



## FATTY ACID PROFILE OF FAST FOODS, TRADITIONAL SNACKS AND SWEETMEATS OF BANGLADESH

Meher Un Nessa<sup>1\*</sup>, Abu Torab M. A. Rahim<sup>2</sup> and Yearul Kabir<sup>3</sup>

<sup>1</sup>*Environmental Science Discipline, Khulna University, Khulna-9208, Bangladesh*

<sup>2</sup>*Institute of Nutrition and Food Science, University of Dhaka, Dhaka –1000, Bangladesh*

<sup>3</sup>*Department of Biochemistry and Molecular Biology, University of Dhaka, Dhaka, Bangladesh*

KUS-08/20-230408

Manuscript received: April 04, 2008; Accepted: June 30, 2008

**Abstract:** A total of 184 samples from 18 varieties of commercial fast foods, traditional snacks and sweetmeats of Dhaka city were examined for fatty acid composition, percentage of monounsaturated fatty acid (MUFA), polyunsaturated fatty acid (PUFA), and saturated fatty acid (SFA). Fatty acid methyl esters prepared from lipid extracts were analyzed by gas-liquid chromatography using capillary columns. The percentage of total fatty acid of these foods was determined. In general, traditional snacks showed high proportion of SFA (ranged 24.4-65.5%) and fast foods showed high proportion of PUFA (ranged 11.9-52.8%). The MUFA content, on the other hand, in all foods ranged 29.8-42.3% with a predominant contribution by oleic acid (18:1). The findings of the study showed that these Bangladeshi commercial fast foods and traditional snacks were high in SFA especially in chicken patties (50.2%), beef pizza (48.1%), beef patties (46.6%), and all sweetmeats (ranged 52.8-65.5%) except kalojam (35.6%). The source of SFA in the fat fraction was basically animal fats and palm oil. The experimental results showed that the Bangladeshi young urbanites who are accustomed to fast foods culture seem to be in the risk of high energy intake with an excessive share of SFA.

**Key words:** Fatty acid, fast food, snacks, Bangladesh

### Introduction

With the social changes in the recent years, Bangladesh is now experiencing a fast food culture especially in urban areas. An increasing proportion of meals are now being purchased or consumed in a ready to eat as fast food or snacks. But concern has been expressed by many scientists about the nutritional impact of such foods on the diet and health of consumers. Fast foods are not balanced foods from nutrition point of view (Cooper, 1989). These foods have been viewed as a source of excessive cholesterol, saturated fat, salt and energy which may be contributory to a steep rise in diet-related non-communicable diseases (NCD), dental caries, and other diseases in developed as well as in many developing countries including Bangladesh (Popkin, 1998; Salamatullah *et al.*, 1990). A recent study in Dhaka city revealed that fast food culture is increasingly penetrating into the dietary practice of young urbanites of the city, especially by the students of moderately solvent and relatively smaller families (Rahim *et al.*, 2001). When consumers' food preferences were examined, as many as 37 types of fast foods of western culture along with a number of traditional snack foods were identified. The findings,

\* **Corresponding author:** cell: 01726036880, <meher.nessa@yahoo.com>  
DOI: <https://doi.org/10.53808/KUS.2008.9.1.0820-L>

therefore, lead to the notion that a new fast food phenomenon is getting its root deep into the young urban society of Bangladesh as a consequence of the emergence of a new nutrition transition. In fact, fast food shops have mushroomed in all major cities of Bangladesh.

Apart from nutritional consequences, fast food culture in developing countries like Bangladesh is also associated with poor hygiene and poor quality foods. It has posed a further concern for nutritionists, dietitians, health professionals, and policy makers of the country. Rahim *et al.* (2002) and Nessa *et al.* (2002) recently had examined some selected fast food and traditional snack foods popularly consumed by the young urbanites for their proximate composition, lipid composition, salt, dietary fiber, and energy. Some of these foods were found to contain high amount of energy and sodium but low amount of dietary fiber. High energy usually comes from high amount of fat and sugar used as ingredients. The present paper examines the fatty acid profile of these foods.

### **Materials and Methods**

**Samples:** A total of 184 samples from 18 varieties of Bangladeshi commercial fast foods and traditional snacks samples were collected at random from four popular fast food shops of Dhaka city. Selected food samples were: beef products (burger, patties, and pizza), chicken products (burger, hotdog, pizza, roll, sandwich, and chicken fry), traditional snacks (beef samocha and beef kebab), traditional sweetmeats (chamcham, kalojam, rashogolla, saundesh, and rashomalai), and traditional beverage (lassee). All samples were obtained without the dressing materials e.g., sauce, cheese, mayonnaise, etc. Solid samples were collected as one single piece of their serving size while liquid and semi-liquid samples were collected as per their selling units used by fast food shops. After collection, weight of the serving size were determined and then stored in a refrigerator till analysis. The time between collection and analysis was not longer than 24 hours. Before analysis, samples were first blended and then grounded in order to homogenize. Portions of homogenized samples were taken for total lipid extraction.

**Extraction of lipids:** Lipids were extracted from the samples using the method of Folch *et al.* (1957). Briefly, food samples ( $10.00 \pm 0.01$  g) were added with 45 ml of chloroform-methanol ( $2:1 v v^{-1}$ ) solution and incubated at  $37^{\circ}\text{C}$  for 30 min in a water bath followed by homogenization for 2 min. The homogenate was filtered and the volume was measured. A 0.9% aqueous NaCl solution was added ( $20\% v v^{-1}$ ) to the filtrate and mixed well. The upper phase was discarded and the volume of the lower phase was adjusted to 40 ml with methanol. Aliquots of this solution were used for analysis.

**Determination of fatty acid composition:** Fatty acid composition of the collected fast foods and traditional snacks samples were analyzed by gas-liquid chromatography (GLC) using capillary columns. Fatty acid methyl esters were prepared from lipid extracts by transmethylation according to the procedure of the ISO (International Organization for Standardization) (Anon, 1978), using a  $2 \text{ mol l}^{-1}$  KOH in methanol and n-heptane. The analyses were performed using a Philips chromatograph model PU-4500 with FID (Flame Ionization Detector) coupled to an automatic integrator (Shimadzu C-R6A, Chromatopac, Japan). An aliquot ( $0.2 \mu\text{l}$ ) of methyl ester sample ( $10 \text{ mg ml}^{-1}$ ) was injected in the gas chromatograph with a flame ionization detector. Fatty acids were separated in a glass column (6ft x 1/8 inch SS) coated with fused silica (GP3% SP-2310/2% SP-2300 on 100/120 chromosorb WAW) as stationary phase. Carrier gas was nitrogen with a constant flow rate ( $20 \text{ ml min}^{-1}$ ). The gas chromatograph was at isothermal condition. Column temperature was maintained at  $185^{\circ}\text{C}$ . The injector and the detector temperature were 220 and  $240^{\circ}\text{C}$  respectively. All peaks of fatty acid methyl esters were identified by comparison of their retention times with appropriate known standards (Sigma, U.S.A). Data were calculated as normalized area percentages of fatty acids. According to our chromatographic conditions no response factor correction was applied.

## Results

The present study describes the fatty acids profile (expressed in percentage) and the percentages of saturated, monounsaturated and polyunsaturated fatty acids in 184 commercial Bangladeshi fast foods and traditional snacks of Dhaka city. The results on fast foods are shown in Table 1 and those of traditional snacks are given in Table 2. The FA composition of fast foods made of beef and chicken (Table 1) showed that chicken patties and beef pizza contained higher amounts of total SFA (50.4 and 48.1% respectively) due to the greater contribution of palmitic (16:0) acid. Highest amount of total UFA (84.5%) was found in chicken sandwich.

Table 1. Fatty acid profile of selected commercial fast food of Bangladesh.

Types of fatty acids (%)	Name of the products analyzed									
	Beef products			Chicken products						
	Patties (n=12)	Burger (n=12)	Pizza (n=12)	Fry (n=12)	Patties (n=12)	Burger (n=12)	Pizza (n=12)	Roll (n=12)	Sandwich (n=12)	Hotdog (n=12)
C12: 0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
C14: 0	2.3*	1.3	2.4	nd	2.6	1.0	2.5	0.8	nd	0.5
C16: 0	34.4	25.9	38.2	27.5	37.1	22.2	32.7	28.3	12.7	15.0
C16: 1	0.4	1.0	2.3	1.7	0.4	nd	2.8	0.4	0.5	3.4
C18: 0	9.3	8.8	6.0	3.2	6.4	4.7	5.3	9.1	2.8	5.0
C18: 1	41.2	33.9	36.7	32.8	29.4	32.4	35.6	41.4	31.2	38.2
C18: 2	11.5	27.6	11.6	32.4	18.5	34.6	18.7	17.9	44.7	32.3
C18: 3	0.4	1.0	1.4	1.2	1.1	4.9	0.5	1.9	8.1	3.9
C20: 0	0.6	0.7	1.5	1.2	4.3	nd	1.9	0.3	nd	0.7
MUFA	41.6	34.9	39.0	34.5	29.8	32.4	38.4	41.8	31.7	41.6
PUFA	11.9	28.6	13.0	33.6	19.6	39.5	19.2	19.8	52.8	36.2
P/S ratio	0.26	0.78	0.27	1.1	0.39	1.42	0.45	0.51	3.4	1.7
$\omega$ -6/ $\omega$ -3	28.8	27.6	8.3	27.0	16.8	7.1	37.4	9.4	5.5	8.3
FA ratio										

Note: n: number of samples analyzed; nd: no detectable amount; SFA: saturated fatty acids; MUFA: mono-unsaturated fatty acids; PUFA: polyunsaturated fatty acids;  $\omega$ -6 and  $\omega$ -3 FA: position of double bond at n-6 or n-3 carbon from methyl end of fatty acid.

\*Results were expressed as average value and calculated as wt% of total fatty acid methyl esters.

It is evident from Table 1 that PUFA content is relatively lower in the fast food made of beef than in fast food made of chicken. For instance, chicken sandwich contained highest amount of PUFA (52.8%) while beef patties contained the lowest (11.9%). The main contributor to PUFA composition for chicken sandwich is linoleic acid (18:2). The contributions of linolenic acid (18:3) in PUFA among all these fast foods and traditional snacks were found low, a maximum of 8.0% in chicken sandwich. Oleic acid (18:1), on the other hand, was found the most abundant MUFA in both fast foods and traditional snacks samples (Table 1 & 2). Short-chain fatty acid, lauric (12:0) was not detected in all fast food samples (Table 1) but found only in some traditional sweetmeats (ranged 0.7–2.8%). The most prevalent short-chain fatty acid in these foods was myristic (14:0) acid.

Table 2. Fatty acid profile of selected traditional snacks, sweetmeats and beverages of Bangladesh.

Types of fatty acids (%)	Name of the products analyzed							
	Snacks		Sweetmeats					Beverage
	Samocha (n=12)	Kebab (n=12)	Chamcham (n=8)	Kalajam (n=8)	Rasgulla (n=8)	Samsa (n=8)	Rasgulla (n=4)	Lassi (n=4)
C12: 0	nd	nd	0.7	nd	2.8	2.5	1.2	nd
C14: 0	nd	nd	7.1	1.1	11.0	12.5	10.3	8.5
C16: 0	18.2*	35.6	34.9	27.7	39.8	35.6	37.6	43.3
C16: 1	1.7	2.8	0.5	0.2	1.2	0.5	0.3	7.0
C18: 0	5.0	4.8	9.5	6.8	11.3	9.8	12.8	5.9
C18: 1	29.2	40.3	36.7	35.0	31.1	34.9	37.0	35.3

C18: 2	41.9	11.2	8.8	27.4	1.0	3.3	0.8	nd
C18: 3	2.7	1.1	1.4	1.8	1.4	0.6	nd	nd
C20: 0	1.2	4.2	0.6	nd	0.6	0.3	nd	nd
MUFA	30.9	43.1	37.2	35.2	32.3	35.4	37.3	42.3
PUFA	44.6	12.3	10.2	29.2	2.4	3.9	0.8	nd
SFA	24.4	44.6	52.8	35.6	65.5	60.7	61.9	57.7
P/S ratio	1.83	0.19	0.82	0.04	0.06	0.01	0.01	-
$\omega$ -6/ $\omega$ -3	15.5	10.2	6.3	15.2	0.7	5.5	nd	nd
FA ratio								

Note: n: number of samples analyzed; nd: no detectable amount; SFA: saturated fatty acids; MUFA: mono-unsaturated fatty acids; PUFA: polyunsaturated fatty acids;  $\omega$ -6 and  $\omega$ -3 FA: position of double bond at n-6 or n-3 carbon from methyl end of fatty acid.

\*Results were expressed as average value and calculated as wt% of total fatty acid methyl esters.

The majority of fatty acids are saturated specially in sweetmeats (ranged 35.6–65.3%, Table 2) and fast food containing beef. PUFA content (*cis* isomer only) in fast foods except chicken fry, burger, sandwich, and samocho was generally lower than 30%, but in case of sweetmeats it was lower than 11% except kalojam.

## Discussion

Traditional sweetmeats are very popular in Bangladesh as a dessert item after feast meal and as snacks in between daily meals (breakfast or afternoon tea). Interestingly, these sweetmeats were found to contain high amount of SFA (ranged 35.6–65.3%, Table 2). The main ingredients of these sweetmeats are ‘Chhana’ (residue after milk is acidified to curdle; posset), farina, and sugar syrup. The extra high amount of SFA in sweetmeats probably came from palm oil used in frying of chhana and farina mixture before dipping in sugar syrup. Palm oil has a high proportion of saturated fatty acids (51.9%) such as lauric acid (12:0), myristic acid (14:0) and palmitic acid (16:0) (Lawson, 1995).

It is evident from Table 1 that PUFA content is relatively lower in fast food made of beef than in fast food made of chicken. For instance, chicken sandwich contained highest amount of PUFA (52.8%) while beef patties contained the lowest (11.9%). The main contributor to PUFA composition for chicken sandwich is linoleic acid (18:2). Fernandez and Juan (2000) reported similar results for Spanish fast food made of chicken.

The content and composition of lipid for a fast food item may differ among different brands. The food samples analyzed in the present investigation were not brand items. They were collected from four different popular fast food shops. In an earlier study, no significant differences were observed in estimations of total fat, cholesterol and triacylglycerol (TG) between samples of the same shop (Nessa *et al.*, 2002). Besides, majority of the food items showed either no inter-shop variation or a variation at 10% level of significance in the content of total fat, cholesterol and TG (Nessa *et al.*, 2002). It may therefore be expected that intra and inter-shop variations in fatty acid composition of the studied samples would be minimal.

To understand the dietary role of fast foods and traditional snacks in the new phenomenon of eating out habit in our population, the fatty acid profile were compared with recommended dietary allowances. Foods that provide as much as one fourth of the day’s allowance for nutrients have the potential for making a significant contribution to the diet (Gurr, 1992).

For many coronary heart disease (CHD) susceptible people, a healthy diet is perceived as a low cholesterol diet, although the main determinant of serum cholesterol is not dietary cholesterol but saturated fat (Clarke *et al.*, 1997). Two important nutritional indices are frequently used to describe the fatty acid composition of foods. The first is the ratio of PUFA: SFA (P/S ratio), where values of 0.23-0.45 are considered optimum (Anon, 1990). However, the American Heart Association (AHA) recommends a P/S ratio >1 for Step-1 diet and >1.4 for Step-2 diet. In this

study, burger, sandwich, hotdog, and fry of chicken among fast foods and only Samocha among traditional snacks food meet this criteria ( $P/S > 1$ ). The second index is the ratio of the  $\omega$ -6 :  $\omega$ -3 fatty acids; usually expressed as the ratio of essential fatty acids C18:2n-6 (linoleic acid) : C18:3n-3 (linolenic acid). The ideal ratio should be 1, however, an optimum ratio is considered to lie between 4 and 10 (Baur, 1995). Rashogolla, a very popular sweetmeat of Bangladesh, showed the lowest value (0.7) to meet these criteria among all fast foods and traditional snacks food examined.

These results, together with data reported earlier (Nessa *et al.*, 2002; Rahim *et al.*, 2002) thus clearly show that energy intake of Bangladeshi young urbanites who are accustomed to fast foods culture is high, with an excessive share of SFA in the total energy intake.

## Conclusion

Bangladesh is now experiencing a fast food culture especially in urban areas. But concern has been expressed by many scientists about the nutritional impact of such foods on the diet and health of consumers. Percentage composition of total fatty acids of these Bangladeshi commercial fast foods and traditional snacks were found high in SFA. As nutrient adequacy or nutrient density of a food item and its frequency of intake can profoundly affect the degree of compliance with a recommended healthful diet an effective dietary education for the Bangladeshi young urbanites who are accustomed to fast foods culture is needed to improve their dietary habits.

## Acknowledgement

The authors are grateful to the University Grants Commission (UGC) for financial support for this research work.

## References

- Anon. 1978. *Animal and vegetable fats and oils to preparation of methyl esters of fatty acids*. International Organization for Standardization (ISO). Method: ISO 5509, Geneve, Switzerland.
- Anon. 1990. Nutrition and Your Health : Dietary Guidelines for Americans. US Department of Agriculture (USDA) and Department of Health and Human Services (DHHS), *Home and Garden Bulletin*. Washington DC, 232 pp.
- Baur, F.J. 1995. Nutritional aspects of oils and fats. pp. 203-210. **In:** Lawson, H. (ed). *Food Oils and Fats: Technology, Utilization, and Nutrition*. Chapman and Hall, New York.
- Clarke, R.; Frost, C.; Collins, R.; Appleby, P. and Peto, R. 1997. Dietary lipids and blood cholesterol: a quantitative meta-analysis of metabolic ward studies. *British Medical Journal*, 314: 112-117.
- Cooper, K.H. 1989. *Controlling Cholesterol*. Bantam Books, U.S.A.
- Fernandez, P. and Juan, S. 2000. Fatty acid composition of commercial spanish fast food and snack food. *Journal of Food Composition and Analysis*, 13(3): 275-281.
- Folch, L.J.M. and Stanley, S.G.H. 1957. A simple method for the isolation and purification of total lipids from animal tissues. *Journal of Biological Chemistry*, 226: 497-504.
- Gurr, M.I. 1992. Fats in Health and Disease. pp. 220-230. **In:** *Role of Fats in Food and Nutrition*. Elsevier Science Publishers, London & New York.
- Lawson, H. (ed). 1995. *Food Oils and Fats: Technology, Utilization, and Nutrition*. Chapman and Hall, New York.

- Nessa, M.U.; Rahim, A.T.M.A. and Kabir, Y. 2008. Fatty Acid Profile of Fast Foods, Traditional Snacks and Sweetmeats of Bangladesh. *Khulna University Studies*, 9(1): 85-90.
- Nessa, M.U.; Rahim, A.T.M.A.; Shaheen, N. and Kabir, Y. 2002. Commercial fast food and traditional snack food of Bangladesh: I. Content of cholesterol and triacylglycerol. *Bangladesh Journal of Nutrition*, 15: 69-77.
- Popkin, B.M. 1998. The nutrition transition and its health implications in lower-income countries. *Public Health Nutrition*, 1: 5-21.
- Rahim, A.T.M.A.; Aziz, F.; Shaheen, N. and Bhuyan, M.A.H. 2001. Perception and preference of fast food and traditional snack food by selected urban population. *Bangladesh Journal of Physiology and Pharmacology*, 17(2): 58-62.
- Rahim, A.T.M.A.; Islam, M.; Ara, G.; Nessa, M.U. and Shaheen, N. 2002. Commercial fast food and traditional snack food of Bangladesh: II. Content of proximate nutrients, sodium, potassium, dietary fiber and energy. *Bangladesh Journal of Nutrition*, 15: 79-89.
- Salamatullah, Q.; Zaman, M.M.; Hossain, A.; Ali, S.M.K. and Malek, A. 1990. Blood cholesterol and other related risk factors of cardiovascular disease: An educated population based study. *Dhaka University Studies, Part E*, 5(1): 7-13.