exhibition halls and even schools. Soft drinks do not possess nutritionally beneficial components. Refined sugars and distilled water are most predominant components. Single 330ml drink can cause an increase of more than 1 pound each month. The overall content of sugar in beverages is very high. Fanta contains 24gm of sugar per 200 ml. while Coca Cola 21.2 gm, Pepsi 21.2 gm, 7up has 13.2gm and Sprite contains 13.2 gm of sugar per 200 ml. Phosphate is present in abnormal amounts in soda. Hyperphosphatemia can lead to increase the risk of bone diseases [17]. Hence frequent consumption of soft drinks increases chances of osteoporosis especially in females, as their milk intake is also low [18,19]. High soda utilization especially cola [20].

In youngster's hyperphosphatemia represents significant risk factor for debilitated calcification of developing bones. Consumption of 1-2 cans/day of soft drinks increases risk of developing type II diabetes [21]. According to research study conducted at Harvard school of Public Health by Dr. Frank Hu, obesity related diseases can be diminished by decreasing utilization of sugary soft drinks [22].

Our present study is based on evaluating the use of cold drinks in younger population, preference of soft drinks, reason of preference and effects observed. Besides that, experimental study was also conducted to evaluate the effect of different soft drinks on blood glucose level.

METHODOLOGY

Survey

It is cross sectional survey-based study carried on young generation N=200 age 15-25 years both male and female from different colleges and universities in Karachi. The survey consisted of 10 questions the answers were recorded as open and close ended.

Animal testing

An acute one-day study was carried out on 5 groups comprising of 6 Rabbits each weighing 1-2.5 kg. Group I was given 5 ml distilled water, Group II was given 5ml black drink, Group III was given 5ml green drink, Group IV was given 5ml Orange drink and Group V was given 5ml White drink.

Blood sugar levels were tested before administration of cold drink and 2 hours after administration of drink using glucometer.

RESULTS

SPSS version 20 was used for statistical evaluation of data. Binomial test, Chi-square test and two-way Anova using post hoc Tukey's test for multiple comparisons was used for evaluating the data. Microsoft excel 2010 was used for representation of graphs. (n=6) Statistical analysis has been done by two-way Anova. Post hoc analysis by Tukey's test show P values $p < 0.001$ as highly significant as compared to control $p < 0.001$ is considered highly significant when compared with black drink.

$P < 0.001$ is considered highly significant when compared with orange drink $p < 0.001$ is considered highly significant when compared with dew $p < 0.001$ is considered highly significant

when compared with white drink and reason of preference.

DISCUSSION

Soft drink may include soda, canned juices, energy and sports drink. Soft drinks usually comprise of carbonated water along with some flavoring agent and sweetener. Soft drinks are usually nonalcoholic beverages [23-25]. The sharpness of flavor and slight burning sensation is due to presence of carbonic acid which also makes the drinks slightly acidic. By introduction of CO₂ under pressure, carbonated beverages are prepared [26]. Type IV caramel color is a very common ingredient in soft drinks which is produced by ammonium compounds and can increase risk of carcinogenicity due to formation of 4-MEI (4-methylimidazole) [27-29]. Although soft drinks are very popular around the world, their consumption in large quantities has raised serious questions about their effects on health [30,31]. Recently a lot of concerns have raised that whether overconsumption of soft drinks lead to energy and nutrient depletion and are risk factors for chronic diseases such as diabetes

and obesity [32, 33]. Soft drink consumption has become a highly visible and controversial public health and public policy issue [34].

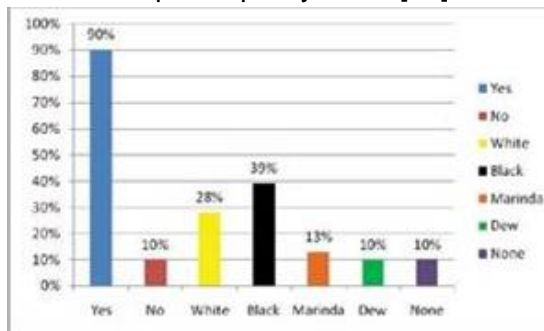


Figure 1. Consumption of soft drinks and preferred brand.

Figure 1 shows consumption of soft drinks and preferred Brands. Our results show that 90% of the population consumes soft drinks and only 10% of the population reported as non-consumers.

Table 1 also shows that highly significant ($p < 0.001$) population consumed soft drink by Binomial test. The most preferable brand is black (Coke or Pepsi) i.e. 39% among all colored drinks and the second most preferable soft drink is white (28%).

Table 1. Binomial test showing consumption and negative effects due to consumption of soft drinks.

		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
Consumption of soft drink	Group 1	yes	180	0.90	0.50	0.000
	Group 2	no	20	0.10		
Negative effects due to consumption	Group 1	yes	32	0.16	0.50	0.000
	Group 2	no	168	0.84		

Table 2. Brand preference among the population.

	Observed N	Expected N	Residual
White	56	40.0	16.0
Black	78	40.0	38.0
Marinda	26	40.0	-14.0
Dew	20	40.0	-20.0
None	20	40.0	-20.0
Total	200		

Table 2 shows that by applying Chi-Square we found that black drink had highest residual value of 38 showing its consumption is greatest. Literature says that over last 30 years sugary drinks consumption has increased specially in children and adult population [35]. People aged 18-34 years had highest consumption of soft drinks i.e. at least once daily [36,37].

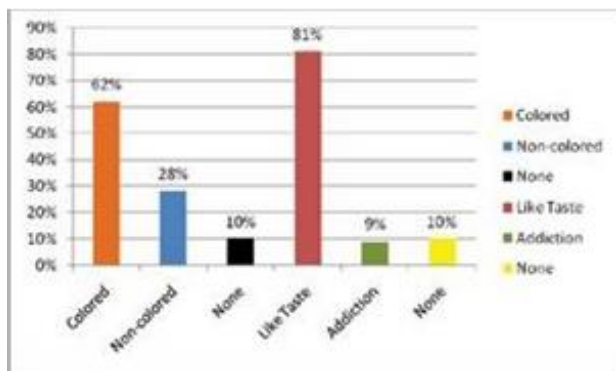


Figure 2. Preference of colored versus non-colored drinks.

Figure 2 shows preference of colored versus non-colored drinks and reason of preference. Our results reported the most preferable use of colored drinks (62%) instead of Non-colored (28%) among the population while 10% of the population prefers none of these. Major reason of preference is found, likeness of taste (81%) with some other reason like Addiction (9%) while 10% prefers colored drinks for no reason. Factors influencing preference to soft drinks are Brand, Price, Packaging, Taste, Color, Advertisement, and Size. In selection of soft drinks people prefer taste, quality and advertisement of product rather than company's name and brand. It was also found that people are attracted for Coca-Cola advertisement most. Preferences vary according to age group of customers [38].

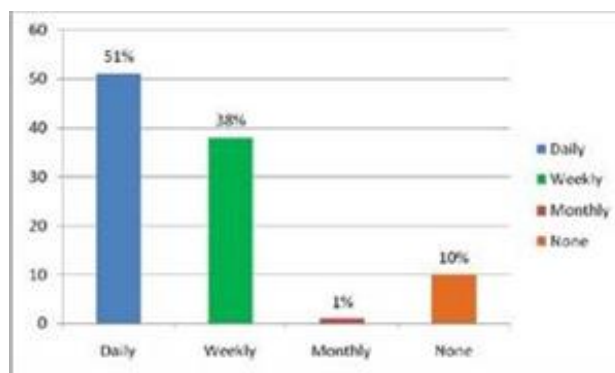


Figure 3. Frequency of consumption.

Figure 3 shows frequency of consumption. Our results supported the higher frequency of consumption on daily basis (51%) with second highest frequency of weekly consumption (38%) and only 1% monthly. Studies shows approximately one-third of participants reported consuming an SSB (Sugar Sweetened Beverages) more than once during their 24-h recall [39]. Soft drink is an important product item in modern society both urban and rural and becoming more popular in the consumer world. At present soft drink market is one of the most competitive markets in the world [40]. Figure 4 shows negative effects felt due to consumption. With our results we have found negative effects in only 16% of the whole population while 84% didn't feel negative effects due to consumption of soft drink.

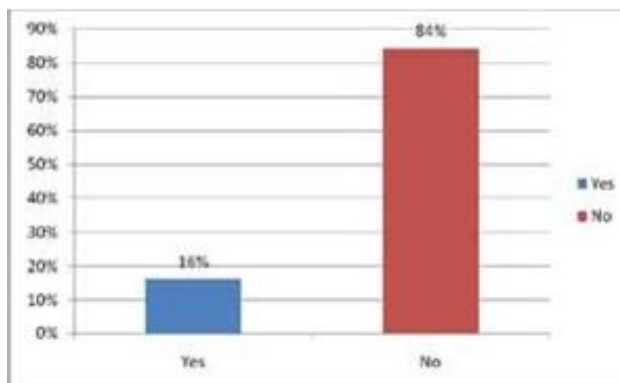


Figure 4. Negative effects felt due to consumption.

Table 3. Effect of different soft drinks on blood glucose level.

Groups	Baseline Mean \pm S.D	After 2 Hours Mean \pm S.D
Control	96.5 \pm 1.04	95.5 \pm 0.51
Black	94.8 \pm 1.16	176.3 \pm 1.73
White	92.1 \pm 0.77	91.0 \pm 1.80
Marinda	94.1 \pm 1.47	113.6 \pm 1.67
Dew	94.8 \pm 0.75	149.5 \pm 0.56

Table 1 also shows that highly significant ($p < 0.001$) population did not suffer from adverse effects after consumption of soft drinks by binomial testing. Studies shows that those who drank a sugary beverage each day had a 20 percent increased risk of having a heart attack [41].

Table 3 shows effect on sugar level before and 2 hours after consumption of colored versus Non-colored drink. Our experimental results reported that Black (Pepsi) affects the blood sugar level the most and highly significantly ($p < 0.001$) increases blood glucose level when compared with all soft drinks as well as control. On the other hand, white drink showed highly significantly ($p < 0.001$) decrease blood glucose level when compared with other drinks as well as control. Dew and Marinda also highly significantly ($p < 0.001$) increased the blood glucose level when compared with control. Studies on the health effects of drinking diet soda have examined connections to a variety of conditions and indicators of health. In many cases, the results have been especially relevant to people who already have Type 2 diabetes or are at risk of developing it [42]. U.S. dietary guidelines issued in 2010 recommend limiting the consumption of foods and beverages with added sugars.

CONCLUSION

In a word, two detection methods were simple, no trauma and low-costed. As the single application had no statistical difference for the diagnosis coincidence rate, it could be applied

according to their advantages and the specific conditions of patients. The combined application could obviously increase the detection rate and accuracy rate on breast cancer, increase misdiagnosis rate and missed diagnosis rate. It had important significance on early stage breast cancer.

REFERENCES

1. Pietka MJ, Korab HE. "Soft drink" Encyclopædia 2016.
2. Riley JJ. Organization in the soft drink industry: a history of the American Bottlers of Carbonated Beverages. American Bottlers of Carbonated Beverages; 1946.
3. Harrington S. The role of sugar-sweetened beverage consumption in adolescent obesity: a review of the literature. *J Sch Nurs.* 2008; 24(1):3-12.
4. Øverby NC, Lillegaard IT, Johansson L, Andersen LF. High intake of added sugar among Norwegian children and adolescents. *Public Health Nutr.* 2004; 7(2):285-93.
5. Fletcher JM, Frisvold DE, Tefft N. The effects of soft drink taxes on child and adolescent consumption and weight outcomes. *J Public Econ.* 2010; 94(11-12):967-74.
6. Lien L, Lien N, Heyerdahl S, Thoresen M, Bjertness E. Consumption of soft drinks and hyperactivity, mental distress, and conduct problems among adolescents in Oslo, Norway. *Am J Public Health.* 2006; 96(10):1815-20.
7. Vågstrand K, Linné Y, Karlsson J, Elfhag K, Lindroos AK. Correlates of soft drink and fruit juice consumption among Swedish adolescents. *Br J Nutr.* 2009; 101(10):1541-8.
8. Grimm GC, Harnack L, Story M. Factors associated with soft drink consumption in school-aged children. *J Am Diet Assoc.* 2004; 104(8):1244-9.

9. Giammattei J, Blix G, Marshak HH, Wollitzer AO, Pettitt DJ. Television watching and soft drink consumption: associations with obesity in 11-to 13-year-old schoolchildren. *Arch Pediatr Adolesc Med.* 2003; 157(9):882-6.
10. French SA, Lin BH, Guthrie JF. National trends in soft drink consumption among children and adolescents age 6 to 17 years: prevalence, amounts, and sources, 1977/1978 to 1994/1998. *J Am Diet Assoc.* 2003;103(10):1326-31.
11. Matthys C, De Henauw S, Bellemans M, De Maeyer M, De Backer G. Breakfast habits affect overall nutrient profiles in adolescents. *Public Health Nutr.* 2007;10(4):413-21.
12. Neumark-Sztainer D, Hannan PJ, Story M, Croll J, Perry C. Family meal patterns: associations with sociodemographic characteristics and improved dietary intake among adolescents. *J Am Diet Assoc.* 2003; 103(3):317-22.
13. Spence C, Smith B, Auvray M. Confusing tastes and flavours. *Perception and its modalities.* 2015;247-74.
14. Adams L, Geuens M. Healthy or Unhealthy Slogans: That's the Question. *J Health Commun.* 2007;12(2):173-85.
15. Apovian CM. Sugar-sweetened soft drinks, obesity, and type 2 diabetes. *Jama.* 2004; 292(8):978-9.
16. Appleton KM, Blundell JE. Habitual high and low consumers of artificially-sweetened beverages: effects of sweet taste and energy on short-term appetite. *Physiol Behav.* 2007; 92(3):479-86.
17. Malik VS, Schulze MB, Hu FB. Intake of sugar-sweetened beverages and weight gain: a systematic review. *Am J Clin Nutr.* 2006; 84(2):274-88.
18. Tucker KL, Morita K, Qiao N, Hannan MT, Cupples LA, Kiel DP. Colas, but not other carbonated beverages, are associated with low bone mineral density in older women: The Framingham Osteoporosis Study. *Am J Clin Nutr.* 2006; 84(4):936-42.
19. Kristensen M, Jensen M, Kudsk J, Henriksen M, Mølgaard C. Short-term effects on bone turnover of replacing milk with cola beverages: a 10-day interventional study in young men. *Osteoporos Int.* 2005; 16(12):1803-8.
20. Ma D, Jones G. Soft drink and milk consumption, physical activity, bone mass, and upper limb fractures in children: a population-based case-control study. *Calcif Tissue Int.* 2004; 75(4):286-91.
21. Malik VS, Popkin BM, Bray GA, Després JP, Willett WC, Hu FB. Sugar sweetened beverages and risk of metabolic syndrome and type 2 diabetes: a meta-analysis. *Diabetes care.* 2010.
22. Hu FB. Resolved: there is sufficient scientific evidence that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases. *Obes Rev.* 2013; 14(8):606-19.
23. Alcala R, Bell R. Promoting nutrition and physical activity through social marketing: Current practices and recommendations. In *Promoting nutrition and physical activity through social marketing: current practices and recommendations 2000.* University of California. Center for Advanced Studies in Nutrition and Social Marketing.
24. Gillis J. *The Thinking Tamil.*
25. Wang YC, Bleich SN, Gortmaker SL. Increasing caloric contribution from sugar-sweetened beverages and 100% fruit juices among US children and adolescents, 1988–2004. *Pediatrics.* 2008; 121(6): e1604-14.
26. Smith TJ, Wolfson JA, Jiao D, Crupain MJ, Rangan U, Sapkota A, Bleich SN, Nachman KE. Caramel color in soft drinks and exposure to 4-methylimidazole: a quantitative risk assessment. *PloS one.* 2015; 10(2): e0118138.
27. Jacobson MF. Carcinogenicity and regulation of caramel colorings. *Int J Occup Environ Health.* 2012; 18(3):254-9.
28. Ye H, Chen X, Feng Z. Preparations of magnetic molecularly imprinted polymer for selective recognition and determination of 4-methylimidazole in soft beverage by high performance liquid chromatography. *Adsorp Sci Technol.* 2017; 35(1-2):37-54.
29. Giudici P, Lemmetti F, Mazza S. *Balsamic Vinegars. Tradition, Technology, Trade.* Cham: Springer. 2015.
30. Ashurst P. *Chemistry and Technology of Soft Drinks and Juices* Blackwell. 2005, Oxford.
31. Lustig RH, Schmidt LA, Brindis CD. Public health: the toxic truth about sugar. *Nature.* 2012; 482(7383):27.
32. Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. *Am J Public Health.* 2007; 97(4):667-75.
33. Schor J. *Born to buy: The commercial culture and the new consumer culture.* New York: Scribner. 2004.
34. Sebastian RS, Cleveland LE, Goldman JD, Moshfegh AJ. Trends in the food intakes of children 1977–2002. *Consumer Interests Annual.* 2006; 52:433-4.

35. Kumar GS, Pan L, Park S, Lee-Kwan SH, Onufrak S, Blanck HM. Sugar-sweetened beverage consumption among adults--18 states, 2012. *MMWR. Morb Mortal Wkly Rep.* 2014; 63(32):686-90.
36. Guthrie JF, Morton JF. Food sources of added sweeteners in the diets of Americans. *J Am Diet Assoc.* 2000; 100(1):43-51.
37. Welsh JA, Sharma AJ, Grellinger L, Vos MB. Consumption of added sugars is decreasing in the United States. *Am J Clin Nutr.* 2011; 94(3):726-34.
38. Kit BK, Fakhouri TH, Park S, Nielsen SJ, Ogden CL. Trends in sugar-sweetened beverage consumption among youth and adults in the United States: 1999–2010. *Am J Clin Nutr.* 2013; 98(1):180-8.
39. Jiménez-Cruz A, Bacardí-Gascón M, Jones EG. Consumption of fruits, vegetables, soft drinks, and high-fat-containing snacks among Mexican children on the Mexico-US border. *Arch Med Res.* 2002; 33(1):74-80.
40. Raju PS. Consumer behavior in global markets: the ABCD paradigm and its application to Eastern Europe and the Third World. *J Consum Mark.* 1995; 12(5):37-56.
41. Davy BM, Harrell K, Stewart J, King DS. Body weight status, dietary habits, and physical activity levels of middle school-aged children in rural Mississippi. *South Med J.* 2004; 97(6):571-7.
42. Rubin RR, Peyrot M. Psychological issues and treatments for people with diabetes. *Clin Psychol Psychother.* 2001; 57(4):457-78.