



Trans-Fats Declaration, Awareness and Consumption in Saudi Arabia

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Abstract

Hydrogenated oil (HO) has been considered one of the major sources of artificial trans-fats that is associated with various public health problems. In the present work, a cross-sectional survey was conducted to monitor trans- fats recording approaches in some food package (N=181) collected from some Saudi markets, 2014-2016. Assessment of participants awareness of HO and consumption frequencies of selected products that listed trans-fats in their package were also conducted based on interview questionnaires (N=302). Data collected from information existing on food package, such as ingredients list, and nutrition facts label as well as nutrition claims showed that 30.39% of the products listed ingredients containing trans-fat such as hydrogenated oil, partially hydrogenated oil, margarine and hydrogenated fats. Questionnaire data analysis showed that only 35.1% of the participants heard of HO and 4% thought that HO is unhealthy. Significant positive correlation was found between participant's education level and hearing about HO (0.69 at 0.01 level) as well as reading the food label (0.87 at 0.01 level). Cakes, wafers and pastries were highly consumed (two-three times per day) by 37.4%, 24.5% and 44.4 %, respectively by participants. Although, one third of collected packaged food products recording ingredients containing trans-fats in the ingredients list such as vegetable fat, HO, margarine and partially HO, only 20% of these products reported trans-fats content. Therefore, more attention should be payed to reevaluate the food label legalization. Furthermore, health education programs about trans-fats sources and related disease are strongly recommended.



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Introduction

Trans fatty acids (TFA) are unsaturated fatty acids containing at least one double bond in the trans configuration. Trans fatty acids are formed artificially as results of hydrogenation of liquid oil. In this process, liquid oils are heated then exposed to hydrogen in presence of catalyst to convert liquid oils to solid fats form such as margarines, shortenings, vanaspati and bakery fats.¹ High temperatures used in this process lead to flip some of the carbon double bonds into the "trans" form and they will be present in the last product as trans-fatty acid.

Trans fatty acids is the type of fat and has been associated with increase of coronary artery disease incidence.² In the past, the effects of fats on increasing plasma total cholesterol levels was thought to refer to increasing the saturation degree of the fatty acids.^{3,4} However, the recent evidence indicates that TFAs existing in HOs not only increases low-density lipoprotein cholesterol and total cholesterol levels, but decreases high-density lipoprotein cholesterol also.⁵ Trans-fats are correlated with heart disease as a result of increasing low-density lipoprotein cholesterol that known as the bad cholesterol.⁶ Therefore, TFAs are suggested to be more harmful than saturated fatty acids.⁷ Scientists at the Public Health School of Harvard University estimated that in USA (2001), about 30,000 people died of cardiovascular diseases events caused by TFAs.⁸ Dietary TFA was associated significantly with bad term recall. Prooxidant and energetic detriments of dietary trans fatty acid and triangulation with other evidence offer predictions for causality.⁹ Partially HOs are risk factor for obesity, heart diseases, and clogged arteries and depression. The total trans fatty acids consumption should not exceed 2 to 3% of the food energy. The sources of TFAs have rapidly increased, from mainly margarine to fried fast foods and bakery products.¹⁰ Some studies stated that the main source of TFA is baked products such as cookies, cakes, muffins, breads and pastries.¹¹ According to Codex Guidelines on Nutrition Labelling, the amount of saturated fatty acids, monounsaturated fatty acids, polyunsaturated fatty acids and cholesterol should be confirmed. The declaration of trans-fats on nutrition label is mandatory in some countries such as the USA and Canada. By means of restricting the use of trans fats, Denmark and New York City have set limits for

trans-fats in food products. Trans fatty acids content of some brands of margarines and shortenings commonly used in Saudi Arabia was analyzed.¹² It was found that trans fatty acids content ranged from 0.2-8.3% and 0.9-20.6% respectively. Trans 18:1 was found to be the main trans fatty acid in their study. Higher trans contents were observed in shortenings samples compared to margarines samples. One of the Food Drug Administration labelling requirements was to inform the consumers about trans-fats presence. The FDA¹³ took steps to reduce partially hydrogenated fat from the American diet such as cakes, cookies, crackers, frozen pies and other bakery products, snack foods, frozen pizza, stick margarines and vegetable shortenings, coffee mates, dough products and other. The artificial trans-fats is common in American packaged foods.¹⁴ Eighty four percent of the American packaged foods that contain partially hydrogenated fats (less than 0.5g) are labelled as 0.0 g of trans-fat. This labelling is reason for alarm because consumers, seeing zero trans-fat (TF) on the food label, may not understand that they are consuming trans-fat less than 0.5g.

In its standard-setting role, the Gulf Cooperation Council has begun the approval process for guidance on mandatory food labelling for total fat, saturated fatty acids, trans-fat and salt in all imported or locally produced food. This will become mandatory in all seven Gulf Cooperation Council countries.¹¹ Therefore, it is important for food consumers to be informed about trans fatty acids content of their food products. The aim of this study was to report how food manufacturers declare trans-fats content on the package of some food products sold in Saudi Arabia markets. Furthermore, assessment of the awareness of hydrogenated oil or trans-fats to public and their consumption frequencies of some products was studied.

Materials and Methods

Data Collection From Food Label

One hundred eighty one food products were collected from local supermarkets in Al Ahsa, Saudi Arabia between 2014 and 2016 to analyse the food labels information about trans-fats containing ingredients with different alternative terms. The food products items included; a) Bakery products; seventy four samples were collected such as biscuits, cakes, toast, wafers, pies, bread, crackers and sambosa

pastry. b) Dairy products; sixty seven samples were collected included fermented milk, labenah, cream cheese spread, cheese slices, mozzarella, butter, cream and whipping cream. c) Other products such as dried soup, coffee mate, peanut butter and vegetable fat. The selected products are sold in supermarkets all over the country.

Data were collected by the authors and skilled dieticians. The present study established the data-collection from the information of the ingredients list and the nutrition facts of the food package that declare the presence of trans-fats and its percentage. Some terms were considered as indicator of trans-fats presence such as HO/fat, partially HO, vegetable fat, margarine.¹⁵ The percentage of trans-fat contained products and the percentage of each alternative name mentioned in the food packages were calculated. Likewise, any claim on the food label about trans-fat percentage (even zero trans-fats) was considered.

Assessment of Awareness and Consumption of Trans-Fats

Dietary interview questionnaires were carried out among 302 participants aged between 14 and 50 from Al Ahsa, Saudi Arabia, 2016, to assess their knowledge about HO and their consumption frequency of some selected packaged food products. The questionnaire was explained and the participants were informed about the purpose of the study. Most of the participants were women (87.1%). The questionnaire contains questions about education level, income of the participants, hearing about HO, thoughts about unhealthy effect and if they bought HO just to save money. The instrument used includes some food products consumption frequencies that labelled with HO. The main question was, "How often do you consume the following products?" then participants were asked about the frequency of their consumption of biscuits, cake, wafers, coffee, mates and pastries intake. The respondents were assessed as 2-3 times per day, once per day, twice per week, and other.

Data Analysis

Data were analysed using SPSS version 21 (SPSS Inc., Chicago, USA). Descriptive data was obtained as percentage for all tested parameters. Data were analysed in percentages and frequencies.

Spearman's rank order correlation was used to determine significance for associations between sociodemographic and knowledge variables.

Results and Discussion

Trans-Fats Declaration on Some Food Products Packages

From 181 food products collected 61 (33.7%) food products declared using the HO (trans-fat containing ingredients) in their food label (table 1). However, the other (64.64%) of food products listed "fat" or "oil" in the products package without any declaration that the products have zero trans-fat in their nutrition fact. Hundred percent of fermented milk, labenah, cream cheese spread, cheese slices, cream and dried soup products did not list any types of trans fat containing ingredient in their ingredients list. However, 33.3% of mozzarella, 25% of butter and 25% of whipping cream recorded trans-fat containing ingredients in their ingredients list. Forty-three from seventy-four samples of bakery products (58.11%) declared using trans-fat containing ingredients in their ingredients. Cake products (94.74%), pies (75%), breads (60%), sambosa (40%) and crackers (60%) showed the highest percentages in reporting trans-fat containing ingredients in their ingredients list.

Figure 1 illustrates how trans-fat content was declared on food label. Thirty-seven of the collected samples (20.44%) declared the trans-fat content or claimed, "zero trans-fats". All coffee mate products collected in this study listed HO in their ingredients list with no claim about trans-fat. Fifty percent of biscuits and pies reported that trans-fat was zero or less than 0.5% in the nutrition facts. On the other hand, 100% of dressing and dried soup samples claimed that all samples had zero percentage of trans-fat. Unexpectedly the vegetable fat collected samples had no sign about trans-fat although 22.2% of its samples reported HO in their ingredients list and 77.7% of the vegetable fats had no information about their ingredients. The types of trans-fat containing ingredients listed in food label of some products sold in Saudi Arabia and using HO were represented in figure 2. The data showed that 100% of pies and coffee mates, 66.66% of collected biscuits samples, 22.2% of vegetable fat and 12.5% of butter reported "hydrogenated oil" in their ingredients list. However,

fifty percent of wafers listed using "partially hydrogenated oil". Vegetable fat term was used with 38.89%, 66.67% and 33.33% in cake, bread and mozzarella products package, respectively. Approximately 33.33% of cakes and toasts

using "margarine" term in their ingredients list. Generally, 1.42% of the samples used vegetable fat term and 35% used HO term. Furthermore, margarine and partially HO terms were used 18 and 5%, respectively.

Table 1. Declaring Trans-Fat Containing Ingredients in the Ingredients List of Some Food Products Sold in Saudi Markets, 2014-2016 (N=181)

Sample	N	%	Trans-Fat Containing Ingredients		Fat /Oil	
			N	%	N	%
Bakery products						
Cakes	19	10.49	18	94.74	1	5.26
Biscuits	16	8.84	6	37.50	10	62.50
Toasts	9	4.97	3	33.33	6	66.67
Pies	8	4.42	6	75.00	2	25.00
Wafers	7	3.87	2	28.57	5	71.43
Breads	5	2.76	3	60.00	2	40.00
Crackers	5	2.76	3	60.00	2	40.00
Sambosa pastries	5	2.76	2	40.00	3	60.00
Total of bakery products	74	40.88	43	58.11	31	41.89
Dairy products						
Fermented milk	6	3.32	0	0.00	6	100.00
Labenah	7	3.87	0	0.00	7	100.00
Cream cheese spread	8	4.42	0	0.00	8	100.00
Cheese slices	9	4.97	0	0.00	9	100.00
Mozzarella	9	4.97	3	33.33	6	66.67
Butter	8	4.42	2	25.00	6	75.00
Cream	12	6.63	0	0.00	12	100.00
Whipping cream	8	4.42	2	25.00	6	75.00
Total dairy products	67	37.01	7	10.45	60	89.55
Other						
Dressings	19	10.49	0	0.00	19	100.00
Coffee mates	3	1.66	3	100.00	0	00.00
Vegetable fat	9	4.97	2	22.22	7	77.78
Dried soups	3	1.66	0	0.00	3	100.00
Peanut butter	6	3.31	6	100.00	0	0.00
Total of other products	40	22.10	11	27.50	29	72.50
Total	181	100	61	33.70	120	76.30

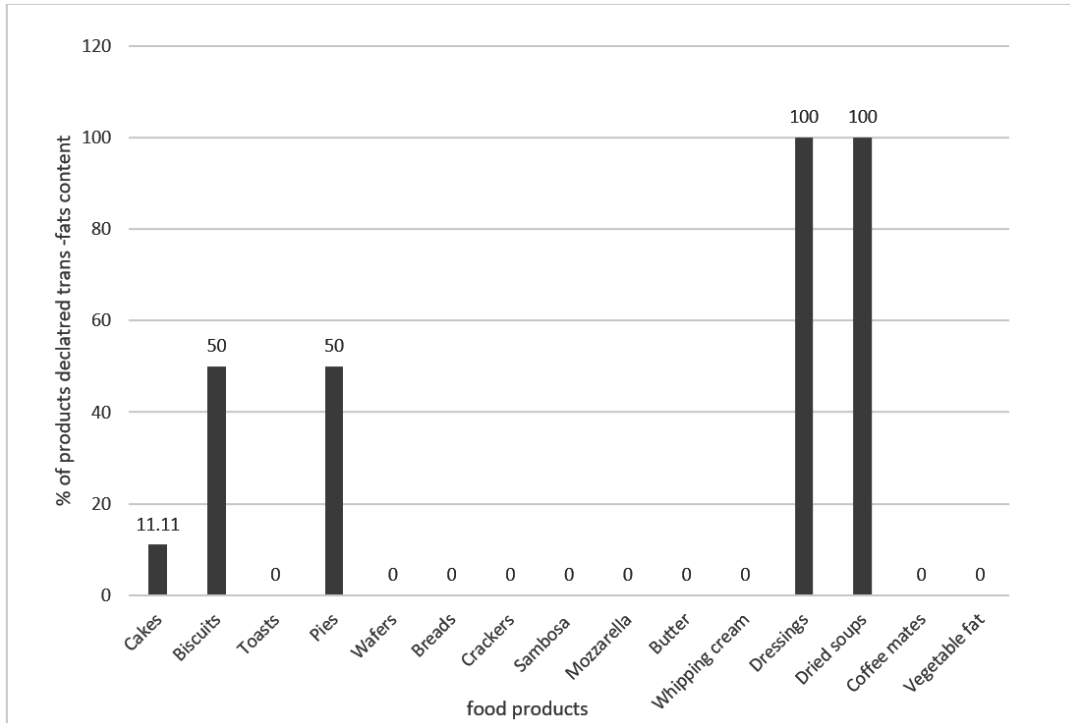


Fig. 1 Declaration of Trans-Fat Content in the Nutrition Facts of Selected Food Products Sold in Saudi Markets

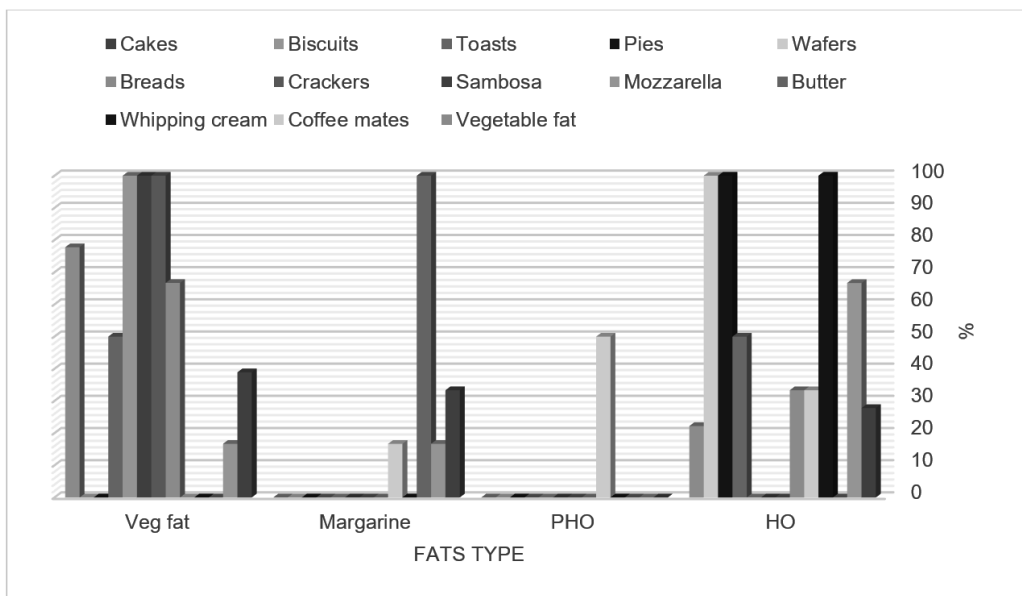


Fig. 2 Percentage of Trans-Fats Listed in The Products

Awareness and Consumption of Trans-Fats

Socio demographic variables and some question's answers about awareness of hydrogenated oils for 302 participants were showed in (table 2) the data indicates that 87.1% of the study

sample was females. Most of them aged 14 to 24 years. University education level formed the majority of the study sample (75.5%) followed by 22.2% were middle school level.

Table 2. Socio-Demographic Variables of Participants Consuming Some Trans-Fat Listing Products Sold in Saudi Markets (N=302)

Variables	Frequency	Valid Percent
Sex		
Male	39	12.9
Female	263	87.1
Mean Age		
14-24	232	77.2
24-50	69	22.8
Education Level		
Primary	7	2.3
Middle - school	66	22.2
University	228	75.5
Income (Rs)		
> 2500 RS	164	54.3
2500-5000	81	26.89
< than 5000	54	17.9
Non-respondents	3	1.0
Have you heard about HO?		
Yes	106	35.1
No	196	64.9
Do you think that HO is unhealthy?		
Yes	12	4.0
No	169	64.9
I don't know	94	31.1
Are you interested in reading the food label?		
Yes	62	20.5
No	240	79.5
Do you buy HO to save money?		
Yes	146	48.3
No	156	51.7

Table 3. Consumption Frequencies of Some Trans-Fat Listing Products Sold in Saudi Markets (N=302)

Samples	2-3 Times Per Day		Once Per Day		Twice Per Week		Other	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Biscuits	23.0	7.6	24.0	7.9	126.0	41.7	129.0	42.7
Cake	113.0	37.4	15.0	5.0	51.0	16.9	123.0	40.7
Wafers	74.0	24.5	105.0	34.8	66.0	21.9	57.0	18.9
Pastries	134.0	44.4	39.0	12.9	60.0	19.9	69.0	22.8
Coffee mate	71.0	23.5	15.0	5.0	15.0	5.0	201.0	66.6

Data from awareness questions showed that 35.1% of the participants heard of hydrogenated oils, 4% thought that HO is unhealthy and 79.5% had not been reading food label. Saving money was found to be the only reason to buy the hydrogenated oils for 48.5% of the participants. No significant relationship was found between education level or income and the consumption frequency of the all products. Significant positive correlation was found between participant's education level and hearing about HO ($r=0.69$, $p> 0.01$) as well as reading the food label ($r=0.87$, $p> 0.01$). In contrast, highly negative correlation between participant income and their awareness about HO ($r=-0.8$, $p> 0.01$), reading the food label ($r=-0.76$, $p> 0.01$) and low price of hydrogenated fat ($r=-0.91$, $p> 0.01$). Questionnaires data analysis in (table 3) showed that cakes and pastries were consumed 2-3 times per day by 37.4 and 44.4 %, respectively. Wafers products were consumed 2-3 times or once per day by 24.5 and 34.8%, respectively. Consumption of biscuits by the participants were mainly twice a week (41.7%) and less (42.7%). It is worthy to mention that 58.11% of bakery products and 28.57% of wafers supposed to have trans fatty acids as presented on its package labels. Fortunately, consumption of coffee mate was 66.6% less than twice a week (other) which supposed to have trans fatty acids as presented on its package labels in all collected samples.

Discussion

It was obviously clear the lack of information about trans-fat content in the collected products although that 33.7% of these products pronounced using hydrogenated oil. That does not help the population to make healthy choice. Furthermore, reporting;

zero or less than 0.5% trans-fat in the nutrition facts is not sufficient because claiming zero trans-fat on the product package does not always mean that the products have no trans-fat in fact.¹⁵ Substituting the hydrogenated oil term with other terms like vegetable fat or partially hydrogenated oils lead to more confusion for consumers to identify the disease-related ingredients in packaged foods easily. These results are in accordance with other previous studies which revealed that in Europe (2006-2007) consumers also could not detect the amount of trans-fats in the food products labels. The poor labelling for fatty acid composition of margarines was found in Spain.^{16,17} Costa *et. al* found that among 268 samples collected from Portuguese market commercialized food, TFA content in the fat added products ranged from 0.06 to 30.2%, with the highest average values in the wafers, biscuits and cookies group (3.4% TFA), followed by pastry group (2%).¹⁸

Brazilian supermarkets as Saudi markets seemed to have several food products items listing trans-fat-containing ingredients with substitute terms. However, 25% of these collected food products from claimed to contain "zero trans-fat" on the packaging.¹⁹

Questionnaires data analysis insured that nutritional education programs is highly recommended to increase the awareness of the consumers and reduce several health problems especially for those who have lower education. The knowledge of US consumers about their dietary fats types, 2004-2005 was also evaluated; it was found that higher education of consumers was parallel with awareness and understanding of different fat types.²⁰

Bakery products which seemed to contain trans-fats containing ingredients were found to be highly consumed and that was similar to data obtained by Markiewicz-Żukowska *et al.*²¹ who found that bakery products were habitually consumed (80%) by young adults among university students. Students from three schools in Morocco consume were found to consume biscuits and chocolates with 37.7% and 14.5%. Biscuits are highly correlated with some additives included trans-fatty acid.²²

Conclusion

In the present study, we found that one third of collected package food products using ingredients containing trans-fats and mentioned that in the ingredients list. Less than one fifth of products reporting the percentage of trans-fats or claimed that no trans-fats. Hydrogenated oil, partially hydrogenated oil, margarine and vegetable fat were used as ingredients component terms. Our questionnaires data showed that the majority of

participants have no information about unhealthy effect of hydrogenated oils nor read the food labels. Cakes, wafers and pastries that have trans-fat on their labels were found to be highly consumed by participants. The present results explained the importance to supply all information on food package by producers to help people monitoring their intake of trans-fats therefore diminish their susceptibility to several health problems. Health education programs are strongly needed to public health. Additional studies on TFA content in food products with and without exact brand label in Saudi Arabia are recommended.

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Conflict of interest

The authors have no competing interests

References

1. Fauziah A., Sundram K. Trans Fatty Acids – An update on its Regulatory Status. *Palm Oil Developments*. 2003;39:16-19.
2. Mishra S., Manchanda M. D. Cooking Oils for Heart Health. *Journal of Preventive Cardiology*. 2012;1:123-131.
3. Ghafoorunissa G. Impact of Quality of Dietary Fat on Serum Cholesterol and Coronary Heart Disease: Focus on Plant Sterols and Other Non-Glyceride Components. *Natl Med J India*. 2009;22:126-32.
4. Volk M. G. An Examination on of the Evidence Supporting the Association of Dietary Cholesterol and Saturated Fats with Serum Cholesterol and Development of Coronary Heart Disease. *Alternative Medicine Review*. 2007;12:228-45.
5. Lichtenstein A. H., Erkkila A. T., Lamarche B., Schwab U. S., Jalbert S. M., Ausman L. M. Influence of Hydrogenated Fat and Butter on CVD Risk Factors: Remnant-Like Particles, Glucose and Insulin, Blood Pressure and C-Reactive Protein. *Atherosclerosis*. 2003;171:97–107.
6. Bajinka O., Touray A. O., Oyelakin O. Trans-Fat Food has More Risk to Cardiovascular Disease than Having Effects as Causative Factors of Cancer. *J Cancer Clin Trials*. 2017;2:134.
7. Sartika R. A. Dietary Trans Fatty Acids Intake and Its Relation to Dyslipidaemia in a Sample of Adults in Depok city, West Java, Indonesia. *Malaysian Journal of Nutrition*. 2011;17:337-46.
8. Dorfman S. E., Laurent D., Gounarides J. S., Li X., Mullarkey T. L., Rocheford E. C., et al.. Metabolic Implications of Dietary Trans-Fatty Acids. *Obesity*. 2009;17:1200-1207.
9. Golomb B. A., Bui A. K. A Fat to Forget: Trans Fat Consumption and Memory. *Plos one*. 2015;10:0128-129.
10. Willett W. C. TransFatty Acids and Cardiovascular Disease – Epidemiological Data. *Atherosclerosis Supplements*. 2006;7:5-8.
11. Nurshahbani S., Azrina A. TransFatty Acids in Selected Bakery Products and its Potential Dietary Exposure. *International Food*

- Research Journal*. 2014;21:6.
12. Bakeet Z. A., Alobeidallah F. M., Arzoo S. Fatty Acid Composition with Special Emphasis on Unsaturated Trans Fatty Acid Content in Margarines and Shortenings Marketed in Saudi Arabia. *International Journal of Biosciences*; 3: 86-93. (2013).
 13. Tentative determination regarding partially hydrogenated oils; request for comments and for scientific data and information. FDA Notice No. FDA2013-N-1317 Fed. Reg. 78, 2013. 67169-67175.
 14. Clapp J, Curtis C. J, Middleton A. E, Goldstein G. P. Prevalence of Partially Hydrogenated Oils in US Packaged Foods, 2012. *Prev Chronic Dis*; 11:140161.(2014).
 15. Hissanaga-Himmelstein V. M., Oliveira M. S. V, Silveira B. M, Gonzalez-Chica D. A, Proença R. P. C and Block J. M. Comparison Between Experimentally Determined Total, Saturated and Trans Fat Levels and Levels Reported on the Labels of Cookies and Bread Sold in Brazil. *Journal of Food and Nutrition Research*; 2:906-913. (2014).
 16. Eckel R. H, Kris-Etherton P, Lichtenstein A. H, Wylie-Rosett J, Groom A, Stitzel K. F, Yin-Piazza S. Americans' Awareness, Knowledge, and Behaviours Regarding Fats: 2006–2007, *J Am Diet Assoc*; 109: 288–296. (2009).
 17. Larque E, Garaulet M, Pérez-Llamas F, Zamora S and Tebar F. J. Fatty Acid Composition and Nutritional Relevance of Most Widely Consumed Margarines in Spain. *Grasasy Aceites*; 54:65–70. (2003).
 18. Silveira B. M, Gonzalez-Chica D. A. In addition, Proença RPC. Reporting of Trans-Fat on Labels of Brazilian Food Products. *Public Health Nutrition*; 16:2146-2153. (2013).
 19. Costa N, Cruz R, Graça P, Breda J, Casal S. Trans Fatty Acids in the Portuguese Food Market. *Food Control*; 64: 128-134. (2016).
 20. Lin C, Jand Yen S. T. Knowledge of Dietary Fats among US Consumers. *Journal of the American Dietetic Association*; 110:613-618. (2010).
 21. Markiewicz-Żukowska R, Moskwa J, Gromkowska-Kępcza, K. et al. Bakery Products as a Source of Total Dietary Fibre in Young Adults. *Roczniki Państwowego Zakładu Higieny*; 67: 131-136. (2016).
 22. Rhaïem N, Sedki H, Youss M, Chahboun N. and Ouhssine M. The Evaluation of the Consumption of Additives and their relationship to the Food Products in Morocco. *Journal of Materials and Environmental Science*; 7:3043-3049. (2016).