

Sugar content of German breakfast cereals for children – recommendations and reality

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Summary

This study examined the sugar content per 100 g of 664 different breakfast cereals found in supermarkets in the Stuttgart area as well as via internet search. The study divided the cereal products into those specifically advertised to children and also separated the products into organic vs. non-organic cereals. The results show a significantly higher sugar content in cereals advertised to children compared to generic cereals (on average 28 g versus 18 g per 100 g). In addition, the average sugar content in organic breakfast cereals as well as organic children's breakfast cereals was significantly lower than the sugar content in conventional breakfast cereals (on average 16 g versus 23 g per 100 g) and conventional children's breakfast cereals (on average 19 g versus 31 g per 100 g).

Keywords: Sugar content, children, breakfast cereals, organic products

Introduction

Many studies indicate that children in Germany consume too many low energy dense foods that are high in fat and sugar [1]. This applies not only to snacks but also to breakfast items [2]. Although the consumption of breakfast cereals has been shown to be related to higher fiber consumption, better concentration and a lower probability to suffer from overweight, breakfast cereals have also recently received criticism given their high sugar content [3–8]. In Germany, however, it is still unclear how much sugar breakfast cereals contain. It is also unclear whether conventional breakfast ce-

reals differ from organic breakfast cereals in sugar content and whether differences can be found between generic breakfast cereals and those breakfast cereals specifically advertised to children.

Breakfast is often rated as the most important meal of the day [9]. Eating breakfast has been shown to be related to better academic performance in children [10–12], to higher intake of fiber and micronutrients [12, 13], and to have a positive relationship with weight status [12]. People that eat breakfast also seem to consume more fruits and vegetables [13] and appear to be more physically active [12].

In Germany, sales figures of breakfast cereals amounted to 120 000 t per year (in 2000) [13]. The EsKiMo study (Eating Study as a KIGGS Module) showed that German children receive 3 to 5 % of their total daily energy intake from breakfast cereals [1]. The study also showed that, in children 6 to 17 years of age, 45 % of the boys and 43 % of the girls consume breakfast cereals high in sugar (such as Smacks or Pops) on a daily basis. German children and adolescents exceed by far the Research Institute for Child Nutrition (FKE) recommended daily maximum amount of sugared foods with low energy density [1].

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A U. S. study showed a relationship between breakfast cereal consumption in children and adolescents and improved micronutrient intake, as well as lower fat intake; however, the study also showed that there was a higher sugar intake in those children who consumed breakfast cereals compared to those who did not [14]. Breakfast cereal consumption has been found to be related to lower body weight and better nutrient intake [14], but repeated exposure to highly sugared foods in childhood can reinforce the already innate preferences for sweets, which might result in a learned desire to consume even higher amount of sweets [15–18]. Studies have shown that a high glycemic breakfast leads to reduced satiety, higher food intake with the following meal, and a stronger and faster decline in cognitive performance [20–23]. On the other hand, low glycemic breakfast consumption is associated with increased satiety in the early postprandial phase, a reduced desire to snack before lunch, lower ghrelin concentration, and a low calorie lunch, as well as more sustained alertness [21].

Official guidelines for sugar content in breakfast cereals

There are no official guidelines or legal regulations in Germany regarding sugar content in children's foods. The Association for Consumer Protection, Nutrition, and Agriculture e. V. (aid infodienst) recommends children to consume plenty of cereals (up to four children's hands per day). Yet it also points out that heavily sugared breakfast cereals are not considered cereals that should be eaten plentifully but are considered sweet snacks that should only be consumed scarcely (up to one children's hand per day if no other additional sweets are consumed during the day) [25]. The FKE developed a dietary concept

especially for children (concept for optimized mixed diet [optimiX]) based on the WHO guidelines [26] and the D-A-C-H reference values for nutrient intake [27]. The concept distinguishes between "recommended" and "acceptable" foods. "Acceptable" foods are foods with low energy density but high fat and sugar content. The FKE recommends that the maximum daily allowance of "acceptable" foods should not exceed 10 % of the daily overall energy intake (10 E%) for children [28]. However, a specific recommendation for the sugar content in breakfast cereals or children's food in particular is not given.

Large food companies such as Nestlé Deutschland AG (Nestlé) recommend a serving of breakfast cereal not to exceed a maximum amount of 25 % of added sugar [29]. Thus, a serving can include between 11 and 25 g of added sugar based on serving size. This amount of sugar equals approximately 2.5 to 5 E% and therefore covers already 25 to 50 % of the recommended daily amount of "acceptable" foods by the FKE. Another company, the Kellogg Deutschland GmbH (Kellogg's), developed their own guidelines, the "Kellogg Global Nutrient Criteria", which are especially tailored to children's food products. According to these guidelines, their products can only be advertised to children under the age of 12 years if they contain no more than 200 kcal and 12.5 g of sugar per serving [30]. The maximum amount of sugar content of a serving of Kellogg's breakfast cereals would then cover 21 to 34 % of the recommended daily amount of "acceptable" foods based on the FKE recommendations.

In Great Britain, the Food Standard Agency (FSA) [31] developed and launched a not yet mandatory traffic light system on food packaging. In regards to sugar, the FSA classifies

food products (per 100 g) containing less than 5 g of sugar as belonging to the green category (low sugar content), products containing 5 to 12.5 g of sugar belonging to the yellow category (medium sugar content), and products containing over 12.5 g of sugar belonging to the red category (high sugar content).

Organic cereal products

It has become well known that fresh organic produce contains fewer pesticides compared to conventionally grown produce; however, no consensus has been reached concerning whether organic food products in general are healthier than conventional food products, such as when comparing secondary plant compounds [32, 33]. Most of the few published studies examined plant- or animal-based products such as fruits, vegetables, milk or meat products [34–36]. Pre-packaged organic products such as cereals, rice or pasta seem not to have been compared with conventional pre-packaged products. In general, there seem to be no studies comparing organic with conventional products in regards to their macronutrient composition.

The objective of this study was to assess the sugar content of breakfast cereals available in Germany, with a focus on breakfast cereals specifically advertised to children. In addition, possible differences in sugar content of organic and conventional breakfast cereals were examined.

Methods

From July to August 2012, supermarkets in Stuttgart were visited and all available breakfast cereals were recorded. An additional online search was conducted. Data assessment occurred in 13 stores (EDEKA, REWE, MARKTKAUF, BONUS, PENNY, LIDL, ALDI SÜD, Netto, NORMA, VITALIA-Reformhaus, Kauf-

land, real, Müller). Excluded products were oat flakes and other flakes that were not considered müsli, including gluten-free products, cereals only available online, cereals for diabetics and cereals for infants (up to 3 years of age) that are subject to dietary regulation.

Caloric content, the type of production (organic vs. conventional), absolute/overall sugar content, and serving size as well as whether it was a product specifically advertised to children were assessed. When information was not available on the package, sugar content was searched via the internet, and the manufacturing company was contacted.

IBM SPSS Statistics Version 20 was used for data analysis. T-tests for unpaired samples were used to compare caloric content and sugar content with type of production (organic vs. conventional, children's vs. generic breakfast cereals).

Results

Overall, 759 breakfast cereals of 49 manufacturers and sellers were assessed. Information of nine manufacturers (18 %) was solely obtained via the internet. No information on sugar content was found on the packages or online for 171 products (23 %). For 75 of those products (44 %), information was made available by the manufacturers after contacting them via email. For the remaining 95 products (13 %), obtaining information on sugar content was not possible. One product was taken out of the assortment upon contacting the manufacturer.

Sugar content in breakfast cereals

The cereal products with available information on sugar content ($n = 664$) contained on average 20 g of sugar and 388.9 kcal per 100 g.

Over 50 % of the cereal products ($n = 337$) were above the average sugar content, containing about 27 g of sugar per 100 g. The lowest sugar content found was 0.4 g per 100 g and the highest was 48 g per 100 g. In ♦ Figure 1, the absolute distribution of sugar content across all cereal products is shown.

Comparison of breakfast cereals advertised to children with generic breakfast cereals (those not specifically advertised to children)

Of the 759 assessed breakfast cereals, 114 products (15 %) were classified as children's breakfast cereals. Of those, 112 products (98 %) contained pictures or packaging appealing to children or added toys. Twenty-eight products (25 %) had the word "child/children" in the product name or the text on the packaging emphasizing the products' suitability for children. No information on the packages or online regarding the sugar content was found for 8 % of the children's breakfast cereals.

However, upon contacting the manufacturers, for 8 out of those 9 products the sugar content was made available.

Caloric content of children's breakfast cereals and generic breakfast cereals did not differ significantly (♦ Table 1, $p = 0.773$). However, the sugar content of children's breakfast cereals was significantly higher than the sugar content of generic breakfast cereals. Children's breakfast cereals contained on average 28.2 g of sugar per 100 g, which was 64 % more sugar than in the generic breakfast cereals (18.1 g, $p < 0.001$). Assuming an average serving size of 27 g, a serving would contain 3 more grams of sugar in children's breakfast cereals compared to a serving of generic breakfast cereals.

Comparison of organic breakfast cereals and conventional breakfast cereals

Out of the 759 assessed breakfast cereals, 332 products (44 %) were classified as organic products. Of those,

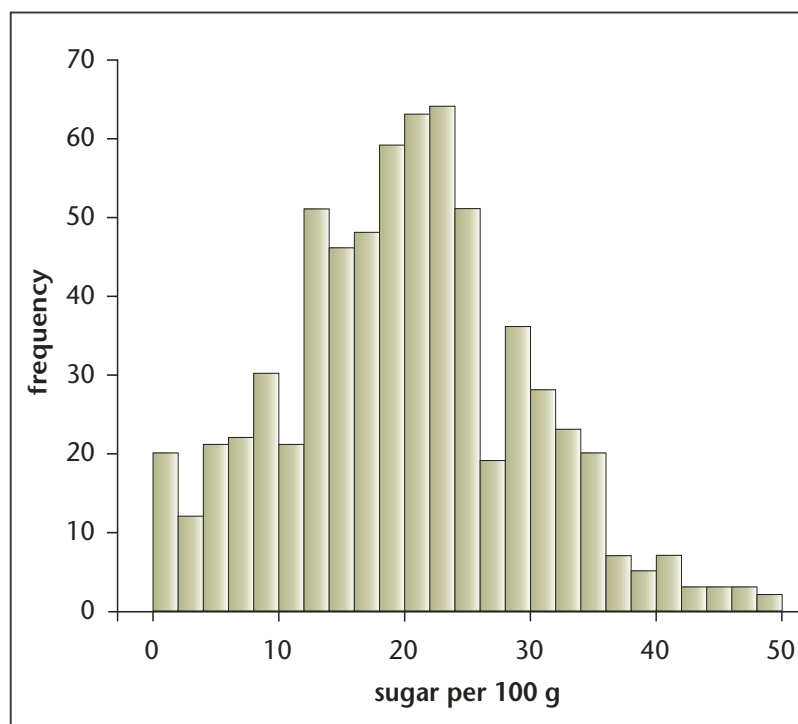


Figure 1: Absolute sugar content distribution per 100 g

27 products (8 %) were considered children's breakfast cereals.

The organic breakfast cereals contained on average 16.1 g of sugar per 100 g, whereas the conventional breakfast cereals contained on average 22.5 g of sugar per 100 g. This difference was significant ($p < 0.001$). No significant difference was found for caloric content per 100 g (organic: 387.3 kcal; conventional: 388.5 kcal, $p = 0.665$).

When comparing organic and conventional breakfast cereals specifically advertised to children, an even more profound difference was observed. Organic breakfast cereals advertised to children contained on average 18.9 g of sugar per 100 g whereas the conventional children's breakfast cereals contained 65 % more sugar per 100 g (♦Table 2). Furthermore, a significant difference in caloric content was found ($p = 0.030$).

Differences in sugar content between generic organic breakfast cereals and organic breakfast cereals advertised to children were small and not sig-

nificant (children's organic breakfast cereals: 18.9 ± 11.6 g per 100 g; generic: 15.9 ± 7.7 g per 100 g; $p = 0.195$). No significant differences were observed for caloric content (children's organic breakfast cereals: 380.8 ± 23.6 kcal per 100 g; generic: 387.8 ± 42.4 kcal per 100 g; $p = 0.177$).

Comparing conventional children's breakfast cereals with conventional generic breakfast cereals in regard to their caloric content did not reveal significant differences (conventional children's breakfast cereals: 389.4 ± 15.9 kcal per 100 g; generic: 388.3 ± 42.4 kcal per 100 g; $p = 0.687$). Nevertheless, conventional children's breakfast cereals contained 55 % more sugar per 100 g (31.1 ± 7.3 g per 100 g) than conventional breakfast cereals not specifically advertised to children (20.1 ± 8.5 g per 100 g; $p < 0.001$).

Discussion and Conclusion

Since there are no regulatory guidelines regarding the acceptable amount of sugar in children's break-

fast cereals and children's food in general, the FSA recommendations regarding sugar content in foods were used: green category (< 5 g), yellow category (5–12,5 g) and red category ($> 12,5$ g), expanded by the category $> 12,5$ g up to 30 g and by the final category > 30 g of sugar per 100 g. The use of these categories reveals that 79 % of the assessed breakfast cereals are above the FSA threshold of 12.5 g of sugar per 100 g and therefore fall into the red category. Approximately 64 % are in the category > 12.5 g to 30 g of sugar per 100 g and 14.2 % fall in the category > 30 g sugar per 100 g (♦Figure 2a). Taking only children's breakfast cereals into consideration reveals even more troublesome results. Ninety percent (90 %) of the children's breakfast cereals would be in the red category, 43.4 % would be in the category > 12.5 g to 30 g of sugar per 100 g and almost 47 % would belong to the category of > 30 g of sugar per 100 g (♦Figure 2a).

♦Figure 2b shows the distribution of organic breakfast cereals. More or-

Breakfast Cereals	conventional	organic	for children	generic (not specifically for children)
n	427	332	114	645
%	56.3	43.7	15.0	85.0
caloric content available (%)	100	100	100	100
mean \pm SD in kcal per 100 g	388.5 ± 38.5	387.3 ± 41.3	387.4 ± 18.3	388.1 ± 42.4
minimum (kcal/100 g)	268.0	136.0	328.0	136.0
maximum (kcal/100 g)	585.0	493.0	457.0	585.0
sugar content available (%)	90.2 (n = 385)	84.0 (n = 279)	99.1 (n = 113)	85.4 (n = 551)
mean \pm SD in g per 100 g	22.5 ± 9.4	$16,1 \pm 8.2$	28.2 ± 10.0	18.1 ± 8.4
minimum (g/100 g)	0.7	0.4	1.4	0.4
maximum (g/100 g)	48.0	47.0	48.0	47.0

Table 1: Summary of captured breakfast cereals (n = 759)
SD = standard deviation

	Children's Breakfast Cereals (n = 114)				significance p
	conventional products		organic products		
	N	mean ± SD	N	mean ± SD	
kcal per 100 g	87	389.4 ± 15.9	27	380.8 ± 23.6	0,030
sugar per 100 g (%)	86	31.1 ± 7.3	27	18.9 ± 11.6	0,000

Table 2: Comparison of conventional and organic children's breakfast cereals
SD = standard deviation

organic children's breakfast cereals fall in the category of ≤ 12.5 g of sugar per 100 g (37 %) compared to all breakfast cereals. In addition, only 22 % of organic children's breakfast cereals fall into the highest category, which is considerably lower than all children's breakfast cereals taken together.

In this study, it was shown that breakfast cereals specifically advertised to children contained on average considerably more sugar (approximately 28 g per 100 g) than

generic breakfast cereals (approximately 18 g per 100 g). The EsKiMo study revealed that German children between the age of 6 to 14 years consume 12 to 41 g of breakfast cereals daily [1]. On average, that amounts to approximately 27 g of breakfast cereals per day. An average portion (27 g) thus contains almost 3 pieces of sugar cubes. Sixty-two percent of the children's breakfast cereals contain disproportionately large amounts of sugar (approximately 34 g per 100 g), meaning that they consist of 30 % pure sugar.

The results also show that organic breakfast cereals contained less sugar than conventional breakfast cereals. This applies to both children's breakfast cereals and generic breakfast cereals. However, organic breakfast cereals advertised to children also contained more sugar per 100 g than generic organic breakfast cereals. But this difference is less profound (on average 3 more grams per 100 g) compared to the conventional breakfast cereals (on average 11 more grams per 100 g). Given these findings, organic breakfast cereals appear to be a better choice for both children and adults in terms of sugar content. Further research should examine whether these differences in macronutrient content of organic versus conventional breakfast cereals also apply to other food products such as sweets, savory snacks or convenience products.

There are many studies showing the positive influence of breakfast cere-

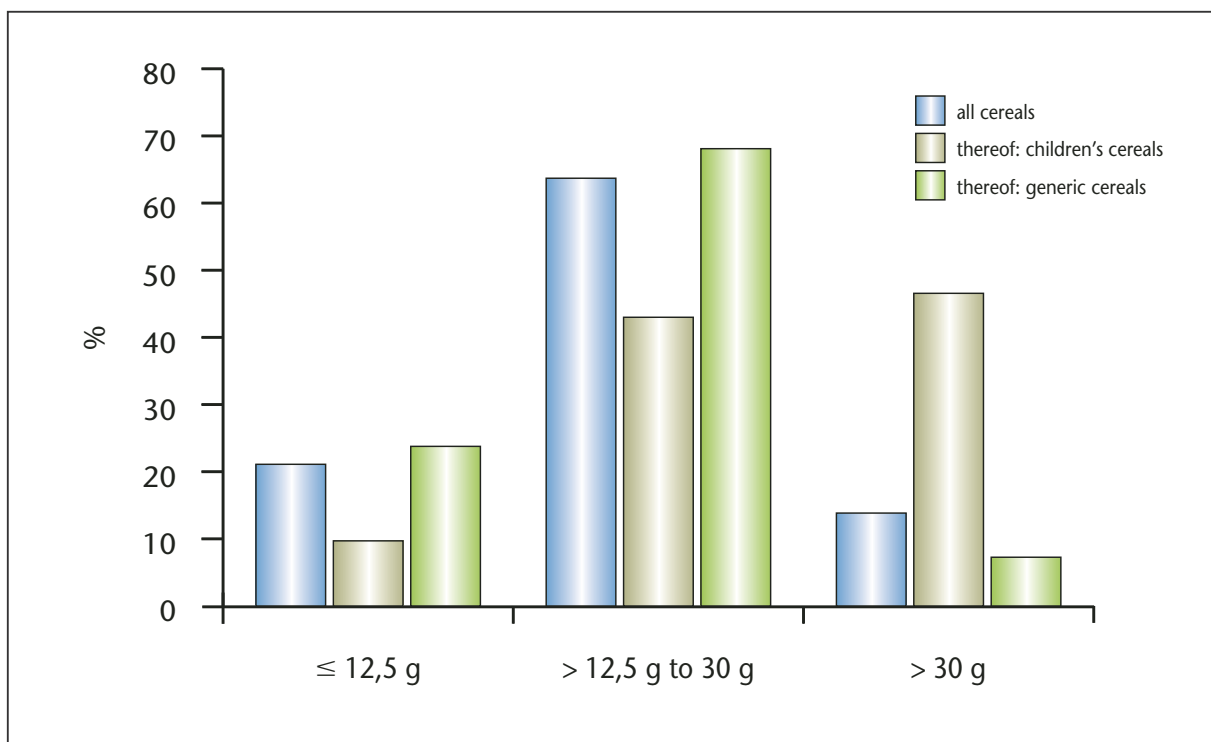


Figure 2a: Sugar content per 100 g of all conventional and organic breakfast cereals separated by categories, and expressed as a percentage of all cereals in a particular category

als on body weight [4, 14], but only a few studies have explored whether the same positive effects can be found if cereals with less sugar are consumed [37]. The question arises whether the high sugar content in breakfast cereals is necessary in order for the consumer to buy and consume the product, independent of the influence on body weight [38].

In addition, it also needs to be discussed why children's breakfast cereals in particular contain more sugar than other breakfast cereals, especially since no difference in caloric content could be found.

Given that many children in Germany consume considerably more than the daily amount of "acceptable" foods recommended by the FKE [1], that breakfast cereals in general should be part of a healthy breakfast and that an increased sugar consumption in childhood can have major consequences later in life [3, 5], legally regulating the amount of

sugar in children's breakfast cereals might be one recommended action for consumer protection in Germany and Europe. The above mentioned traffic light system used in Great Britain would be another possible action. The health of children should be more important than economic interests.

In the end, this is a matter of responsibility. On the one hand, consumers should be allowed to pick which products they want to buy and consume. On the other hand, how many consumers actually do know that a product specifically advertised to children is not necessarily healthier, and might even be less healthy compared to the same product not specifically advertised to children? One study by HARRIS et al. [39] conducted in the U.S. showed that the majority of parents misinterpret package labeling. The conclusion that similar findings will apply to German parents stands to reason.

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Conflict of Interests
 The authors declare no conflict of interests according to the guidelines of the International Committee of Medical Journal Editors.

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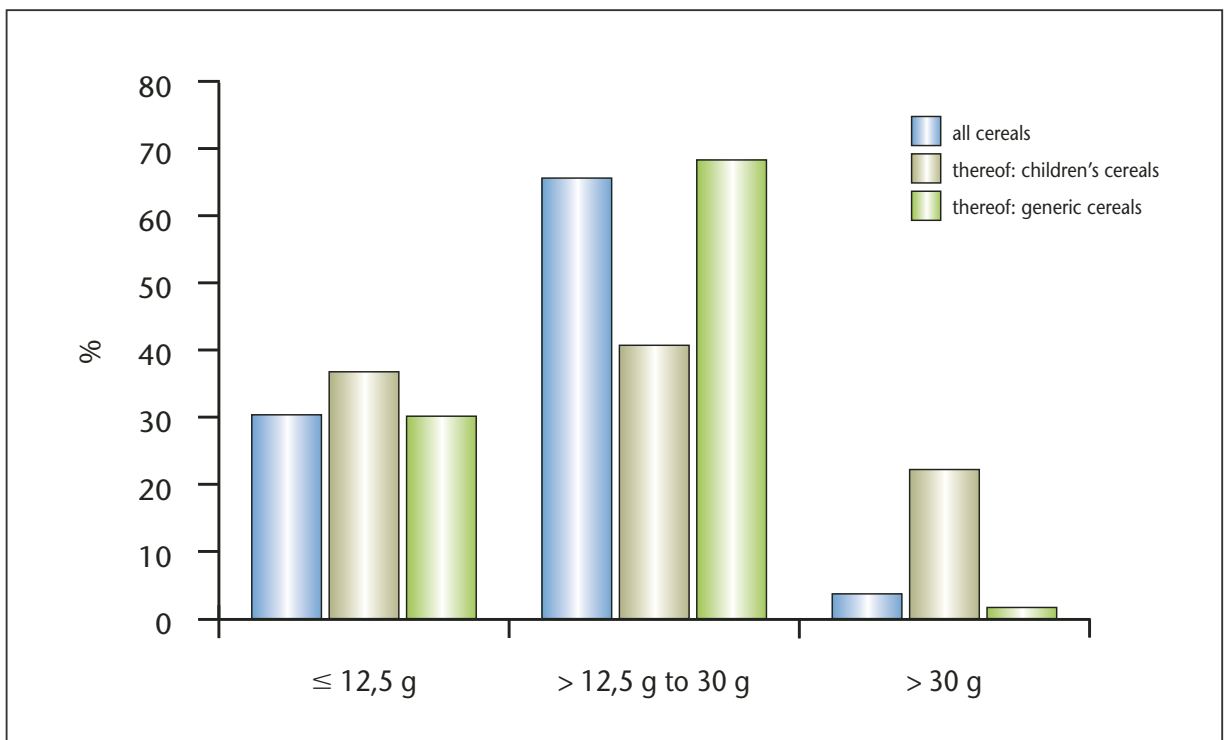


Figure 2b: Sugar content per 100 g of all organic breakfast cereals separated by categories, and expressed as a percentage of all organic cereals in a particular category

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