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Original article

Examining the amounts of added sugars and saturated fatty acids recorded on the nutrition panels of snack foods for young children

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Summary. *Background.* Consumption of foods rich in added sugars and saturated fatty acids by children is believed to be positively associated with weight gain and obesity. Purpose: this study was undertaken to compare contents of added sugars and saturated fatty acids and assess suitability of total energy intake from these nutrients in 30g of selected snack foods for young children from 4 to 13 years old. *Methods:* the amounts of total carbohydrate, added sugars, total fat and saturated fatty acids in grams displayed in nutrition information panels were recorded from 71 snack foods. These products comprise a selection of ready-to-eat cereals, chocolate confectionery and biscuits sold in supermarket outlets in Muscat, Oman. Nutrients were assessed using the guidelines of the WHO recommended daily intakes of energy from added sugars (< 5%) and saturated fatty acids (< 10%). *Results:* in 100g, the mean value of added sugars in biscuits (26.4g±9.4) was significantly lower than in chocolate confectionery (52.2g±6.2). Meanwhile, the mean values of total fat and saturated fatty acids were significantly high in chocolate confectionery (28g±10.3; 14.9g±4.1) and biscuits (22.8g±6; 14.4g±7.2) than in ready-to-eat cereals (2.8g±1.5; 0.83g±0.6). The results also showed that intake of 30g of ready-to-eat cereals and chocolate confectionery provides significantly high amounts of added sugars than saturated fatty acids for young children and suggest that 15g portion size is a better option. *Conclusion:* for some snack foods such as chocolate confectionery added sugar content is inappropriate for young children, hence strict eating practice should be followed.

Key words: Added sugars; Saturated fatty acids; Snack foods; Children's health; Eating practices

Introduction

Childhood obesity is currently one of the acknowledged health problems affecting children and its prevalence is increasing worldwide. It is associated with many types of chronic diseases such as diabetes mellitus, hypertension, cerebral and cardiovascular diseases, various cancers, breathing disorders and psychosocial problems, and often leads to obesity during adulthood (1). Worldwide, there are a total of 155 million children (1 in 10) who are overweight and 30-40 million who have been classified as obese (2). Changes in food consumption habits such as increased or late night snacking as well as sedentary life style influenced by watching television or playing video games for lengthy periods, are among the important factors contribute to the increased prevalence of obesity in children (2,3). Accessibility and consumption of food rich in added sugars (AS) as well as saturated fatty acids (SFA) by children is positively associated with higher energy intakes which results in weight gain and later develop into obesity (4). A typical example of these foods is snack foods which are usually consumed anytime outside of the main daily meals and

its consumption is generally referred to as snacking. A single study published in Oman by Al-Shookri and co-workers investigated the dietary intake of children of a preschool age 2 – 5 years old using a quantitative food-frequency questionnaire. Their results showed that, among 24 food groups, snack foods such as chocolate confectionery and biscuits were part of the childrens daily food intake which reported to be 27.9g/day and 29.3g/day respectively (5). Current research reported that children tend to eat 1 to 2 snack meals per day sometime in between the three main meals; breakfast, lunch and dinner. This results in children who eat 4 to 5 times throughout the day (6). The most recently published recommended daily intake of total energy from AS and SFA are 5% and 10% respectively (7-10). Consequently, the number of eating occasions and portion size of snack foods rich in AS and/or SFA consumed per day can impact the amount of these nutrients consumed daily and may in fact differ from the recommended daily intake of these nutrients. Therefore, the aim of this study is to research two main issues; 1) compare between selected snack foods categories in terms of contents of the AS and SFA in 100g, and 2) assess suitability of the total energy intake from AS and SFA in 30g portion size of selected snack foods for young children from 4 to 13 years old based on the recommended daily intake of energy from of these nutrients. This can help in establishing recommendations on the best choice and the best consumption practice which includes eating occasions and serving portion size. A selected categories of snack foods such as ready-to-eat (RTE) cereals (sugar coated and chocolate flavoured), chocolate confectionary and biscuits were examined in this study.

Methods

A total of 71 products were systemically and randomly selected in 2016 based on: their appearances in television commercials which target children, popular cartoon drawings on the products, and availability in supermarkets and shops. These products were classified into three groups: 12 products of sugar coated and chocolate flavoured RTE cereals, 28 products of chocolate confectionery, and 31 types of biscuits (see Appendix I). The nutrition information panels, or nutrition panels, of these products were used as a source of information in this study. Consequently, products with no information about SA and SFA in the nutrition panel and/or the panel is not clearly displayed on the product's external package were excluded. This included but was not limited to ice creams, jelly and candies. The nutrition panels show the total carbohydrates, sugars, total fats and saturated fatty acids per 100g along with a recommended serving portion size which varies from 20g to 45g. Therefore, 100g and 30g were the values used for further comparison and assessment in this study.

The amounts of total carbohydrates and AS as well as total fats and SFA for 100g were extrapolated from the nutrition panel and the mean values were compared between the selected snack foods categories to highlight the significance of these values. To assess the suitability of total energy intake from AS and SFA in these products for 4 to 13 years old children, three factors were studied in combination: percentage contribution of energy in a 30g portion size, eating occaisions and the published recommended daily intake of energy from AS and SFA.

Statistical analysis

The data were evaluated using SPSS 19.0 package program. Total carbohydrates and sugars as well as total fat and saturated fat contents were compared among selected groups of snack foods using ANOVA. A criterion p level of <0.05 was used to determine statistical significance.

Results

In the majority of the selected products, there were different terms used to indicate the recommended daily consumption in (%) of nutrients such as Guideline Daily Amounts (GDA), Daily Values (DV) and Nutrient Reference Value (NRV) which are displayed alongside with the nutrition panels. These GDA, DV and NRV values represent the 2000kcal energy requirements for adults and hence do not accurately reflect the requirements for children from 4 – 13 years old, the primary consumers of such products. A biscuit

product "McVities Butter Puffs" has an ideal nutrition panel where information about energy and all nutrients; proteins, carbohydrates, sugars, total fat, SFA, fibre and sodium in 100g and per biscuit alongside with GDA (in grams) are displayed for adults and children (5-10 years).

The mean values for total carbohydrates, AS, total fat and SFA in 100g and 30g for the three snack foods categories are presented in Table 1. RTE cereals contain significantly high ($p < 0.05$) amounts of total carbohydrates when compared with that in chocolate confectionary and biscuits. However, when it comes to the AS content in these three groups, chocolate confectionary contains significantly higher ($p < 0.05$) amounts of AS than the others. In relation to the total fat and SFA, the content is significantly high ($p < 0.05$) in chocolates and biscuits when compared to that in RTE cereals. Table 2 shows the percent (%) contribution of energy from AS and SFA in a 30g portion size by 4 – 8 and 9 – 13 years old children of RTE cereals, chocolates confectionary and biscuits compared with the recommended daily intake of energy from these nutrients for the same conditions per day and per eating occasion. The percent contribution of AS in all snack foods categories does not fall within and yet exceed the recommended daily intake per 4 or 5 eating occasions for children of both age groups. Meanwhile, for the same mentioned conditions, the percent contribution of SFA in chocolate confectionery and biscuits is higher (2.9% and 2.8%; respectively) than the recommended daily intake per 4 or 5 eating occasions for children of 4 – 8 years old. The percent contribution of SFA in RTE cereals do however fall within the recommended daily intake per 4 or 5 eating occasions for children of both age groups.

Discussion

The period of childhood through adolescence is especially important in the determination of life-long eating habits. Evidence indicates that eating habits established during childhood related to food intake persist when the child becomes an adult (11, 12). Children are energetic creatures and require energy suppllied from various types of nutrients to sustain growth and well being and snack foods can contribute to the overall nutrient and energy intake when combined with daily meals during the course of the day (13). Children in the groups of 4 – 8 and 9 – 13 years old should obtain a daily energy requirement of 1400kcal and 1950kcal respectively. Accordingly children of 4 – 8 and 9-13 years old are recommended to take < 17.5g and < 24.5 g of AS respectively and < 16g and < 22g of SFA respectively per day. This is based on the published

Table 1. Contents of total carbohydrate, AS, total fats and SFA in grams in 100g and 30g of RTE cereals, chocolate confectionery and biscuits.

	Contents in grams of	30 g Mean values (g)	100 g Mean values (g)
RTE Cereals (n = 12)	Total carbohydrates	24.2±1.4[a]	80.6±4.7[a]
	AS	9.5±1.6[a]	31.7±5.2[a]
	Total fats	0.85±0.5[a]	2.8±1.5[a]
	SFA	0.25±0.2[a]	0.83±0.6[a]
Chocolate confectionary (n = 28)	Total carbohydrates	18±1.5[b]	60.1±4.8[b]
	AS	15.7±1.8[b]	52.2±6.2[b]
	Total fats	8.4±3.1[b]	28±10.3[b]
	SFA	4.5±1.2[b]	14.9±4.1[b]
Biscuits (n = 31)	Total carbohydrates	19.3±2.4[c]	64.4±7.9[c]
	AS	7.9±2.8[a]	26.4±9.4[a]
	Total fats	6.8±1.8[c]	22.8±6[c]
	SFA	4.3±2.2[b]	14.4±7.2[b]

Superscripts [a,b,c] for a criterion (e.g.AS) in each group with unlike superscript letters represent significance (p <0.05)

Table 2. A comparison grid of the percent (%) contribution of energy from AS and SFA provided by 30g of the selected snack foods against the Recommended Daily Intake (RDI) for two age groups 4 – 8 and 9 – 13 years old children.

		4 - 8 years old				9 - 13 years old			
		Recommended Daily Intake	(%) contribution of energy from AS and SFA from 30g‡			Recommended Daily Intake	(%) contribution of energy from AS and SFA in 30g‡		
		1400 kcal*	RTE Cereals	Chocolate	Biscuits	1950 kcal*	RTE cereals	Chocolate	Biscuits
AS (per day)		< 5%	2.7%	4.5%	2.3%	< 5%	2%	3.2%	1.6%
SFA (per day)		< 10%	0.16%	2.9%	2.8%	< 10%	0.12%	2.1%	2%
Eating occasion/day (4 times/day)	AS (g)	< 1.25%				< 1.25%			
	SFA (g)	< 2.5%				< 2.5%			
Eating occasion/day (5 times/day)	AS (g)	< 1%				< 1%			
	SFA (g)	< 2%				< 2%			

*(‡) Percent values which were calculated by using the mean values of AS (X) and SFA (Y) in 30g presented in "Table 1". The following equation was used = (X) or (Y) * 4 kcal for AS/9 kcal for SFA ÷ 1400 kcal (or) 1950 kcal;*
(*) Recommended daily intake of energy(7)

recommendation of < 5% of added sugars and < 10% of saturated fat consumption per day for both age groups. Snacking is a worldwide habit reported and practiced in most nations and as such parents should not view eating snacks between meals as an unhealthy behaviour that must be stopped but rather one that should be monitored (14). In fact, parents should be involved in their kid's selection of snack foods, its nutritional composition, eating occasions and portion sizes. This will help parents, if started in early ages, to enforce specific life-long eating/snacking habits towards snack foods (15, 16).

The content in 100g of total carbohydrates in sugar coated and chocolate flavoured RTE cereals is higher than that in chocolate confectionary and biscuits and was statistically significant ($p < 0.05$). However, AS content in chocolate confectionary is significantly higher ($p < 0.05$) than in both sugar coated and chocolate flavoured RTE cereals and biscuits. A review of Table 1 reveals that AS content in sugar coated and chocolate flavoured RTE cereals and biscuits is approximately 40% of the total carbohydrates content. Meanwhile, in chocolate confectionary it is about 87% of the total carbohydrates content. This is because of the fact that sugar coated and chocolate flavoured RTE cereals and biscuits contain intrinsic sugars mainly in a form of polysaccharides as these products are made of corn, wheat flour and/or other grains (17).

AS are sugars and syrups which may consist of fructose- and nonfructose-rich corn syrups, cane and beet sugar (sucrose), honey and other edible syrups and according to literature high sugar intake increases the risk of high blood triglycerides in children and is associated with a higher incidence of weight gain and obesity in addition to dental caries (14, 18). Regarding SFA, chocolate confectionary and biscuits contain significantly higher ($p < 0.05$) amounts of SFA than in sugar coated and chocolate flavoured RTE cereals. There is convincing evidence that SFA elevate the risk of dyslipoproteinemia, with an increase of LDL cholesterol and may contribute to cardiovascular diseases (19).

Table 2 discusses the intake suitability of AS and SFA in selected snack foods. The percent contribution of energy from AS in 30g of sugar coated and chocolate flavoured RTE cereals, biscuits and chocolate confectionery is in the range of 1.6 – 4.5% and for SFA is in the range of 0.12 – 2.9% for 4-13 years old children. For a child of 4-8 years old the percent contribution of energy from AS in 30g of any of the selected chocolate confectionary products is 4.5% which is high when compared with the recommended daily intake of energy from AS of 1.25% for the same

child eating 4 times per day or 1% if the child eats 5 times per day. This is true when the four eating occasions; one 30g of chocolate confectionary, one breakfast meal, one lunch meal and one dinner meal, are all assumed to be a source of AS. In case of 9 – 13 years age group (taking the same example above) the intake of energy from AS is 3.2%. Considering similar intake occasions, the percent contribution of energy from AS in 30g of sugar coated and chocolate flavoured RTE cereals and biscuits are 2.7% and 2.3% respectively for age group 4-8 years old and 2% and 1.6% respectively for age group 9-13 years old. These values are significantly lower than that in respect to chocolate confectionery. Therefore, more eating occasions and/or large portion size of chocolate confectionary is going to be a clear contribution to weight gain and dental carries especially among children of age 4-8 years old. Regarding SFA, in general, the percentage contribution of energy from SFA in 30g of selected snack foods types is tolerable for both age groups. As a result, the main health risk factor associated to the selected products is the AS content rather than the SFA content. To reduce this health risk, children of both age groups are recommended to reduce the intake from 30g to a portion size of 15g once a day of one of their choice of chocolate confectionary or sugar coated and chocolate flavoured RTE cereals or biscuits. This is a big challenge for such a young population as research showed that they have already exceeded the recommended intake of < 5% of AS and are instead at 15% (20, 21). Hence, a limited intake of AS should be introduced at a time when parents are likely to have a greater influence over their children's eating habits (around 4 – 8 years old) which would ultimately set the foundation for adulthood eating habits.

The large variety of available snack foods could confuse parents in selecting the suitable type in terms of nutritional benefits for their kids. The data presented in this research revealed that a serving size portion of chocolate confectionery is clearly rich in AS and total fat and therefore should not be consumed on daily bases. On the other hand, sugar coated and chocolate flavoured RTE cereals contain a high total carbohydrate content and are therefore considered as high glycemic index food. The intake of a high glycemic index food could further induce more food intake during the day in addition to other physiological consequences as discussed in details in the literature (22, 23). When comparing biscuits with chocolate confectionery and sugar coated and chocolate flavoured RTE cereals, biscuits offer better nutritional profile. It has less AS, less total fat and a low glycemic index. Therefore, biscuits can be consumed on daily bases and can be generally considered a suitable snack choice for children, which is in agreement with earlier research (24).

In conclusion, chocolate confectionery are much more involved in providing high amounts of AS than sugar coated and chocolate flavoured RTE cereals and biscuits. Meanwhile, SFA amounts in selected snack foods types are generally acceptable. This research communication recommends that: a) 4-8 years old children should be restricted to 15g once a day (considering four eating occasions; 3 main meals + 1 snack) of the selected snack foods in order to be within the recommended daily energy intake from AS for this age group. b) redesign of the nutrition panel of snack foods to address the recommended nutritional needs of children per serving portion size as children are the main consumers of such products.

Study limitations

This study was limited to the nutrition information displayed in the nutrition panels of selected snack foods available in main supermarket outlets. This study does not include data on the amount of snack foods that individuals actually consume or actual snacking frequency, which can be further investigated. The credibility of this research concept is based on the fact that a nutrition panel is a standard reference for nutrition information used by nutritionist and dietetics. This research can provide a complementary information for further research in nutrition education which can be related to snack foods consumption by young children and the impact on their health.

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Appendix I

* The nutrients content in 100g and 30g of selected snack foods; RTE cereals, chocolate confectionary and biscuits

	100g				30g			
	CHO	**sugars**	**fat**	**saturated**	**CHO**	**sugars**	**fat**	**saturated**
RTE cereal								
1	84	35	2.5	0.9	25.2	10.5	0.75	0.27
2	82	29	3	1.5	24.6	8.7	0.9	0.45
3	75.8	28.8	4.5	1.8	22.74	8.64	1.35	0.54
4	75.4	28.1	4	1.7	22.62	8.43	1.2	0.51
5	75.2	28.5	2.2	0.6	22.56	8.55	0.66	0.18
6	84	43	1.5	0.4	25.2	12.9	0.45	0.12
7	87	37	0.6	0.1	26.1	11.1	0.18	0.03
8	82	35	5	0.9	24.6	10.5	1.5	0.27
9	82	35	5	0.9	24.6	10.5	1.5	0.27
10	76.1	28.4	1.7	0.2	22.83	8.52	0.51	0.06
11	76.1	24.5	2.8	0.6	22.83	7.35	0.84	0.18
12	88	28	1	0.3	26.4	8.4	0.3	0.09
Mean	80.6	31.7	2.8	0.83	24.2	9.5	0.85	0.25
SD	4.7	5.2	1.5	0.6	1.4	1.6	0.5	0.2
Chocolate confectionary								
1	59.2	49.6	70	20	17.76	14.88	21	6
2	60.7	57.5	28.5	17.7	18.21	17.25	8.55	5.31
3	61.5	57.5	26	16	18.45	17.25	7.8	4.8
4	57	54.5	29.5	18	17.1	16.35	8.85	5.4
5	61	46	27	15	18.3	13.8	8.1	4.5
6	60.5	53	13.2	8.2	18.15	15.9	3.96	2.46
7	61.5	49.7	10.7	6.7	18.45	14.91	3.21	2.01
8	58.3	45.7	29.7	17.6	17.49	13.71	8.91	5.28
9	66.9	47.5	20.9	14.7	20.07	14.25	6.27	4.41
10	58.4	40.9	24.8	13.5	17.52	12.27	7.44	4.05
11	54	53	38	8.7	16.2	15.9	11.4	2.61
12	57.6	56.8	31.6	11	17.28	17.04	9.48	3.3
13	49.5	41.2	37.3	17.3	14.85	12.36	11.19	5.19
14	54.5	50.6	31.6	14.6	16.35	15.18	9.48	4.38
15	53.3	53.3	35	22.6	15.99	15.99	10.5	6.78
16	64.6	48.4	24	13.9	19.38	14.52	7.2	4.17
17	59.7	50.1	25.8	20.4	17.91	15.03	7.74	6.12
18	69.6	61.3	17.6	10.2	20.88	18.39	5.28	3.06
19	60.9	50.7	26.4	10.1	18.27	15.21	7.92	3.03
20	57.5	45.5	30	19.5	17.25	13.65	9	5.85
21	55.6	47.5	28	10.1	16.68	14.25	8.4	3.03
22	63.9	54.5	23.5	15.8	19.17	16.35	7.05	4.74
23	61.5	51.9	24.3	15.2	18.45	15.57	7.29	4.56
24	68.4	62.5	23.4	14.5	20.52	18.75	7.02	4.35
25	68.9	65.5	20.7	12.7	20.67	19.65	6.21	3.81
26	55.7	55.1	32.2	19.2	16.71	16.53	9.66	5.76
27	62	62	29	18	18.6	18.6	8.7	5.4
28	61	50	26	17	18.3	15	7.8	5.1
Mean	60.1	52.2	28	14.9	18	15.7	8.4	4.5
SD	4.8	6.2	10.3	4.1	1.5	1.8	3.1	1.2

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	100g				30g			
	CHO	**sugars**	**fat**	**saturated**	**CHO**	**sugars**	**fat**	**saturated**
Biscuits								
1	74.5	34	19	9.5	22.35	10.2	5.7	2.85
2	73	32	19	9.5	21.9	9.6	5.7	2.85
3	59	1.1	24.8	11.8	17.7	0.33	7.44	3.54
4	68.2	34.6	20.4	11	20.46	10.38	6.12	3.3
5	68.1	31.6	20.4	10.7	20.43	9.48	6.12	3.21
6	71.3	30.8	16.6	7.9	21.39	9.24	4.98	2.37
7	66.1	30.7	21.6	13.1	19.83	9.21	6.48	3.93
8	72	30	23.2	14.8	21.6	9	6.96	4.44
9	83.3	30	13.3	6.7	24.99	9	3.99	2.01
10	58.8	33.8	26.4	22.2	17.64	10.14	7.92	6.66
11	53.4	30.2	32.7	24.1	16.02	9.06	9.81	7.23
12	53.9	32.4	28.4	21.3	16.17	9.72	8.52	6.39
13	73	39	19	8	21.9	11.7	5.7	2.4
14	66	16	22.8	11.3	19.8	4.8	6.84	3.39
15	53.6	31.3	34.7	31.9	16.08	9.39	10.41	9.57
16	50.6	29	35.7	32.8	15.18	8.7	10.71	9.84
17	56.7	31.3	24.5	18.8	17.01	9.39	7.35	5.64
18	56.7	15	23.33	10	17.01	4.5	6.999	3
19	60.6	18	24.1	11.9	18.18	5.4	7.23	3.57
20	72.5	20.7	14.3	6.7	21.75	6.21	4.29	2.01
21	63.6	28	24.5	11.9	19.08	8.4	7.35	3.57
22	61.2	30.5	27	23.4	18.36	9.15	8.1	7.02
23	58.9	28	26.2	22.1	17.67	8.4	7.86	6.63
24	56.1	31	29.1	20.3	16.83	9.3	8.73	6.09
25	63.5	10.5	22	10	19.05	3.15	6.6	3
26	60.6	10.3	22.9	15.8	18.18	3.09	6.87	4.74
27	76	27	11	6.8	22.8	8.1	3.3	2.04
28	71	27	11	5.7	21.3	8.1	3.3	1.71
29	68	34.5	20.5	10.5	20.4	10.35	6.15	3.15
30	62	34.1	27.1	13.7	18.6	10.23	8.13	4.11
31	65	6	22	11	19.5	1.8	6.6	3.3
Mean	64.4	26.4	22.8	14.4	19.3	7.9	6.8	4.3
SD	7.9	9.4	6	7.2	2.4	2.8	1.8	2.2