Fatty acid analysis of Iranian junk food, dairy, and bakery products: Special attention to trans-fats

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Background: Low attention to dairy product consumptions and high intake of junk foods and bakery products might be related to high prevalence of chronic diseases because of their fat content and fatty acid composition. **Objective:** In this study we investigated the kind and amount of fatty acid content in Iranian junk foods, dairy, and bakery products **Materials and Methods:** Some common brands of Iranian's junk foods, dairy, and bakery products were chosen randomly from different supermarkets in Iran. The amount of 10 g sample was considered for fatty acid analysis by gas chromatography equipment with flam ionization detector. **Results:** In this study stearic acid (C18:0) and palmitic (C16:0) acid have the highest amount among other saturated fatty acids in all groups. In junk foods and bakery products, the most common trans-fatty acid (TFA) is elaidic acid (C18:1 9t) with ranging from 2.4% to 18.5% and in dairy products vaccinic acid (C18:1 11t) has the high level of TFAs among others (2.1% to 11.5%). **Conclusion:** The amount of TFAs in Iranian junk foods and bakery products was in a high level.

Key words: Dairy products, junk foods, trans-fatty acid

INTRODUCTION

Dairy products are important components of the diet.[1] They are the best source of calcium, a nutrient that is associated with several chronic diseases.[2-5] Low consumption of dairy products especially milk may cause risks of several diseases such as dental caries, obesity, and osteoporosis.[3,4] Also, several studies show reverse relationship between dairy product intakes and overweight.[6-8] Data regarding the amount of dairy consumption among Tehranian adults showed that the amount of dairy intake was lower than the recommended amounts.[9] Regarding the adolescents, a low percentage of Tehranian adolescents consumed recommended amounts of dairy products. However, the rate of junk food intakes is higher than the healthy ones.[10] Low diary consumption and low diversity in choice of dairy products can cause micronutrients' deficiency.[11,12] These junk foods often contain high amount of industrially produced trans-fatty acids (IP-TFA) because of the use of partially hydrogenated fat in its production. TFA in the diet result from IP-TFA or from ruminant fat in dairy and meat products called ruminant-produced trans-fatty acid (RP-TFA).[13] TFA intake is associated with different chronic diseases such as coronary hearth disease.[13,14] Such an association is not reported for RP-TFA up to a daily intake of 4 g. The high consumption of IP-TFA in foods have a more harmful effect on health than RP-TFA.[13] The development of cardiovascular and other chronic diseases in adulthood is related to food habit especially dietary fat in childhood and adolescence.[10,15] Thus, the American Heart Association suggests limiting trans-fats to <1% energy, and the American Dietetic Association, the Institute of Medicine, US Dietary Guidelines, and the National Cholesterol Education Project all recommend limiting dietary trans-fat intake from industrial sources as much as possible.[14] It seems that useful educations about nutrition have important role in the choice of healthy dietary.[16,17] Therefore, knowledge about fatty acid composition of foods is necessary for performance of these useful educations. There are no completed reports regarding the amount of TFA content of foods in Iran. Therefore, in this study we have investigated fatty acid profile of some common products of dairies, bakeries, and junk foods produced in Iran.

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Quick Response Code:	**Website:** www.journals.mui.ac.ir/jrms
	DOI: ***

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MATERIALS AND METHODS

Seven kinds of junk foods that are consumed at high amount in Iran include cakes, cream biscuits, simple biscuits, cream chocolates, simple chocolates, potato chips and puffy, and eight kinds of dairy products such as high-fat milks, low-fat milks, high-fat yoghurts, low-fat yogurts, high-fat cheeses, low-fat cheeses, animal butters, and plant butters were considered. We asked from different supermarkets regarding the usual brands that people mostly buy in order to have a representative sample of different foods. After choosing these items, each one was randomly selected seven times from foods available in supermarkets. Each time 10 g of each food was chosen for fatty acid analysis.

Total lipids were extracted with Folch technique using chloroform: methanol (2:1 v/v).[18] Then the fatty acid components of the lipid extract converted to their respective methyl esters. BF_3-MeOH method was used for methyl-esterification of samples.[19] Gas chromatography (TR-CN100 column) was used to measure the fatty acid methyl esters by using a capillary (60 m, 0.25 mm inside diameter, 20 $_\mu$m film thickness), and flame ionization detectors was used. Conditions of process injection temperature, detector temperature, and initial temperature were 240°C, 250°C, and 90°C, respectively. Initial time was 5 min; 150°C for 10 min; 200°C for 15 min; and final temperature was 240°C for 20 min. The carrying gas was helium, with a pressure of 20 psi and a split ratio of 20:1.

Statistical Methods:

All findings have been reported as means and standard deviations. Fatty acid compositions of different foods were compared by using the test of analysis of variance. *P*-values were considered significant at <0.05. Statistical Package for Social Sciences (SPSS ver. 15) was used for all statistical analyses.

RESULTS

The results for Saturated Trans and Unsaturated fatty acid for junk food and bakery products are shown in tables 1-3 and this measurements for dairy products are shown in tables 4-6. According to Table 1, the most common SFAs in junk foods are related to cream chocolates (as 72.2%). In this group palmitic acid (C16:0) and stearic acid (C18:0) have the highest level among other SFAs as about 10% in cakes, creamed biscuits, and simple biscuits. Total fat in junk foods ranged from 20.8% to 36% compared with 1.4% to 92.9% in dairy products. In dairy products, levels of SFAs are higher than other fatty acids. They ranged from 42.4% in plant butter to 78.5% in low-fat yogurts. The most common SFAs in dairy products were palmitic acid (C16:0), stearic acid (C18:0), and then mirystic acid (C14:0), respectively.

Palmitic acid (C16:0) was two times more than mirystic acid (C14:0). In low-fat yogurts, the amount of mirystic acid (C14:0) and stearic acid (C18:0) was higher than high-fat ones. These results are shown in Table 4.

TFAs in dairy products are from 1.3% in low-fat cheese to 16.1% in plant butters while TFAs in junk foods are higher than dairy products as 4.5% in cream chocolates to 36.1% in cakes. Elaidic acid (C18:1 9t) is the most common TFA in junk foods as 2.4% in cream chocolates to 18.4% in cakes [Table 2], while in dairy products vaccinic acid (C18:1 11t) is more than other TFAs as 2.1% in low-fat yogurt to 11.5% in plant butter [Table 5]. Level of vaccinic acid (C18:1 11t) in chips and puffy and level of trans-13-octadecenoic acid (C18:1 13t) in simple chocolates, cream chocolates, chips, puffy, and level of petroselaidic acid (C18:1 6t) in cakes are zero. Except them, the other junk foods contain all types of TFAs less or more. In dairy products elaidic acid (C18:1 9t) in milk is zero and in plant butter it is at the high amount (3.2%). Petroselaidic acid (C18:1 6t) in all of dairy products is zero except in high-fat cheeses and animal butters. Linolelaidic acid (C18:2 9t 12t) in all group is zero except animal butters and plant butters. Petroselaidic acid (C18:1 6t) also, except high-fat cheeses and animal butter, in other group is zero [Table 5]. According to Table 3, although in junk foods MUFA (mono unsaturated fatty acid) and PUFA (poly unsaturated fatty acid) have the same level (as 14.8%), but in other foods in this group MUFA is from 2 to 6 times more than PUFA in this group and from 3 to 12 times higher than PUFA in dairy products [Table 6]. The most common MUFA in junk foods and dairy products is oleic acid (C18:1 9c). In junk foods high level of PUFA is related to linoleic acid (C18:2) but in cream chocolates linolenic acid (C18:3) as 1.9% is more than linoleic acid (C18:2) as 0.3%. conjugated linoleic acid (CLA) in cream chocolates, chips, and puffy is zero.

DISCUSSION

In this study, bakery products and junk foods had high amount of TFAs. The most component of TFAs in these products was elaidic acid (C18:1 9t). Comparing with the same products in other courtiers, the amount of TFAs was 0.02 to 3.13 g/100 g of product in four bakery products in food products in Italy.[20] In Turkey, bakery products have the highest TFA contents and ranged from 0.99 to 17.77 g/100 g fatty acids.[21] In Iranian bakery products cakes contain more level of TFAs (as 36.1%) than Turkish and Italian bakery products. TFAs were less than 0.17 g/100 g fatty acids in chocolate samples in Turkey.[21] In China, the content of TFAs in different foods ranged from 12.07% in pie and cake to 1.44% in chocolate and 0.83% in Chinese-style snacks.[22] TFAs are also present in cheese, cake, crisps, chips, wafer, and biscuit in China.[22] The amount of TFA content of cheese, butter, and milk was 5.6, 5.8 and 5.8 of total fatty

Table 1: Saturated fatty acid content (%) of different junk foods and bakery products in Iran

Fatty acids	Cakes (n = 21)	Cream biscuits (n = 21)	Simple biscuits (n = 21)	Simple chocolates (n = 21)	Cream chocolates (n = 21)	Potato chips (n = 21)	Puffy (n = 21)	P-value
Total fat	30.6±8.28	36.4±2.73	20.8±1.86	28.5±1.52	36.7±4.48	32.8±9.26	36.1±4.78	<0.01
C4:0	0.01±0.02	0.0±0.0 [b]	0.0±0.0 [b]	0.0±0.0 [b]	0.0±0.0 [b]	0.0±0.0 [b]	0.0±0.0 [b]	<0.01
C6:0	0.0±0.0 [a]	0.0±0.0 [a]	0.0±0.0 [a]	0.0±0.0 [a]	0.0±0.0 [a]	0.0±0.0 [a]	0.0±0.0 [a]	<0.01
C10:0	0.1±0.2	0.1±0.19	0.0±0.0 [b]	0.0±0.0 [b]	1.3±0.62	1.2±0.63	0.8±0.28	<0.01
C12:0	3.3±1.62	1.1 ±.043	1.9±2.80	2.1±0.95	1.3±0.65	1.3±0.68	0.9±0.30	<0.01
C14:0	3.2±4.62	1.6±0.30	2.9±0.77	2.1±0.70	1.9±0.54	1.3±0.9	3.6±0.98	<0.01
C16:0	10.2±4.5	25.9±2.40	17.8±6.14	37.1±4.58	24.8±10.8	15.9±4.71	21.5±3.97	<0.01
C17:0	0.01±0.03	0.0±0.0 [a]	0.5±0.57	0.03±0.03	12.4±2.75	0.3±0.12	0.03±0.03	<0.01
C18:0	10.8±5.5	10.8±1.78	10.5±3.50	14±2.3	30.5±3.50	18.9±6.54	20.1±4.5	<0.01
Total SFA	27.6±11.55	39.5±3.48	33.6±6.24	55.3±5.25	72.2±10.88	38.9±10.47	46.9±6.22	<0.01

C4:0 (Butyric acid); C6:0 (Capric acid); C8:0 (Caprylic acid); C10:0 (Capric acid); C12:0 (Lauric acid); C14:0 (Myristic acid); C16:0 (Palmitic acid); C17:0 (Heptadecanoic acid); C18:0 (Stearic acid).

Table 2: Trans -fatty acid content (%) of different junk foods and bakery products in Iran

Fatty acids	Cakes (n = 21)	Cream biscuits (n = 21)	Simple biscuits (n = 21)	Simple chocolates (n = 21)	Cream chocolates (n = 21)	Potato chips (n = 21)	Puffy (n = 21)	P-value
C16:1t	0/0±0/0[a]	003/0±002/0[b]	05/0±05/0[c]	03/0±03/0[c]	3/0 ±21/0 [d]	03/0±01/0[c]	01/0±03/0[c]	P < 01/0
C18:1 6t	9/5±20/6[a]	2/6±70/1[a]	8/3±02/3[b]	4/1±45/0[c]	3/1±57/0[c]	4/2±41/1[b]	6/0±11/0[d]	P < 01/0
C18:1 9t	4/18±6/5[a]	4/12±40/1[b]	6/9±4/2[b]	3/5±4/1[c]	4/2±89/0[c]	5/10±43/2 [b]	2/13±71/1[b]	P < 01/0
C18:1 11t	9/5±6/3[a]	3/0±19/0[b]	3/5±1/2[a]	4/1±42/0[c]	03/0±04/0[d]	0/0±0/0 [e]	0/0±0/0 [e]	P < 01/0
C18:1 13t	6/5±9/3[a]	2/2±70/1[b]	4/3±5/1[b]	0/0±00/0 [c]	0/0±0/0 [c]	0/0±0/0 [c]	0/0±0/0 [c]	P < 01/0
C18:2 9t 12t	3/0±23/0[a]	2/2 ±31/1 [b]	4/2±77/0[b]	2/0±30/0[a]	5/0±16/0 [a]	2/4±97/2[c]	8/7±24/2[d]	P < 01/0
Total TFA	1/36±01/8[a]	2/23±13/4[b]	5/24±10/6[b]	3/8±60/1[c]	5/4±32/1[c]	1/17±38/4[d]	6/21±94/2[b]	P < 01/0

(t = trans), C16:1 t (Palmitelaidic acid); C18:1 9t (Elaidic acid); C18:1 6t (Petroselaidic acid); C18:1 11t (Trans-vaccinic acid); C18:1 13t (trans 13-octadecenoic acid); C18:2 9t 12t (Linolelaidic acid).

Table 3: Unsaturated fatty acid content (%) of different junk foods and bakery products in Iran

Fatty acids	Cakes (n = 21)	Cream biscuits (n = 21)	Simple biscuits (n = 21)	Simple chocolates (n = 21)	Cream chocolates (n = 21)	Potato chips (n = 21)	Puffy (n = 21)	P-Value
C16:1	0/3±24/2[a]	6/1±17/1[b]	9/1±3/1[b]	4/4±03/1 [a]	7/2 ±51/2 [b]	2/0±24/0[c]	7/1±9/0[b]	< 01/0
C18:1 9c	4/21±16/0[a]	3/28±9/3[b]	7/29±6/4[b]	6/22±8/3[a]	5/10±3/3[c]	5/25±3/7[a]	2/13±70/1[c]	< 01/0
Total MUFA	4/24±60/11[a]	0/30±10/4[b]	6/31±1/6[b]	9/26±10/3[a]	2/13±5/2[c]	7/25±31/7[a]	8/14±04/2[c]	< 01/0
C18:2	9/8±7/5[a]	6/4±1/1[b]	6/8±4/2[a]	7/7±21/2[a]	3/0±22/0[c]	8/16±8/7[d]	3/12 ±1/9 [d]	< 01/0
CLA	2/0±21/0[a]	3/0±13/0[a]	5/0±52/0[b]	3/0±38/0 [a]	0/0±0/0 [c]	0/0±0/0 [c]	0/0±0/0 [c]	< 01/0
C18:3	3/1±91/0[a]	3/0 ±16/0 [b]	5/0±50/0[b]	7/0±37/0 [b]	9/1±60/0[a]	2/1±975/0[a]	8/2±74/0[c]	< 01/0
Total PUFA	2/10±83/6[a]	1/5±1/1[b]	6/9±4/2[a]	7/8±62/2[a]	4/2±40/0[b]	0/18±4/8[c]	8/14±3/9[c]	< 01/0

(c = cis), MUFA = Monounsaturated fatty acid, PUFA = Polyunsaturated fatty acid, C16:1 (Palmitoleic acid); C18:1 9c (Oleic acid); C18:2 (Linoleic acid); C18:2 9t 11c or C18:2 10t 12c (Conjugated linoleic acid (CLA)); C18:3 (Linolenic acid)

acids, in Ottawa.[23] Some researchers believe that there is no association regarding the RP-TFA intake and CHD (coronary heart disease) risk. They report that even the probable association is mostly related to the saturated fatty acids.[24] Vaccenic acid (C18:1 11t) from either IP-TFA or RP-TFA can be changed to rumenic acid. Rumenic acid (C18:2 9c 11t) is a CLA that has beneficial metabolic outcomes. However, elaidic acid (C18:1 9t), which is produced from IP-TFA, has not the mentioned favorable effects.[13]

IP-TFA may contain 60% of the fatty acids in trans-form. However, the RP-TFA has only 6% TFAs.[13] Based on the unfavorable effects of IP–TFA, public health authorities believed that IP-TFA should be kept in the minimum amounts.[14,25] Different studies have shown that food sources and amounts of TFAs are not equal worldwide.[26] Previous studied have shown in Iranian foods main source of TFAs are fast foods[27] and hydrogenated oils.[28] Again, fast foods were also the major source of TFAs intake among commercial Spanish foods.[29] As a limitation of the current study, we could not determine all fatty acids (e.g. myristelaidic acid trans-C14:1) in the tested foods, because of financial barriers. Previous studies have demonstrated that high consumption of TFAs may cause many chronic diseases such as type II diabetes, metabolic syndrome, and abdominal obesity. Also, the relationships between foods with high amount

Table 4: Saturated fatty acid content (%) of different dairy products in Iran

Fatty acids	High-fat milk (n = 21)	Low-fat milk (n = 21)	Low-fat yogurt (n = 21)	High-fat yogurt (n = 21)	Low-fat cheese (n = 21)	High-fat cheese (n = 21)	Animal butter (n = 21)	Margarine (n = 21)	P-value
Total fat	5.8±2.25	2.5±1.15	1.4±0.30	4.4±0.56	24.2±1.5	37.2±4.55	92.9±27.34	9.6±9.88	< 01/0
C4:0	4.2±3.42	3.3±2.25	3.5±0.71	2.3±1.58	0.8±0.82	0.8±0.13	2.9±0.33	0.0±0.0[d]	< 01/0
C6:0	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.8±0.56	1.5±0.32	< 01/0
C8:0	2.6±0.53	1.5±0.44	2.8±0.71	2.3±1.32	1.6±0.20	1.6±0.54	1.1±0.26	0.3±0.21	< 01/0
C10:0	2.6±2.89	1.8±0.22	3.5±0.28	2.4±0.68	4.9±1.1	3.8±0.7	2.0±0.4	0.4±0.5	< 01/0
C12:0	4.3±3.41	3.3±4.21	3.5±0.72	4.5±0.90	7.0±1.64	4.6±1.4	4.2±0.45	3.6±0.33	< 01/0
C14:0	13.2±7.10	11.3±8.22	14.3±2.14	11.4±2.04	13.5±2.46	13.5±2.16	11.7±1.21	0.7±0.42	< 01/0
C16:0	26.3±13.1	21.2±6.42	28.6±5.71	31.8±7.04	23.8±0.54	26.3±2.65	32.1±9.24	20.6±0.89	< 01/0
C17:0	0.3±0.26	0.2±0.3	0.0±0.0[c]	0.0±0.0[c]	0.4±0.22	1.3±0.54	0.2±0.11	0.1±0.1	< 01/0
C18:0	12.2±8.68	10.2±6.65	21.4±23.56	9.1±2.49	22.5±0.70	23.5±2.48	12.0±1.72	15.2±0.56	< 01/0
Total SFA	65.7±33.90	52.8±13.25	78.5±22.13	63.7±0.44	74.5±1.31	75.4±7.45	67.0±8.96	42.4±9.92	< 01/0

C4:0 (Butyric acid); C6:0 (Capric acid); C8:0 (Caprylic acid); C10:0 (Capric acid); C12:0 (Lauric acid); C14:0 (Myristic acid); C16:0 (Palmitic acid); C17:0 (Heptadecanoic acid); C18:0 (Stearic acid).

Table 5: Trans-fatty acid content (%) of different dairy products in Iran

Fatty acids	High-fat milk (n = 21)	Low-fat milk (n = 21)	Low-fat yogurt (n = 21)	High-fat yogurt (n = 21)	Low-fat cheese (n = 21)	High-fat cheese (n = 21)	Animal butter (n = 21)	Margarine (n = 21)	P-value
C16:1t	3.3±7.01	1.3±0.88	0.0±0.0[c]	0.2±0.21	0.8±0.82	0.5±0.1	0.2±0.31	0.5±0.04	< 01/0
C18:1 6t	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.03±0.01	0.2±0.03	0.0±0.0[a]	< 01/0
C18:1 9t	0.0±0.0[a]	0.0±0.0[a]	0.7±0.21	0.4±0.21	1.6±0.20	0.1±0.03	0.3±0.25	3.2±0.58	< 01/0
C18:1 11t	10.8±13.6	7.9±4.25	2.1±0.22	2.3±1.1	4.9±1.11	2.7±0.6	2.7±0.34	11.5±6.33	< 01/0
C18:1 13t	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.03±0.01	0.02±0.003	0.0±0.0[a]	< 01/0
C18:2 9t 12t	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.0±0.0[a]	0.3±0.33	0.9±0.6	< 01/0
Total TFA	14.1±10.9	9.2±5.52	2.8±0.7	2.9±1.1	1.3±0.3	3.3±0.6	3.4±0.70	16.1±7.88	< 01/0

(t = trans), C16:1 t (Palmitelaidic acid); C18:1 9t (Elaidic acid); C18:1 6t (Petroselaidic acid); C18:1 11t (Trans-vaccinic acid); C18:1 13t (trans 13-octadecenoic acid); C18:2 9t 12t (Linolelaidic acid).

Table 6: Unsaturated fatty acid content (%) of different dairy products in Iran

Fatty acids	High-fat milk (n = 21)	Low-fat milk (n = 21)	Low-fat yogurt (n = 21)	High-fat yogurt (n = 21)	Low-fat cheese (n = 21)	High-fat cheese (n = 21)	Animal butter (n = 21)	Margarine (n = 21)	P-value
C16:1	0.0±0.0[a]	0.0±0.0[a]	0.7±0.01[b]	0.2±0.09[c]	0.8±0.1[b]	1.9±0.0.02[d]	0.2±0.21[c]	0.1±0.1[c]	< 01/0
C18:1 9c	13.1±0.35[a]	10.0±2.25[a]	14.2±0.01[a]	24.0±4.5[b]	15.9±1.7[a]	13.5±3.8[a]	25.4±8.8[b]	25.2±8.55[b]	< 01/0
Total MUFA	13.1±0.35[a]	10.0±2.25[a]	14.9±0.04[a]	24.2±3.8[b]	16.7±1.8[a]	15.4±3.9[a]	25.6±8. 8[b]	25.3±9.96[b]	< 01/0
C18:2	0.5±0.004[a]	0.2±0.03[b]	0.7±0.004[c]	0.4±0.01[a]	0.8±1.2[c]	0.8±0.08[c]	0.3±0.11[b]	8.5±5.5[d]	< 01/0
CLA	1.1±0.02[a]	0.9±0.45[ab]	0.7±0.01[b]	6.8±5.5[c]	4.9±1.0[d]	4.3±1.0[d]	3.6±0.5[d]	0.5±0.44[b]	< 01/0
C18:3	0.5±0.01[a]	0.5±0.03[a]	1.4±0.003[b]	0.7±1.25[a]	0.1±0.02[c]	0.1±0.05[c]	0.5±1.6[a]	0.1±0.02 [c]	< 01/0
Total PUFA	2.1±0.03[a]	1.6±0.25[a]	2.8±0.01[a]	7.9±5.9[b]	5.8±1.90[c]	5.2±1.0[c]	2.4±0.46[a]	9.1±4.65[b]	< 01/0

(c = cis), MUFA = Monounsaturated fatty acid, PUFA = Polyunsaturated fatty acid, C16:1 (Palmitoleic acid); C18:1 9c (Oleic acid); C18:2 (Linoleic acid); C18:2 9t 11c or C18:2 10t 12c (Conjugated linoleic acid (CLA)); C18:3 (Linolenic acid).

of TFAs and some chronic diseases have been mentioned frequently.[30-33] Therefore, the amount of TFAs exists in foods and also having knowledge regarding different kinds of the fatty acids in different foods is important in society heath maintenance. Many beneficial effects of foods are related to their fatty acid content. For example, recent researches have proven that the kind of fatty acid in soy production is important component in its healthy effects on aspects of chronic diseases.[34-36] Hence, consumption of foods contains good kinds of fatty acids including MUFA and PUFA which have effective influences in prevention and treatment of chronic diseases. Although many researchers believe that

low-fat diet has more advantage compared to high-fat diet, but some recent studies have shown that a moderate-fat diet, which contains good kinds of fats, has more beneficial effects on weigh reduction than low-fat diet.[37] Therefore, the attention to the kinds of fatty acid consumption and preparation of food composition tables in each country is one of the basic necessary work for increasing knowledge about food science.

By the way this is the first study that shows the amount of TFAs in Iranian dairies, bakeries, and junk foods. The traditional Iranian food composition table does not contain

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the amounts of TFAs in different foods. This is an important barrier in conducting researches regarding the association between the TFAs' intake and risk of chronic diseases in Iranian population. Therefore, this association in Iran was restricted on the source of TFAs' intake like partially hydrogenated vegetable oil and non-communicable diseases. This study provides a suitable material for assessing the relationship between TFAs intake and the risk of chronic diseases.

In conclusion, in Iran cakes had the highest amount of TFAs among the bakery products and junk foods. Among dairy products, margarines had the highest amount of TFAs. More quality control is needed regarding the type of fat content for these products.

ACKNOWLEDGMENTS

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