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Article

Accepted Version

Chu, B. T. Y., Irigaray, C. P., Hillier, S. E. and Clegg, M. E. (2020) The sugar content of children's and lunchbox beverages sold in the UK before and after the soft drink industry levy. European Journal of Clinical Nutrition, 74. pp. 598-603. ISSN 0954-3007 doi: 10.1038/s41430-019-0489-7 Available at https://centaur.reading.ac.uk/85179/

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To link to this article DOI: http://dx.doi.org/10.1038/s41430-019-0489-7

Publisher: Nature Publishing Group

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The sugar content of children's and lunchbox beverages sold in the UK before and after the Soft Drink Industry Levy

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Running title: Sugar content of children's beverages

Abstract

Background: Childhood obesity is associated with an increased intake of sugary soft drinks and juice drinks. The aims of this study were (1) to report the sugar and energy content in commercial fruit juice (FJ), juice drinks (JD) and smoothies (S) specifically targeted at children in the UK, (2) to identify beverages liable for the Soft Drinks Industry Levy (SDIL) and (3) to compare the amount of sugar in these beverages before and after the levy.

Methods: The beverages were retrieved using the online shopping tool my Supermarket, websites of nine major supermarket in the UK and manufacturers webpages. Comparisons of sugar content were taken before and after the introduction of the SDIL.

Results: 131 FJJDS fulfilled the inclusion criteria. The mean sugar content of all the beverages was 6.3g±4.5/100mL. There was large variation in the sugar content from 0.1g/100mL to 15.2g/100mL, with smoothies found to contain the most sugar (11.55±1.62 g/mL). The beverages were reanalysed in September 2018 to determine their eligibility for the SDIL. Of the 131 products only 7 JD were eligible for the levy. Four of these beverages had reformulated their ingredients since the initial analysis resulting in a sugar content of <5g/100mL.

Conclusions: The majority of the beverages targeted at children and children's lunch boxes were not eligible for the SDIL. This study suggests the necessity to adapt the SDIL to include all FJJDS aimed at children as the total sugar content of these beverages are still above the recommended quantities for this age group.

Introduction

Over the last 40 year's children and adolescent's obesity rate has risen from 11 million to 124 million (1). In the U.K. specifically, 9.6% of children aged 4-5 years and 20.1% of children aged 10-11-year are obese (2). Childhood obesity is known to increase the risk of becoming obese in adulthood and can lead to serious health consequences including an increased risk of developing type 2 diabetes mellitus and cardiovascular disease (3). The pathophysiology of childhood obesity is multifaceted, combining factors such as genetic susceptibility, dietary consumption and lifestyles (4). As a result of this there are growing concerns surrounding the implications of childhood obesity and Governments are required to urgently deal with what is one of the most serious health challenges of this century.

The high intake of sugar in children, especially sugar added to food products has come under scrutiny as a contributing factor to childhood obesity (5). Moreover, childhood obesity has been associated with an increased intake of sugary soft drinks and juice drinks (6). Prospective cohort studies have shown risk of developing dental caries and type 2 diabetes is associated with a greater consumption of sugar in children (7). The Scientific Advisory Committee on Nutrition (SACN) recommends that free sugar should total no more than 5% of the total daily energy intake (7). They define free sugars as the sugars added to foods and beverages by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrups and fruit juice.

For a child under 3 years, plain water and milk are the recommended beverages that should be consumed (8) in order to prevent tooth decay and other possible adverse health outcome, including childhood obesity and type 2 diabetes (7). Children aged 5-11 years should continue to consume water and milk as the primary source of hydration, however fruit juice (FJ), juice drinks (JD) and smoothies (S) can be consumed in quantities of no more than a small glass (150mL) per day (9). However, in the latest National Diet and Nutrition Survey (NDNS) (10) fruit juice contributed 12%

of free sugar intake in children aged 1.5-3 years, 11% in 4 to 10 year olds and 10% in 11 to 18 years. In addition, previous data from the National Diet and Nutrition Survey 2008–2011, showed that the volume of fruit juice drink (which may or may not include sugar) intake in 4-8 year olds contributed to 241.3mL/day intake compared to a 240.5mL/day intake of milk. In 9-13 year olds, this was 242.8mL/day of fruit drink compared to 184.9mL/ day of milk (11). This highlights the large consumption rate of these types of beverages in UK children's diets and potential contribution to free sugar intake.

On the 6th of April 2018 the U.K. government implemented the Soft Drinks Industry Levy (SDIL). The aim of this levy is to decrease the rates of obesity with the levy forming part of the UK Government's 2016 "Childhood obesity: A plan for action" document (12, 13). A beverage is liable for the levy if it meets the following conditions: a) it has had sugar added during production, or anything (other than fruit juice, vegetable juice and milk) that contains sugar, such as honey; b) it contains at least 5 g of sugar per 100 mL in its ready to drink or diluted form c) it's either ready to drink, or to be drunk it must be diluted with water, mixed with crushed ice or processed to make crushed ice, mixed with carbon dioxide, or a combination of these d) it's bottled, canned or otherwise packaged so it's ready to drink; e) it has a content of 1.2% alcohol by volume (ABV) or less. Beverages are not eligible for the levy if they are made with fruit juice or vegetable juice and don't have any other added liable sugar (14). The food industry has been encouraged to reformulate beverages in order to reduce the levy that will be applied to them (13).

With these facts in mind, the present study had three aims. (i): To provide an updated and comprehensive review of the sugar and energy content in commercial FJJDS beverages that were specifically targeted at children in the UK and (ii) To identify the beverages that are liable for the SDIL and (iii) compare the amount of sugar in these beverages before and after the levy was implemented.

Method

The methodological design of the study is divided into two parts, before and after the SDIL. The first part is an update on the study by Boulton *et al* (15), in which the aim was to record and evaluate the sugars content of children's FJJDS. The second part is to compare the sugar content of these beverages before and after the SDIL was introduced in April 2018.

Beverage Evaluation

The beverages were retrieved using the online shopping tool my Supermarket, as well as websites of nine major supermarket in the UK, including; Tesco, Asda, Morrisons, Sainsbury, Waitrose, Ocado, Aldi, Marks & Spencer (M&S) and Lidl, during the period of December 2017 and February 2018. This was done by accessing the "kids and lunchbox beverages" or equivalent grocery divisions available on the websites of supermarkets. Both supermarket-own brand and branded products were included. For FJJDS that did not present in these specific divisions, the presence of children appealing graphics, slogans or strap lines that were tailored towards children - such as "ideal for kid's lunchboxes", were used to determine whether the beverages were suitable to be included in this study. Only beverages that specifically targeted at children were included in the analysis.

Descriptive data, including the brand name, product description, type of drink (FJ/JD/S), recommended age group, serving size, ingredients and price were recorded from super market webpage, official manufacturer websites or in-store samples. In addition, nutritional information, including the energy (kcal/100mL), protein (g/100mL), carbohydrate (g/100mL), sugar (g/100mL), fat (g/100mL), saturated fat (g/100mL), salt (g/100mL) and fibre (g/100mL) content were also

collated into a database. Products that were offered in different packaging sizes were only recorded once.

Sweetened water that contained zero content of fruit juice, cordial, sports drinks and flavoured iced teas were not included in this study. Cordial beverages were excluded from this analysis as dilution of these beverages is often subjective in nature as individuals may dilute to their taste instead of the recommended guidelines (15). As a result, the sugar and energy content in each serving may vary; this would cause difficulty in comparing these products to the baseline FJJDSs. Additionally cordial beverages were not seen to be marketed solely at children and were not marketed as "kids and lunchbox beverages"s and hence did not meet our inclusion criteria for this reason also.

The classification of juices was completed in accordance with the guidelines published by the Food Standards Agency (2007) and the British Soft Drinks Association (2016) (16) in which Fruit Juice (FJ) is obtained "directly from fruit". Fruit Juice from concentrate (FJC) "is juice which has been concentrated and returned to its original state by the addition of water". Fruit Juice non-concentrate (FJNC) "refers to products just obtained directly from fruit and not treated by reconstitution". With regards to Smoothies (S) there is no legal definition of a smoothie and no standard method of manufacture, however, fruit smoothies usually contain crushed fruit, purees and fruit juice. On the other hand, Juice Drinks (JD) are flavoured beverages that contain between 1% to 99% juices, with the addition of the presence of additives, such as added sugar (16). Although product sizes varied, nutritional data were compared at a standardised 100mL size, to enable comparison between products.

After the SDIL came into effect in April 2018, the original database was updated in September 2018. From the samples that were collected, those eligible for the levy were identified. Only JD beverages were affected by the levy as they are the only group that met the required conditions (16). Subsequently, the database was revised and the nutritional information before and after the levy was

compared to identify any changes in the amount of sugar they contain per 100mL and the addition of sugar. A Pearson's correlation was conducted to assess the correlation between energy and sugar content, as well as between sugar content and product prices.

Results

A total of 131 FJJDS samples fulfilled the inclusion criteria, thus, were included in the dataset.

Before the Soft Drinks Industry Levy

All 131 beverages identified contained sugar, in which the mean sugar content was 6.3±4.5g/100mL. The relatively large standard deviation indicates that the sugar content varies greatly between products with values ranging from 0.1g/100mL to 15.2g/100mL. The average sugar content in the FJC category was 10.2±1.19 g/100mL (n=25). The average sugar content of 100% fruit juice (FJNC) was 9.5±0.83 g/100mL (n=9). On average, JD contained 3.3g±3.37 of sugar per 100mL (n=77) and smoothies contained the most sugar on average 11.6±1.5g/100mL (n=20) (Table 1). Forty products of the 131 FJJDS that were analysed contained at least 19g/100mL of sugar. According to the Public Health England this is the maximum daily sugar allowance for a 4 to 6-year-old children (8). Furthermore, 81 of the 131 products contained at least 9.5g/100mL of sugar, which represents half of the daily sugar recommendations for this age group (17).

The mean energy content of the 131 FJJDS analysed was 29.2±21.3 kcal/100mL. The energy content of the FJC was reported as 45.9±3.1 kcal/100mL, the FJNC as 44.6±4.1 kcal/100mL, the JD contained 14.5±13.8 kcal/100mL and Smoothies contained 57.8±11.3 kcal/100mL. The results showed that there was a strong positive correlation (rho= 0.98, $p<0.001$) between the sugar content and the energy content of the beverages, such that FJJDS that contain a higher sugar content would also provide more calories than FJJDS with a lower sugar content.

The price of beverages was also examined. The prices between beverages varied by as much as 16-fold. On average, commercial children's FJJDS were sold at £0.23±0.18/100mL, in which smoothies were found to be the most expensive beverage type among the FJJDS series, with an average price of £0.54± 0.18/100mL. Furthermore, a positive correlation ($r=0.55$, $p<0.05$) was also been found between sugar content and beverage prices, indicating that the more expensive or premium products contain more sugar and energy than the cheaper products.

After the Soft Drinks Industry Levy

The SDIL was introduced in April 2018. In September 2018 all 131 products were reanalysed to determine their eligibility to the SDIL guidelines**.** Considering the classification of beverages given by the British Soft Drinks Association (16) and the conditions that a drink must meet to be eligible, JD are the only category of beverage that could be eligible for the levy. After reanalysis, 7 JD were eligible for taxation as they contained more than 5g/100mL of sugar and added sugar in their ingredients (Table 2). Since the Levy, four of these samples have reformulated their ingredients resulting in a sugar content of <5g/100mL. The other three had not been reformulated as of October 2018. In addition, 3 JD that were not eligible for the levy were also reformulated to reduce their sugar intake. However the amount of sugar they contained even after reformulation was still over 5g/100mL (Table 3).

Discussion

The aims of the present study were to report the sugar and energy content in commercial FJJDS beverages that were specifically targeted at children in the UK. It also aimed to identify the beverage that are liable for the SDIL and compare the amount of sugar they contained before and after the levy.

An important finding was that most of the beverages targeted at children and children's lunch boxes were not eligible for the SDIL including the grouping of smoothies which contain the highest amount of free sugar.

Before the Soft Drinks Industry Levy

The World Health Organisation has stated that healthy food environments need to be created and protected for children (1). In the UK, reducing dietary sugar intakes has been highlighted as potential means for doing this (12). In the current study, forty beverages of the 131 FJJDS contained above the maximum daily sugar allowance for a 4 to 6-year-old children (8) and 81 beverages contained at half of the daily sugar recommendations for this age group (17). This agrees with the finding in previous literature (15) in which the authors found 64% of the products examined contained ≥ 9.5g of sugar, suggesting that the sugar content in commercial children FJJDS has not changed significantly in the past 3 years despite the ongoing scrutiny over the sugar content in FJJDS.

Moreover, the majority of beverages examined in the present study were packaged in a 200mL size and were advertised as "perfect for lunchboxes", implicating that the beverages are highly likely to be consumed by the children in one serving, hence greatly increasing the risk of excess consumption of sugar and energy. One possible factor that might have fuelled the consumption of FJJDS is the public perception of it as a healthier, lower sugar alternative to soft drinks (18,19). In a survey conducted in 2014 asking for the perception of the public on the sugar content in beverages, the sugar content in soft drinks was overestimated by 12%, in comparison to that in FJJDS, which has been underestimated by close to 50% (18), suggesting that consumers were not fully aware of the actual sugar content in these products. Alongside this, manufacturers have been associating FJ consumption and achieving the "5-a-day" fruit and vegetable intake recommendation in their marketing strategies (19). However, a recent market report showing that the general public might not be aware that only a

150mL portion of FJ counts as one of the "5-a-day". Less than a third of respondents were aware that daily consumption of FJ should be limited to 150mL (19). In fact, of the 131 products surveyed in the current study, only 8 were in a ≤150mL package, suggesting that it is most likely that consumers, children in particular, will exceed the maximum recommended daily intake of FJ, and hence be at risk of excessive intake of sugar.

After the Soft Drinks Industry Levy

The UK is not the only country that has established a tax or levy on sugar-sweetened beverages in an attempt to decrease the obesity prevalence. Similar levies have been executed in six U.S cities and 19 countries including Mexico, France, Chile, Brazil, and legislated in South Africa (20). In Mexico there was a 12% reduction per capita of sugar-sweetened beverage purchases after the first year which was followed by a decrease of 9.7% in the second year (20).

As it was shown in the results, many of the beverages that are not eligible for the sugar tax, contain a high amount of sugar and there is no incentive for these to be reformulated. Smoothies contained the highest sugar content of all the drink categories surveyed, however they are often associated with being a healthier alternative to soft drinks (21). The current research does indicate that although the Levy was introduced in an attempt to reduce sugar intake in children as part of the Childhood Obesity Plan (12) it may not be serving its purpose as it is not targeting products that are aimed at children.

The sugar tax/levy has the potential to reduce the amount of sugar sweetened beverages being consumed, nevertheless the application of other health promotion strategies such as education campaigns, easy-to-understand food labelling, food regulations, subsidies for healthier foods (20) are also needed to help people make informed decisions. The study by Moran *et al* (21) confirms that parents believe that juice drinks and other beverages are healthier than other soft drinks. This issue is probably due to these drinks being advertised as healthier alternatives, which could help influence

parent's buying decisions. Previous literature has reported that both soft drinks and FJJDS are positively correlated with risk of being overweight or obese (3, 6), suggesting that the sugar and energy in FJ could be equally as obesogenic as the sugar-sweetened beverages that are currently being taxed.

Conclusion

The current study indicates that the sugar content of FJJDS remains high. These beverages make a large contribution to the sugar intake in children yet the majority of the them are not eligible for the SDIL. There appears to be little incentive to the food industry to reformulate these beverages and as such the changes to the sugar content before and after the introduction of the SDIL was minimal.

Acknowledgements and conflicts of interest: There were no conflicts of interest associated with this manuscript. There is no funding to report.

Authorship: SEH and MEC developed the research question, BTYC and CPI collected the data. All authors contributed to the analysis of the findings of the manuscript and wrote the manuscript. All authors approved the final submission.

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