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Impact of Caloric Beverage Consumption on Weight and Health Status of Pre-school Children: A study in Egypt

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Abstract: Background: Several studies found reliable evidence to back-up the fact of negative impact of high intake of sugar sweetened beverages (SSBs) on children's health and expose them to overweight/obesity risk. The high consumption of sugar sweetened beverage has increased in parallel to the obesity epidemic all over the world and therefore, the World Health Organization considered that high intake of SSBs may be responsible for extra calories which is more than child's energy requirements and leading to weight gain. **Objectives:** To describe preschool children's consumption of different beverages' categories and to assess impact of sugar sweetened beverages consumption on their body mass index. **Methods**: observational cross sectional analytical study was implemented on 450 preschool children aged two to six years in Cairo and Suez governorates. Data was collected from five primary health care units (PHCs). Four of which are located in Cairo and one in Suez governorates. **Results:** Normal weight children had significantly higher intake of milk and herbal drinks than wasted and obese children. On the other hand, 80% and more of overweight and obese children were found to consume higher quantities of canned/sugar added fruit juices as well as soda drinks. Children suffering from chronic diseases was found to have low intake of milk (68%) and natural fruit juices (96%) with statistical significance. **Conclusion:** Consumption of sugar-sweetened beverages and/or soda drinks was significantly related to overweight and obese preschool children. Meanwhile, high intake of milk and herbal drinks was found associated to normal weight children than wasted or obese ones.

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Key words: Sugar sweetened beverages, pre-school children, obesity, body mass index, milk intake.

1. Introduction

The dramatic increase in childhood obesity is of significant public health concern worldwide [1] and it is considered as a predisposing factor for obesity-related diseases and their consequences which affects an individual's future health status as an adolescent and as an adult later in life. [2]. The World Health Organization (WHO) has reported that most of overweight or obese children were found to be located mainly in low- and middle-income countries, particularly in Northern and Southern Africa, the Middle East and the Pacific Islands, where this problem has been growing more rapidly than in developed countries [3]. Given these facts, and in addition, that over 38 million children aged under 5 living with overweight or obesity in 2017, [4]. Efforts are being made to identify risk factors and to plan effective interventions to help in reducing the impact of this growing problem. Eating habits are established early in life, making preschool-age children a critical group to focus on. [5] A child's first five years of life is the period during which food preferences and practices develop to serve as the basis for future eating habits [6]. Several studies worldwide was done to describe beverage consumption among preschool-aged children and its association with obesity. [7]. It was found that the regular consumption of high caloric beverages among preschool children is thought to contribute to weight gain. [8] And it was stated that Childhood obesity is linked to the consumption of sugar-sweetened beverages (SSBs) by many researchers [9-11]. Only a few studies are available on Egyptian children's dietary habits including some beverage consumption, but none of these covered pore-school aged children. Therefore, the aim of our study was to delineate the beverage intake among low-income preschool children and investigate associations between types and amounts of beverages consumed and weight status amongest this age group.

2. Subjects and Methods

Study design:

Observational cross sectional analytical study.

Study population and setting:

The study was implemented on preschool children (n=450) aged two to six years in Cairo and Suezgovernorates, from January to March 2018. The data was collected from five primary health care units (PHCs). Four of which are located in Cairo and one in Suez governorates.

Sample size and technique:

Epi-calc 2000 was used to calculate the sample size of this cross sectional study. Assuming 80% power, 0.05 level of significance, 54.5% null hypothesis value and estimated proportion of 61%. Sample size = 450 preschool children (two to six years).

Data collection and study tools:

Beverage Consumption interview guided Questionnaire was used for data collection from interviewing the parents of the studied population. The used interview guided Questionnaire tool was created and validated by the staff in Clinical Nutrition department -Egyptian National Nutrition Institution. The Beverage Consumption interview guided Questionnaire included items of average daily intake, amount and frequency of consumption of the following categories of drinks: 1-fresh natural juices, 2-canned/sugar added juices (canned fruit juices, canned fruit juices with milk and tang powder), 3-milk (pure milk, fruit milk, milk tea, milk fenugreek, milk grains, yogurt drink and sopia), 4- water, 5-Caffinated drinks (tea, coffee, nescafe and other caffeine drinks with creamer), 6- herbal drinks (mint, cinnamon, chamomile, ginger, doum, tamarind and kharop), 7-carbonated soft drinks (cola – pepsi, seven up – sprite, Miranda, barley, fayrouz). The total intake was assessed as high and low intake from each category by using the median of cases' responses all through the questions of daily intake, amount and frequency.

Body Mass Index (BMI) was calculated from height and weight measurements and adjusted for age. A BMI score was computed from recorded height and weight. Overweight and obesity were defined by national reference age-sex specific BMI. Overweight and obesity were defined by national reference age-sex specific BMI: those with an age-sex specific BMI>or=85th, but <95th percentile as overweight and those with BMI>or=95th age-sex specific percentile as obese, BMI = 5th percentile to <85th percentile as normal or healthy Weight and BMI <5th percentile as wasted **[12].** Physical activity levels were assessed using data recorded from the questionnaire.

Statistical Analysis:

Microsoft excel 2013was used for data entry and the statistical package for social science (SPSS version 21) was used for data analysis.

Simple descriptive statistics (arithmetic mean and standard deviation) used for summary of normal quantitative data and frequencies used for qualitative data. Bivariate relationship was displayed in cross tabulations and Comparison of proportions was performed using the chi-square and Fisher's exact tests where appropriate. The level of significance was set at probability (P) value <0.05.

Ethical consideration:

The researchers thoroughly described the study and its purpose, and took a few minutes before administering the questionnaire to explain the nature of the questionnaire and to answer any question that the parents had. Then asked for an approval from the parents. Only those who agreed were included. Strict confidentiality and privacy was maintained throughout the process of data collection, entry and analysis.

3. Results

A total of 450 children were analyzed, of which (48.2%) were males with mean age 3.7±1.1 years. About 12 % of the children were overweight or at risk for overweight (BMI ≥85%), and 3.3% were obese (BMI ≥95%). There were no statistically significant differences in BMI between boys and girls. Obese children tended to be older (mean age: 4.3±0.8 years) compared with the normal-weight children (mean age: 3.6±1.1 years) with a statistical significant differences (P-value= 0.012). In **(Table 1)** About 33% percent of the wasted children suffered from chronic diseases compared to 11.5% of the overweight ones and none of the obese ones had any chronic diseases with statistical significant difference (P-value=0.005)**.** About 45% of children had an intake of milk and similarly from water and herbal drinks but only 14.7% drank natural fruit juices. Thirteen percent drank caffeinated drinks, and 48% drank soda **(Table 2)**. As regards the relation between BMI categories and beverage consumption pattern, normal weight children had high intake of milk and herbal drinks as compared to wasted and obese children with a statistical significant difference (P-value≤0.05). Nearly 81% of the overweight children and 93.3% of the obese ones consumed canned/sugar added fruit juices frequently compared to only 41.2% of the normal ones. As well regarding soda drinks, overweight and obese children had higher intake than normal ones with highly statistical significant difference (P-value≤0.001) **(Table 3)**. Children suffering from chronic diseases had low intake of milk (68%) and natural fruit juices

(96%) with statistical significant difference (P-value≤0.05) **(Table 4)**.

4. Discussion

Describing the pattern of beverages consumption among 450 preschool two to six years old children in Cairo and Suez governorates, it was noticeable that consumption of what is considered healthy drinks was low where almost half of the participants were consuming less quantities of milk, water and herbal drinks and even less number of them (14.7%) were consuming natural fresh juices in comparison to their consumption of the canned/sugar-added beverages (46.4%).

Table (1) Comparison between different BMI categories and Health status of the studied group of children:

		BMI categories								
		Wasted		Normal		Overweight		Obese		
		Count	%	Count	%	Count	%	Count	%	P value
Chronic diseases	Yes	7	33.3%	37	10.2%	6	11.5%	0	0.0%	**0.005***
	No	14	66.7%	325	89.8%	46	88.5%	15	100.0%	
Types	Asthma	1	16.7%	20	55.6%	3	50.0%	0	0.0%	0.118
	DM	0	0.0%	0	0.0%	1	16.7%	0	0.0%	
	Lactose intolerance	0	0.0%	1	2.8%	2	33.3%	0	0.0%	
	Anemia	0	0.0%	1	2.8%	0	0.0%	0	0.0%	
	Chronic tonsilitis	2	33.3%	6	16.7%	0	0.0%	0	0.0%	
	Celiac disease	0	0.0%	1	2.8%	0	0.0%	0	0.0%	
	Congenital heart	1	16.7%	2	5.6%	0	0.0%	0	0.0%	
	Colon disease	0	0.0%	1	2.8%	0	0.0%	0	0.0%	
	Vision problem	0	0.0%	1	2.8%	0	0.0%	0	0.0%	
	Parasites	2	33.3%	3	8.3%	0	0.0%	0	0.0%	

Table (2) Frequency distribution of the consumption pattern of different beverage categories:

		Count	Percent
Milk	Low intake	246	54.7%
	High intake	204	45.3%
Water	Low intake	253	56.2%
	High intake	197	43.8%
Natural fruit juices	Low intake	384	85.3%
	High intake	66	14.7%
Herbal Drinks	Low intake	252	56.0%
	High intake	198	44.0%
Canned/ Sugar added fruit juices*	High intake	209	46.4%
	Low intake	241	53.6%
Caffeinated Drinks*	High intake	59	13.1%
	Low intake	391	86.9%
Soda Drinks*	High intake	216	48.0%
	Low intake	234	52.0%

Table (3): Comparison between different beverage consumption patterns as regards BMI categories:

		BMI categories								
		Wasted		Normal		Overweight		Obese		
		Count	%	Count	%	Count	%	Count	%	P value
Milk	Low intake	18	85.7%	213	58.8%	11	21.2%	4	26.7%	**<0.001***
	High intake	3	14.3%	149	41.2%	41	78.8%	11	73.3%	
Water	Low intake	11	52.4%	197	54.4%	35	67.3%	10	66.7%	0.276
	High intake	10	47.6%	165	45.6%	17	32.7%	5	33.3%	
Natural fruit juices	Low intake	19	90.5%	309	85.4%	45	86.5%	11	73.3%	0.526
	High intake	2	9.5%	53	14.6%	7	13.5%	4	26.7%	
Herbal Drinks	Low intake	12	57.1%	190	52.5%	37	71.2%	13	86.7%	**0.006***
	High intake	9	42.9%	172	47.5%	15	28.8%	2	13.3%	
Canned/ Sugar added fruit juices*	High intake	4	19.0%	149	41.2%	42	80.8%	14	93.3%	**<0.001***
	Low intake	17	81.0%	213	58.8%	10	19.2%	1	6.7%	
Caffeinated Drinks*	High intake	6	28.6%	43	11.9%	8	15.4%	2	13.3%	0.163
	Low intake	15	71.4%	319	88.1%	44	84.6%	13	86.7%	
Soda Drinks*	High intake	4	19.0%	154	42.5%	47	90.4%	11	73.3%	**<0.001***
	Low intake	17	81.0%	208	57.5%	5	9.6%	4	26.7%	

Table (4): Comparison between different beverage consumption patterns as regards health status:

		Chronic diseases				
		Yes		No		
		Count	%	Count	%	P value
Milk	Low intake	34	68.0%	212	53.0%	**0.045***
	High intake	16	32.0%	188	47.0%	
Water	Low intake	28	56.0%	225	56.3%	0.973
	High intake	22	44.0%	175	43.8%	
Natural fruit juices	Low intake	48	96.0%	336	84.0%	**0.024***
	High intake	2	4.0%	64	16.0%	
Herbal Drinks	Low intake	27	54.0%	225	56.3%	0.763
	High intake	23	46.0%	175	43.8%	
Canned/ Sugar added fruit juices*	High intake	7	14.0%	202	50.5%	**<0.001***
	Low intake	43	86.0%	198	49.5%	
Caffeinated Drinks*	High intake	8	16.0%	51	12.8%	0.521
	Low intake	42	84.0%	349	87.3%	
Soda Drinks*	High intake	14	28.0%	202	50.5%	**0.003***
	Low intake	36	72.0%	198	49.5%	

In this present study we also investigated the influence of different beverages consumption behaviors of 450 preschool aged children on their Body Mass Index and its relation to their health status. It was found that almost 16% of all participant children were overweight and/or obese, whereas 80% or more of them were found to be consuming high intake of canned/sugar-added beverages and/or soda drinks. These findings are consistent with those from previous studies that found that preschool aged from two to six years children drinking Sugar added beverages demonstrated associations with higher BMI [13] and also that high intake of sugar-sweetened beverages in preschool aged children is associated with poor eating habits, and increased risk of childhood obesity. [14]

Hence the vast majority of the overweight and obese children were high consumers of canned/sugar-added beverages and/or soda drinks, this kind of beverages add an energy dense yet nutrient poor items to children's daily diet and consequently increasing the risk of developing obesity. Prior studies have also highlighted some similar findings, one cross-sectional study among 9600 children ages of four and five years, where intake of sugar-containing beverages was directly associated with BMI [15]. In another study, association was observed between the consumption of sugar-sweetened soft drinks and obesity even though

this association was not statistically significant [16]. Another study upon two years old children has described a higher percentage of obesity among participants which was consuming one or more soft drinks daily [17], despite of other studies among United States children under 5 years old which have shown variable results between soft drinks and weight gain, overweight or obesity [18-19]. The absence of consistency between different studies may be a result of several reasons, for an example; lesser sample size of participants, the different range in children's age, classification criteria of obesity, or the variations in defining and assessing canned/sugar-added beverages.

Information relating the amount of milk intake to the weight status of preschool aged children are inadequate and contradictory. Some studies reported that there is no association between the quantity of milk consumption and body mass index [20-23]; yet other studies stated that lower BMI *z*-scores for children with higher milk intake [24-26] (or less body fat with higher total dairy [27-28]; and there is one study found a higher BMI in children drinking more than three servings of milk per day [29]. Given these previous results, findings from the current study found that a significant high intake of milk was found with normal BMI preschool children compared to wasted and/or obese ones. Same association was found with water and herbal beverage consumption among these preschool children as it was of high intake of those with normal BMI.

Another interesting significant relation was found between participants suffering from chronic disease and bad health conditions with higher consumption of canned/sugar-added beverages and/or soda drinks, while those with better health were related to higher consumption of milk and natural fruit juices. More than a few researchers have explored the effect of Sugar sweetened beverages on health condition over the past years. The link between high consumption of Sugar sweetened beverages and a number of health consequences among adults was confirmed through evident based studies including weight gain [30-31], cardiovascular risk factors [32], insulin resistance and type 2 diabetes [33-34] and non-alcoholic fatty liver disease [35]. Similar researches for children are more limited and dedicated to weight gain [30] and dental caries [36], in addition to insulin resistance to a lesser extent [37-38].

Conclusion:

In conclusion, consumption of sugar-sweetened beverages and/or soda drinks was significantly related to overweight and obese preschool children. Meanwhile, high intake of milk and herbal drinks was found associated to normal weight children than wasted or obese ones. Future research is needed to explore in-depth the link between health risks and high consumption of Sugar sweetened beverages among same age category.

Table (1) Comparison between different BMI categories and Health status of the studied group of children:

		BMI categories								
		Wasted		**Normal**		**Overweight**		**Obese**		
		Count	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**P value**
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	Celiac disease	0	0.0%	1	2.8%	0	0.0%	0	0.0%	
	Congenital heart	1	16.7%	2	5.6%	0	0.0%	0	0.0%	
	Colon disease	0	0.0%	1	2.8%	0	0.0%	0	0.0%	
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References:

1. Onis M, Blossner M: Prevalence and trends of overweight among preschool children in developing countries. Am J ClinNutr 2000, 72(4):1032-1039.
2. Afshin A, Forouzanfar MH, Reitsma MB, et al. Health effects of overweight and obesity in 195 countries over 25 years. N Engl J Med. 2017;377:13–27. [PMC free article] [PubMed] [Google Scholar].
3. WHO. Commission on Ending Childhood Obesity: Facts and figures on childhood obesity. 2014. [Google Scholar].
4. World Health Organization. Taking action on childhood obesity report.2018;7. WHO/NMH/PND/ECHO/18.1.
5. Charvet A,. Huffman FG. Beverage Intake and Its Effect on Body Weight Status among WIC Preschool-Age Children. J Obes. 2019 Jan 16;2019:3032457. doi: 10.1155/2019/3032457. eCollection 2019.
6. Birch L, Savage JS, Ventura A: Influences on the development of children's eating behaviors: from infancy to adolescence. Can J Diet Pract Res 2007, 68: s1–s56.
7. Rajeshwari R, Yang SJ, Nicklas TA, Berenson GS: Secular trends in children's sweetened-beverage consumption (1973 to 1994): the Bogalusa Heart Study. J Am Diet Assoc. 2005, 105 (2): 208-214. 10.1016/j.jada.2004.11.026.
8. Dubois L, Farmer A, Girard M, Peterson K. Regular sugar-sweetened beverage consumption between meals increases risk of overweight among preschool-aged children. J Am Diet Assoc. 2007 Jun;107(6):924-34; discussion 934-5.
9. Lim S, Zoellner JM, Lee JM, et al. Obesity and sugar sweetened beverages in African-American preschool children: a longitudinal study. Obesity (Silver Spring). 2009;17:1262-1268. doi:10.1038/oby.2008.656.
10. Nicklas TA, Yang SJ, Baranowski T, Zakeri I, Berenson G. Eating patterns and obesity in children. The Bogalusa heart study. Am J Prev Med. 2003;25: 9-16.
11. Ariza AJ, Chen EH, Binns HJ, Christoffel KK. Risk factors for overweight in five- to six-year-old Hispanic-American children: a pilot study. J Urban Health. 2004;81:150-161. doi:10.1093/jurban/jth091.
12. https://www.cdc.gov/obesity/childhood/defining.html.
13. Mark D. DeBoer, Rebecca J. Scharf, Ryan T. Demmer. Sugar-Sweetened Beverages and Weight Gain in 2- to 5-Year-Old Children. Pediatrics, September 2013, VOLUME 132 / ISSUE 3.
14. Manolis Linardakis, Katerina Sarri, Maria-Styliani Pateraki, Manolis Sbokos & Anthony Kafatos. Sugar-added beverages consumption among kindergarten children of Crete: effects on nutritional status and risk of obesity.2008, *BMC Public Health*volume 8, Article number: 279.
15. Shefferly, A.; Scharf, R.J.; DeBoer, M.D. Longitudinal evaluation of 100% fruit juice consumption on BMI status in 2-5-year-old children. *Pediatr Obes.*2016, *11*, 221–227. [Google Scholar] [CrossRef].
16. Sandra Gonzalez-Palacios, Eva-María Navarrete-Muñoz, Manoli García-de-la-Hera, Laura Torres-Collado, Loreto Santa-Marina, Pilar Amiano, Maria-Jose Lopez-Espinosa, Adonina Tardon, Isolina Riano-Galan, Martine Vrijheid, Jordi Sunyer and Jesus Vioque. Sugar-Containing Beverages Consumption and Obesity in Children Aged 4–5 Years in Spain: the INMA Study. Nutrients 2019, 11(8), 1772; https://doi.org/10.3390/nu11081772.
17. Lim, S.; Zoellner, J.M.; Lee, J.M.; Burt, B.A.; Sandretto, A.M.; Sohn, W.; Ismail, A.I.; Lepkowski, J.M. Obesity and Sugar-sweetened Beverages in African-American Preschool Children: A Longitudinal Study. Obesity2009, 17, 1262–1268. [Google Scholar] [CrossRef].
18. Newby, P.K.; Peterson, K.E.; Berkey, C.S.; Leppert, J.; Willett, W.C.; Colditz, G.A. Beverage consumption is not associated with changes in weight and body mass index among low-income preschool children in North Dakota. *J. Am. Diet. Assoc.* 2004, *104*, 1086–1094. [Google Scholar] [CrossRef].
19. Kral, T.V.E.; Stunkard, A.J.; Berkowitz, R.I.; Stallings, V.A.; Moore, R.H.; Faith, M.S. Beverage Consumption Patterns of Children Born at Different Risk of Obesity. *Obesity*2008, *16*, 1802–1808. [Google Scholar] [CrossRef].
20. Kral TVE, Stunkard AJ, Berkowitz RI, et al. Beverage consumption born at different risk of patterns of children obesity. Obesity.

2008;16(8):1802–08. doi: 10.1038/oby.2008.287. published Online First: Epub Date. [PMC free article] [PubMed] [CrossRef] [Google Scholar].
21. O'Connor TM, Yang S-J, Nicklas TA. Beverage intake among preschool children and its effect on weight status. Pediatrics. 2006;118(4): E1010–E18. doi: 10.1542/peds.2005-2348. published Online First: Epub Date. [PubMed] [CrossRef] [Google Scholar].
22. Forshee RA, Storey ML. Total beverage consumption and beverage choices among children and adolescents. International Journal of Food Sciences and Nutrition. 2003;54(4):297–307. doi: 10.1080/09637480120092143. published Online First: Epub Date. [PubMed] [CrossRef] [Google Scholar].
23. Phillips SM, Bandini LG, Cyr H, et al. Dairy food consumption and body weight and fatness studied longitudinally over the adolescent period. International Journal of Obesity. 2003;27(9):1106–13. doi: 10.1038/sj.ijo.0802370. published Online First: Epub Date. [PubMed] [CrossRef] [Google Scholar].
24. Barba G, Troiano E, Russo P, et al. Inverse association between body mass and frequency of milk consumption in children. British Journal of Nutrition. 2005;93(1):15–19. doi: 10.1079/bjn20041300. published Online First: Epub Date. [PubMed] [CrossRef] [Google Scholar].
25. Murphy MM, Douglass JS, Johnson RK, et al. Drinking flavored or plain milk is positively associated with nutrient intake and is not associated with adverse effects on weight status in US children and adolescents. Journal of the American Dietetic Association. 2008;108(4):631–39. doi: 10.1016/j.jada.2008.01.004. published Online First: Epub Date. [PubMed] [CrossRef] [Google Scholar].
26. Tanasescu M, Ferris AM, Himmelgreen DA, et al. Biobehavioral factors are associated with obesity in Puerto Rican children. Journal of Nutrition. 2000;130(7):1734–42. [PubMed] [Google Scholar].
27. Moore LL, Bradlee ML, Gao D, et al. Low dairy intake in early childhood predicts excess body fat gain. Obesity. 2006;14(6):1010–18. doi: 10.1038/oby.2006.116. published Online First: Epub Date. [PubMed] [CrossRef] [Google Scholar].
28. Carruth BR, Skinner JD. The role of dietary calcium and other nutrients in moderating body fat in preschool children. International Journal of Obesity. 2001;25(4):559–66. doi: 10.1038/sj.ijo.0801562. published Online First: Epub Date. [PubMed] [CrossRef] [Google Scholar].
29. Berkey CS, Rockett HRH, Willett WC, et al. Milk, dairy fat, dietary calcium, and weight gain - A longitudinal study of adolescents. Archives of Pediatrics & Adolescent Medicine. 2005;159(6):543–50. doi: 10.1001/archpedi.159.6.543. published Online First: Epub Date. [PubMed] [CrossRef] [Google Scholar].
30. Malik VS, Pan A, Willett WC, Hu FB. Sugar-sweetened beverages and weight gain in children and adults: a systematic review and meta-analysis. Am J ClinNutr. 2013;98(4):1084–1102. doi: 10.3945/ajcn.113.058362. [PMC free article] [PubMed] [CrossRef] [Google Scholar].
31. Resolved HFB. There is sufficient scientific evidence that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases. Obesity reviews: an official journal of the International Association for the Study of Obesity. 2013;14(8):606–619. doi: 10.1111/obr.12040. [PMC free article] [PubMed] [CrossRef] [Google Scholar].
32. Malik VS, Popkin BM, Bray GA, Després J-P, Hu FB. Sugar-sweetened beverages, obesity, type 2 diabetes mellitus, and cardiovascular disease risk. Circulation. 2010;121(11):1356–1364. doi: 10.1161/CIRCULATIONAHA.109.876185. [PMC free article] [PubMed] [CrossRef] [Google Scholar].
33. Malik VS, Popkin BM, Bray GA, Després J-P, Willett WC, Hu FB. Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes. Diabetes Care. 2010;33(11):2477–2483. doi: 10.2337/dc10-1079. [PMC free article] [PubMed] [CrossRef] [Google Scholar].
34. Schulze MB, Manson JE, Ludwig DS, Colditz GA, Stampfer MJ, Willett WC, et al. Sugar-sweetened beverages, weight gain, and incidence of type 2 diabetes in young and middle-aged women. JAMA. 2004;292(8):927–934. doi: 10.1001/jama.292.8.927. [PubMed] [CrossRef] [Google Scholar].
35. Nseir W, Nassar F, Assy N. Soft drinks consumption and nonalcoholic fatty liver disease. World J Gastroenterol: WJG. 2010;16(21):2579. doi: 10.3748/wjg.v16.i21.2579. [PMC free article] [PubMed] [CrossRef] [Google Scholar].
36. Tahmassebi J, Duggal M, Malik-Kotru G, Curzon M. Soft drinks and dental health: a review of the current literature. J Dent. 2006;34(1):2–11. doi:

10.1016/j.jdent.2004.11.006. [PubMed] [CrossRef] [Google Scholar].

37. Davis JN, Ventura EE, Weigensberg MJ, Ball GD, Cruz ML, Shaibi GQ, et al. The relation of sugar intake to β cell function in overweight Latino children. Am J ClinNutr. 2005;82(5):1004–1010. [PMC free article] [PubMed] [Google Scholar].

38. Hu FB, Malik VS. Sugar-sweetened beverages and risk of obesity and type 2 diabetes: epidemiologic evidence. PhysiolBehav. 2010;100(1):47–54. doi: 10.1016/j.physbeh.2010.01.036. [PMC free article] [PubMed] [CrossRef] [Google Scholar].

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