

Type 2 Diabetes—Hard to Select a Healthy Choice

Stefan Backe

Department of Public Health Sciences, University of Skövde, Skövde, Sweden

Email: Stefan.backe@his.se

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Abstract

Introduction: The use of foods containing high levels of sugar is increasing all the time. This is a risk factor for increased incidence of type 2 diabetes. There are few studies that have investigated the availability of low-sugar müsli products in grocery stores. **Purpose:** The study aims to identify which types of müsli contain high respectively low levels of sugar, and which brands are involved. **Methods:** The material consists of both qualitative interviews and observations from five grocery stores: City Gross, Hemköp, Ica Maxi, Stora Coop and Willy's in Helsingborg, Sweden. The qualitative interviews had a semi-structured character and were recorded. The interviews took approx. 20 minutes and a textual analysis was conducted of the results. Data from observation was analyzed based on brand, nutritional composition and flavors, and also, where low sugar products were placed on store shelves. **Results:** The grocery stores provided together brands from AXA, Coop, Finax, Frebaco, Garant, ICA, Risenta, Saltå Kvarn och Urtekram, in total 24 müsli products. Of these products, 19 were high in sugar. The observation reveals that müsli products with high sugar content (17 - 29 g per 100 g müsli) are more prominently displayed than those with low sugar content. From the interviews with the store managers, it became clear that it would be valuable to highlight healthy müsli products on the shelves. However, central bureaucracy puts obstacles to such measures. **Discussion:** The study emphasizes the need for increased visibility of low-sugar products and proposes solutions such as negotiating with responsible person at the head office in Stockholm. Several reviews have shown that if the grocery store raises the prices of unhealthy food, the consumer is willing to purchase healthier müsli and other products. **Conclusion:** This study shows the need for grocery stores to upgrade healthy müsli products along with advertising to be able to influence customer's shopping habits. Also, further research is needed how type 2 diabetes is affected by high intakes of food products with high sugar content.

Keywords

Type 2 Diabetes, High Sugar Content in Müsli, Difficulty Making Healthy Choices, Central Food Bureaucracy

1. Introduction

In 2019, diabetes was responsible for 1.5 million fatalities, with 48% of those occurring before the age 70. More than 95% of diabetes cases are type 2 diabetes and globally around 422 million people have diabetes [1]. In Sweden, diabetes affects approximately 4% - 5.5% of the population, with 85% - 90% of cases being type 2 diabetes [2].

A review by Veit *et al.* [3] discusses the effects of dietary sugar intake in the development of type 2 diabetes (T2DM). The authors conclude that “the major risk for T2DM, although it is a multifactorial disease, is a positive energy balance, mainly due to increased energy intake and reduced physical activity resulting in overweight and obesity” [3]. However, there is a debate regarding these findings: are they standing alone or mediated by excess energy intake?

Another study by Janket *et al.* [4], a prospective 6 years study examining the effect of sugar intake on risk of type 2 diabetes in woman, found that sugar intake does not significantly increase the risk of developing type 2 diabetes. However, in another study involving 650 participants, it was observed that “high-sugar diets cause thirst, obesity, and metabolic dysregulation, leading to diseases including type 2 diabetes and shortened lifespan” [5]. A systematic review and meta-analysis confirmed the association between sugary foods and the onset of metabolic syndrome [6]. Another systematic reviews with meta-analysis including 53 publications about the role of diet in type 2 diabetes incidence showed that red meat, processed meat, bacon and sugar sweetened beverages increased the incidence for the disease. Some of the study’s results show that higher intake of sugar sweetened beverages increased incidence of type 2 diabetes [7].

In a 2016 review by Rippe & Angelopoulos [8] on the relationship between added sugar consumption and health considerations, the authors suggest that a consumer should not consume more than 20% of calories from added sugars for their health.

While food products for allergy sufferers, such as lactose intolerance or gluten allergies, are readily identified and organized, there is no such system for products aimed at diabetics, making it challenging for them to make healthy choices.

For a type 2 diabetic, it is extremely important to be able to find and choose müsli products and other products (jam, marmalade) with a low sugar content to maintain good health. This possibility does not exist today. Therefore, my aim is to identify which types of müsli contain high respectively low levels of sugar, and which brands are involved.

2. Purpose

The study aims to identify which types of müsli contain high respectively low levels of sugar, and which brands are involved.

3. Methods

The material consists of both qualitative interviews and observations from five biggest grocery stores: City Gross, Hemköp, Ica Maxi, Stora Coop and Willy's in Helsingborg, Sweden. The qualitative interviews had a semi-structured character to get closer to the interviewees' perceptions of healthy müsli options. The interviews were recorded and took approx. 20 minutes, and started with City Gross, Hemköp, Ica Maxi, Stora Coop and Willy's. Then a text analysis was carried out. Observations were carried out in the autumn of 2023 in the shops where I noted how they highlighted müsli products with high and low sugar content per 100 g of müsli. Data from observation was analyzed based on brand, nutritional composition and flavors. Also, where low sugar products were placed on store shelves. Descriptive statistics are reported in form of a table where all müsli products are reported in alphabetical order based on nutritional content (energy, carbohydrates with sugar content, fiber, protein and salt).

The three largest grocery stores: ICA, Coop and Axfood account for 80% - 85% of grocery retail sales [9]. The qualitative interviews had a semi-structured character to get closer to the interviewees' perceptions and their perspectives on the visibility of healthy müsli options [10]. Further, data collected from the five food chains were analyzed based on brand, nutritional composition, and flavors (The Joint Action on Nutrition and Physical Activity (JANPA) [11]).

4. Results

Observation: ICA Maxi offered the most müsli brands/products, with twelve containing high sugar content, ranging from 17 g to 29 g per 100 g müsli. Stora Coop had six products with sugar content from 5.5 g to 24 g per 100 g müsli. Hemköp had five brands/products, with a maximum sugar content of 25 g per 100 g müsli. City Gross and Willy's each offered four brands/products with highest content of 25 g per 100 g müsli. Surprisingly, City Gross, Hemköp, and Willy's offered the best müsli products with low sugar content. The brand "Frebaco Müsli Peach Raspberry without added sugar" contained only 2.1 g per 100 g müsli, see **Table 1**.

Interview with store manager from City Gross, ICA Maxi, Hemköp, Stora Coop and Willy's: The store manager from City Gross likes the idea of displaying all low-sugar müsli products in one place on store shelves and clearly labeling these healthy products, but unfortunately, it is not as easy to implement as desired. It depends on central decisions in the form of a kind of map, planogram, which points out where the products should be on the shelf.

The interview with the store manager from ICA Maxi conveyed a slightly different picture. They have the same central system with so-called planograms,

Table 1. Brands in alphabetical order and with the nutritional value of the müsli products per 100 g. Highest to lowest sugar content per product.

AXA, Müsli Gold Fruit 750 g	Nutritional value per 100 g: Energy (Kcal) 390 Kcal, Energy (KJ) 1650 KJ, Fat 9.2 g, Of which saturated fat 6.5 g, Carbohydrate 66 g, Of which sugar 25 g, Fiber 6.7 g, Protein 6.6 g and Salt 0.4 g.
AXA, Papaya & Oat Gluten Free Müsli 350 g	Nutritional value per 100 g: Energy (Kcal) 430 Kcal, Energy (KJ) 1800 KJ, Fat 18 g, Of which saturated fat 2.9 g, Carbohydrate 50 g, Of which sugar 16 g, Fiber 8.6 g, Protein 14 g and Salt 0.2 g.
AXA, Gold Müsli Berries 725 g	Nutritional value per 100 g: Energy (Kcal) 420 Kcal, Energy (KJ) 1750 KJ, Fat 15 g, Of which saturated fat 4.9 g, Carbohydrate 55 g, Of which sugar 15 g, Fiber 8 g, Protein 10 g and Salt 0.3 g.
AXA, Müsli Fruit 750 g	Nutritional value per 100 g: Energy (Kcal) 350 Kcal, Energy (KJ) 1500 KJ, Fat 6 g, Of which saturated fat 2.8 g, Carbohydrate 61 g, Of which sugar 13 g, Fiber 10 g, Protein 8.8 g and Salt 0.2 g.
AXA, Müsli Fruit & Berries 600 g	Nutritional value per 100 g: Energy (Kcal) 349 Kcal, Energy (KJ) 1460 KJ, Fat 3.8 g, Of which saturated fat 0.7 g, Carbohydrate 63 g, Of which sugar 8.2 g, Fiber 10 g, Protein 9.9 g and Salt 0.02 g.
AXA, Müsli Blueberry 575 g	Nutritional value per 100 g: Energy (Kcal) 350 Kcal, Energy (KJ) 1500 KJ, Fat 4.4 g, Of which saturated fat 0.8 g, Carbohydrate 63 g, Of which sugar 5.6 g, Fiber 9.7 g, Protein 10 g and Salt 0.5 g.
Finax, Fruit müsli Gluten Free 550 g	Nutritional value per 100 g: Energy (Kcal) 360 Kcal, Energy (KJ) 1510 KJ, Fat 5 g, Of which saturated fat 0.5 g, Carbohydrate 67 g, Of which sugar 18 g, Fiber 9 g, Protein 8 g and Salt 0.6 g.
Frebaco, Müsli Fruit 700 g	Nutritional value per 100 g: Energy (Kcal) 400 Kcal, Energy (KJ) 1650 KJ, Fat 9.5 g, Of which saturated fat 7.3 g, Carbohydrate 64 g, Of which sugar 16 g, Fiber 7.2 g, Protein 9.2 g and Salt 0.3 g.
Frebaco, Müsli Fruit & Berries 700 g	Nutritional value per 100 g: Energy (Kcal) 350 Kcal, Energy (KJ) 1450 KJ, Fat 2.7 g, Of which saturated fat 0.6 g, Carbohydrate 66 g, Of which sugar 8.2 g, Fiber 8.5 g, Protein 11 g and Salt 0.2 g.
Frebaco, Müsli Peach & Raspberry No added sugar 700 g	Nutritional value per 100 g: Energy (Kcal) 360 Kcal, Energy (KJ) 1500 KJ, Fat 4.2 g, Of which saturated fat 0.7 g, Carbohydrate 63 g, Of which sugar 2.1 g, Fiber 11 g, Protein 12 g and Salt 0.2 g.
Garant, Müsli Fruit & Berries Ecological 750 g	Nutritional value per 100 g: Energy (Kcal) 370 Kcal, Energy (KJ) 1550 KJ, Fat 6.7 g, Of which saturated fat 3.4 g, Carbohydrate 62 g, Of which sugar 6.3 g, Fiber 11 g, Protein 10 g and Salt 0.2 g.
ICA, Müsli 45% Fruit 750 g	Nutritional value per 100 g: Energy (Kcal) 350 Kcal, Energy (KJ) 1477 KJ, Fat 4.2 g, Of which saturated fat 2.1 g, Carbohydrate 66 g, Of which sugar 29 g, Fiber 8.2 g, Protein 7.5 g and Salt 0.08 g.
ICA, Müsli 50% Fruit & Nuts 750 g	Nutritional value per 100 g: Energy (Kcal) 398 Kcal, Energy (KJ) 1670 KJ, Fat 14 g, Of which saturated fat 6.1 g, Carbohydrate 56 g, Of which sugar 21 g, Fiber 8.2 g, Protein 7.9 g and Salt 0.3 g.
ICA, Müsli Mix Crunch strawberry & yogurt & 500 g	Nutritional value per 100 g: Energy (Kcal) 404 Kcal, Energy (KJ) 1701 KJ, Fat 9.7 g, Of which saturated fat 4.4 g, Carbohydrate 65 g, Of which sugar 17 g, Fiber 9.5 g, Protein 9.8 g and Salt 0.25 g.
ICA, Müsli Fruit Ecological, I love Eco 750 g	Nutritional value per 100 g: Energy (Kcal) 360 Kcal, Energy (KJ) 1500 KJ, Fat 7 g, Of which saturated fat 2 g, Carbohydrate 57 g, Of which sugar 8 g, Fiber 10 g, Protein 11 g and Salt 0.25 g.
Risenta, Crunchy Müsli almond & apricot 450 g	Nutritional value per 100 g: Energy (Kcal) 373 Kcal, Energy (KJ) 1580 KJ, Fat 11 g, Of which saturated fat 1.3 g, Carbohydrate 53 g, Of which sugar 12 g, Fiber 10 g, Protein 12 g and Salt 0.2 g.
Saltå Kvarn, Fruit Müsli 750 g	Nutritional value per 100 g: Energy (Kcal) 350 Kcal, Energy (KJ) 1400 KJ, Fat 2.7 g, Of which saturated fat 0.4 g, Carbohydrate 67 g, Of which sugar 16 g, Fiber 9 g, Protein 7.7 g and Salt 0.1 g.
Stora Coop, Müsli Fruit & Nuts 700 g	Nutritional value per 100 g: Energy (Kcal) 365 Kcal, Energy (KJ) 1536 KJ, Fat 9 g, Of which saturated fat 2.3 g, Carbohydrate 58 g, Of which sugar 24 g, Fiber 8.2 g, Protein 8.9 g and Salt 0.34 g.
Stora Coop, 31% Fruit Müsli Tropical 700 g	Nutritional value per 100 g: Energy (Kcal) 394 Kcal, Energy (KJ) 1656 KJ, Fat 11 g, Of which saturated fat 4.1 g, Carbohydrate 60 g, Of which sugar 19 g, Fiber 7.6 g, Protein 9.9 g and Salt 0.5 g.
Stora Coop, Änglamark Müsli Fruit & Nuts Eco 700 g	Nutritional value per 100 g: Energy (Kcal) 349 Kcal, Energy (KJ) 1473 KJ, Fat 5.1 g, Of which saturated fat 0.6 g, Carbohydrate 61 g, Of which sugar 12 g, Fiber 9.6 g, Protein 10 g and Salt 0 g.

Continued

Stora Coop, 21% Fruit Müsli Tropical 700 g	Nutritional value per 100 g: Energy (Kcal) 362 Kcal, Energy (KJ) 1513 KJ, Fat 4.8 g, Of which saturated fat 2.7 g, Carbohydrate 67 g, Of which sugar 8.2 g, Fiber 8.6 g, Protein 7.4 g and Salt 0.4 g.
Stora Coop, Müsli Fruit & Berries 700 g	Nutritional value per 100 g: Energy (Kcal) 352 Kcal, Energy (KJ) 1472 KJ, Fat 3.3 g, Of which saturated fat 0.7 g, Carbohydrate 66 g, Of which sugar 5.5 g, Fiber 9.4 g, Protein 9.5 g and Salt 0.4 g.
Stora Coop, Änglamark Müsli with Berries 750 g	Nutritional value per 100 g: Energy (Kcal) 351 Kcal, Energy (KJ) 1470 KJ, Fat 3 g, Of which saturated fat 0.7 g, Carbohydrate 65 g, Of which sugar 5.3 g, Fiber 10 g, Protein 10 g and Salt 0.15 g.
Urtekram, Fruit Müsli Gluten Free Ecological 400 g	Nutritional value per 100 g: Energy (Kcal) 400 Kcal, Energy (KJ) 1680 KJ, Fat 9.6 g, Of which saturated fat 3.7 g, Carbohydrate 68 g, Of which sugar 18 g, Fiber 6.4 g, Protein 7.5 g and Salt 0.02 g.

sending out twice per year. However, based on conducted interviews, ICA retailer's opportunities to support producers who produce müsli products with low sugar content seem to be good. Further, the store manager tells me that ICA has a structure with "free traders in collaboration", creating a great scope for individual action to drive the company in the direction they wish. In addition, ICA traders also not have to buy all goods from ICA's wholesale operations, which makes things easier.

The interview with the store manager from Hemköp and Willy's expressed similar views. Both department stores belong to the Axfood group; hence the same policy and structure.

Both managers liked the idea of creating a special shelf for low-sugar products and advertising them in the name of public health choice, but point out that central bureaucracy puts a damper on such a project. Where the products should be on the shelf, the store receives help from a central source in the form of a kind of map, planogram, which is renewed twice a year.

The store manager for Stora Coop also expressed his approval of the idea of arranging a special place on the store shelves for all products containing low levels of sugar. Unfortunately, it emerged in the interview that fixing the store goods in such a way was not entirely easy as the placement of the goods on the shelves is controlled centrally from Stockholm and applies to all Coop's department stores in Sweden. The store manager also told me that the producers buy places for their goods to be placed best on the store shelves. All this is reflected in the planograms that are shared with the stores twice a year.

5. Discussion

The five store chains together offered 24 different müsli products with varying sugar content.

Of these products, 19 müsli products contained high sugar content ranging from 8 g to 29 g per 100 g. Frebaco was the brand that reduced sugar contents the most in its müsli, with other brands having at least 2.6 times as much sugar. The analysis shows that it is sugar-rich müsli products that the producers choose to highlight in the spotlight. This relationship is confirmed by a recently published systematic reviewer. The conclusion from that study shows that: Inceas-

ing the availability of healthy products and simultaneously reducing less healthy products was effective in increasing selection or purchase of healthy products, with enhanced effect if combined with high light of these products [12]. In one study comprehensive six interventions aimed at major United Kingdom grocery stores testing availability, positioning, promotions, and announcements about healthy products and the influence on buying behavior. The results from this study show: A combination of increasing the availability of healthier products, relegation of unhealthy products and advertising for healthy products can influence people's buying habits. However, if these actions not repeated, the effect diminishes. Purchasing behavior may also change if the grocery store raises the prices of unhealthy food [13].

A limitation of the study is that the results stand for the five investigated grocery stores and it is unknown if other small grocery stores in Helsingborg show the same pattern. Furthermore, it is difficult to say whether the pattern is the same in general, but the product range is probably equivalent as well as the product placement on the store shelves.

A strength regarding the interviews is that the statements from the interviews were checked by the interviewees.

6. Conclusion

This study highlights the unhealthy trend of adding sugar to various products and the availability of healthier alternatives in the food industry. The grocery stores provided together brands from AXA, Coop, Finax, Frebaco, Garant, ICA, Risenta, Saltå Kvarn och Urtekram, in total 24 müsli products. Of these products, 19 were high in sugar. From the interviews with the store managers, it became clear that it would be valuable to highlight healthy müsli products on the shelves. However, central bureaucracy puts obstacles to such measures. Another way to increasing the consumption of healthy müsli and other products as shown by several reviews can help if the grocery store raises the prices of unhealthy food. Research is needed to examine how type 2 diabetes is affected by high intakes of food products with high sugar content.

Declarations

- Ethics approval and consent to participate: This study doesn't involve human participants, human data or human tissue. "Not applicable" in this section.
- Consent for publication:
- Availability of data and material: The datasets during and/or analyzed during the current study available from the corresponding author on reasonable request.
- Funding: No funds have been used for this study.
- Author's contributions: All text of this manuscript was authored by me.
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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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List of Abbreviations

JANPA The Joint Action on Nutrition and Physical Activity

T2DM Type 2 Diabetes