Commercial Fast Food and Traditional Snack Food of Bangladesh: I. Content of Cholesterol and Triacylglycerol

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Abstract

Bangladeshi commercial fast food (FF) and traditional snack food (TS) were analyzed for their content of total fat, cholesterol and triacylglycerol. Analysis was done by standard biochemical methods. A total of 184 samples from 18 items of these foodstuffs were examined. Results show that commercial Bangladeshi FF of western-type have proportionately high cholesterol especially in chicken sandwich (230.6 mg), chicken hotdog (165.6 mg), fried chicken (132.3 mg) and chicken burger (119.8 mg) per 100 gm edible portion. Some commercial TS also contained high amount of cholesterol e.g., beef kebab (112.4 mg), beef samocha (89.1 mg) and kalojam (80.5 mg). The source of cholesterol in the fat fraction was basically animal fat from meat (as ingredient) and cooking oil (used in processing). In general, the results showed a wide variability in the content of total fat and disproportionate variation in the content of cholesterol and triacyglycerol among different items. The lipid content when compared with the recommended dietary intake revealed that majority of the FF provided at least 25% and TS provided at least 15% of the recommended intake.

Key Words: Fast Food; Traditional Snacks; Fat; Cholesterol; Triacyglycerol

Introduction

Recent findings indicate that, non-communicable diseases (NCD) have surpassed infectious diseases throughout the world[1]. In fact, NCD are the predominant cause of death in industrialized countries now a day; and are rapidly becoming a major health problem in developing countries as well[2]. Since the populations of developing countries are experiencing a demographic and epidemiologic transition, the increased vulnerability to NCD has consequently increased the risk of higher morbidity and mortality[2]. Apart from population growth, the major attributes of developmental transition are confined to changes in occupational pattern in family structure, lifestyle, dietary pattern and practices, ageing population, etc. The

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emergence of NCD is significantly associated with the changes in dietary pattern in most of the countries.

The nutrition transition is described as a change from traditional, indigenous, rural, high-fiber, low-fat diet eaten by poorer people to a more affluent, western-type of diet rich in animal fats and low in fiber[3]. Fast food, in this connection, is the most popular and most consumed western-type snack foods throughout the world. Being included in this phenomenon, fast food shops have mushroomed in all major cities of Bangladesh. More and more urban people, especially the adolescents and the young take their snacks and lunch in these shops. Most popular snack foods are the FF of western-type but TS are also frequently eaten.

Fast foods are recognized as having a very large role in urban food consumption and it has been reported that they provide a very significant proportion of total food intake for many people[4]. However, FF and probably TS are not always good in nutritional persist of view. In general, most of them are rich in energy content as well as salt. High energy usually comes from high amount of fat and sugar used as ingredients. The ingredients and dressing materials of these foodstuffs are mainly livestock products and provide large amount of cholesterol[5]. Moreover, in developing countries like Bangladesh, the fast food culture is associated with poor hygiene and poor quality foods. The consequence of the fast food culture and hence a new way of dietary life may be contributory to a steep rise in diet-related NCD, dental caries, and other diseases in many developing countries[1, 2]. Reports are now available indicating a significant rise in CHD-related morbidity and mortality in Bangladesh[6, 7].

As fast food culture is becoming a new trend in our society, so keeping in view the importance of the subject, a series of studies were undertaken to investigate the nutrient composition, nutritional value and consumption pattern of some commercial FF and TS of Bangladesh. In this paper we report the content of total fat, cholesterol and triacylglycerol of some selected commercial FF and TS.

Materials and Methods

Samples

A total of 184 samples from 18 varieties of Bangladeshi commercial FF and TS samples were purchased at random from four different fast food shops situated at Dhaka city. All samples were obtained without the dressing materials viz., 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 purchase 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, cholesterol and triglyceride estimations.

Extraction of Lipids

Lipids were extracted from the samples using the method of Folch *et al.*[8] with appropriate modification. Briefly, food samples (10.00 ± 0.01 g) were added with 45 ml of chloroform-methanol (2:1 v/v) solution and incubated at 37° 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) to the filtrate and mixed well. The upper phase was discarded and the volume of the lower phase was adjusted to 40ml with methanol. Aliquots of this solution were used for lipid analysis.

Analysis of Lipids

Total fat was estimated by a standard method[9]. To 0.50 ml lipid extract was added 2 ml of conc. H_2SO_4 and mixed well. Standard solution (1.0 gm pure soybean oil dissolved in 100 ml of absolute alcohol) was treated similarly. The mixtures were heated to 100°C for 10 minutes in a water bath. To 0.2 ml of the cooled acid mixture was added 5.0 ml of vanillin reagent and mixed well. After 10 min, the absorbance was read at 530 nm.

The quantification of cholesterol was done chemically with Leibermann-Burchard reagents as described in the laboratory manual of ICOMR[9]. On the other hand, the quantity of triacylglycerol was estimated enzymatically[10]. Briefly, 10 µl lipid extract and standard triacylglycerol solutions were taken in screw-cap tubes (Pyrex, UK) followed by drying in a Centrivap concentrator (Labquip, USA). To each tube 1.0 ml of solution from the enzymatic reagent kit was added, mixed vigorously, and incubated in a water bath at 37° C for 5 minutes. The absorbance was read at 500 nm.

Results

The amounts of total fat, cholesterol, and triacylglecrol of various FF and TS foods were examined. The sample included in the study is described with their main ingredients in Table 1. Results are presented in Tables 2 & 3 respectively. The results were expressed as mean ± standard deviations of 4-12 samples, each one in duplicate estimations.

Table 1. Food items and their main ingredients

Food items (numbers)	Weight per serving size (g)	Main ingredients
A Western Type Fast Foods		
Beef Burger (12)	82.37 ± 3.92	bread, beef, onion, oil, salt
Beef Patties (12)	33.15 ± 2.1	flour, beef, onion, oil, chili, salt
Beef Pizza (12)	56.48 ± 8.17	bread, beef, onion, oil
Chicken Burger (12)	42.06 ± 4.48	bread, chicken, onion, oil
Chicken Hotdog (12)	55.68 ± 3.23	bread, chicken, onion, oil
Chicken Patties (12)	20.18 ± 1.98	flour, chicken, onion, oil, chili
Chicken Pizza (12)	84.09 ± 9.64	bread, chicken, onion, oil
Chicken Roll (12)	27.28 ± 5.21	bread, chicken, onion, oil
Chicken Sandwich (12)	11.83 ± 1.57	bread, chicken, onion
Fried Chicken (12)	71.06 ± 14.83	flour, chicken, oil
B Traditional Snack Foods		
Non-sweet snacks		
Beef Samocha (12)	25.25 ± 2.17	flour, beef, onion, oil,
Beef Kebab (12)	78.34 ± 11.43	beef, onions, oil,
Sweets		
Chamcham (8)	46.14 ± 1.11	curd, flour, sugar, oil
Kalojam (8)	54.02 ± 3.0	curd, flour, sugar, oil
Rashomalai (4)	-	curd, milk, sugar
Rasagolla (8)	56.38 ± 3.64	curd, sugar
Saundesh (8)	55.15 ± 2.44	curd, sugar
Beverages		
Lassee (4) yogurt, sugar, water or/and ice		

Lipid analysis of commercial FF prepared in western way showed that among the beef products, beef burger contained higher amounts of total fat, cholesterol and triglyceride respectively (Table 2) than that of the other two items. Among FF that was prepared of chicken, the highest amount of total

Table 2. Lipid content of commercial Bangladeshi fast foods*

Food items	Total lipid (gm100g sample)	Cholesterol (mg/100g sample)	Triacylglycerol (g/100g sample)
A: Beef Products			
Beef Burger	22.08 ± 1.30	98.21 ± 6.30	6.22 ± 0.30
Beef Patties	11.11 ± 1.03	61.07 ± 4.87	4.77 ± 0.38
Beef Pizza	7.58 ± 1.10	60.76 ± 7.61	4.93 ± 0.64
B: Chicken Products			
Chicken Burger	19.81 ± 4.34	119.84 ±18.23	8.40 ± 1.30
Chicken Pizza	14.44 ± 1.24	78.48 ± 6.01	6.20 ± 0.78
Chicken Roll	13.22 ± 1.53	80.34 ± 29.6	6.74 ± 1.00
Chicken Sandwich	44.87 ± 1.52	230.59 ± 14.27	8.86 ± 1.36
Chicken Hotdog	20.07 ± 0.98	163.57 ± 16.60	5.88 ± 0.87
Chicken Patties	9.77 ± 1.25	63.14 ± 3.28	6.31 ± 0.94
Fried Chicken	14.98 ± 2.60	132.90 ± 28.82	5.78 ± 1.20

*mean ± s.d.

fat, cholesterol and triglyceride was estimated in chicken sandwich (Table 2). Chicken burger was found to contain similar amount of triglyceride but the content of total fat and cholesterol were nearly half of the amount found in chicken sandwich.

Table 3. Lipid content of some selected traditional snack foods*

Food Items	Total Lipid (g/100g sample)	Cholesterol (mg/100g sample)	Triacylglycerol (g/100g sample)
A: Non-sweet snacks			
Beef Samocha	15.47 ± 1.34	89.10 ± 10.70	5.43 ± 0.37
Beef Kebab	14.43 ± 1.60	112.35 ± 8.20	6.54 ± 0.73
B: Sweets			
Chamcham	6.45 ± 0.15	51.57 ± 0.97	0.94 ± 0.04
Kalojam	10.83 ± 0.16	80.45 ± 2.98	1.51 ± 0.17
Rashagollah	6.16 ± 0.11	41.52 ± 0.96	1.71 ± 0.06
Saundesh	14.61 ± 0.26	43.88 ± 1.35	3.81 ± 0.15
Rashamalai	7.81 ± 0.13	20.91 ± 0.97	2.62 ± 0.08
C: Beverages			
Lassee	1.22 ± 0.07	13.16 ± 0.62	0.56 ± 5.28

*mean ± s.d.

The snack food consumed traditionally in our country also contained considerable amount of lipids (Table 3). Beef kebab and samocha, for example, were found to contain total fat, cholesterol and triacyglycerol similar to that of beef FF (Table 2). Among the sweets, kalojam contained highest amount of cholesterol (80.45mg/100g edible portion) which was about four times higher than that of raw milk (17.29mg/100g)[5], a major constituent of it. On the other hand, these sweets were estimated to contain relatively lower amount of lipids than FF (Table 2). The milk shake, Lasse was found, for obvious reason, to contain the lowest amount of total fat, cholesterol and triacyglycerol (Table 2 & 3) respectively in all FF and TS studied.

Discussion

With the social changes in 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 form prepared outside the home. But concern has been expressed by many (e.g. Cooper *et al.*[11]) about the nutritional impact of such foods on the diet and health of consumers. To assess the impact of these foods analytical data on their nutrient composition are needed. In the present study, some selected western type FF and TS from well-known commercial fast food shops of Dhaka city were analyzed for their lipid content and composition.

Western Type Fast Foods

Analysis of lipid content and composition of FF showed that, if 100 g edible portion of these FF when consumed there would be a total fat intake of 7.58-44.87 g, cholesterol intake of 60.76-230.59 mg and TG intake of 4.77-8.86 g per (Table 2). These have reflected a wide variation in lipid intake with respect to the fast food eating behaviour of consumers. Beef burger contained higher amount of total fat, cholesterol and TG among the beef products, while chicken sandwich showed highest amounts for the same among chicken products (Table 2). The results also revealed that the amount of cholesterol and TG estimated in FF are not directly proportional to the total fat content of the respective item. Chicken burger, for instance, contained 19.81 g total fat, 119.84 mg cholesterol and 8.4 g TG per 100 g sample, whereas fried chicken contained 14.98 gm total fat, 132.28 mg cholesterol and 5.78 g TG respectively.

The variations in the amount of total fat, cholesterol and triglyceride among FF items may be many folds. Firstly, there were variations in the amount of meat portion used by different shops in FF preparation. Secondly, the amount of total fat, cholesterol and TG in raw meat used as ingredients of FF were found to vary according to meat-types (beef or chicken), meat-cuts (thigh or chest), and meat-sources (hen or cock, and free-living or broiler)[5]. Thirdly, frying, deep frying, or mixing with oil, ghee, butter oil, etc., was needed for some FF preparation but not for others. Fourthly, different shops used different brands of oil, ghee, or butter oil, which might have contributed to the total lipid profile differently. Similarly, other factors would also be contributory to the different values of lipid among them. Our findings, however, are in good agreements with that of some common fast foods brands in the West[11, 12, 13].

Traditional Sweets and Snacks

Traditional sweets and snacks are popular and frequently consumed all over Bangladesh. They are popular among the young urbanites too. Non-sweet snacks like beef samocha and beef kebab had similar amount of total fat, cholesterol and tryglycerides (Table 3) when compared with FF of western-types (Table 2). Among the sweet snacks, saundesh contained highest amount of total fat and TG while kalojam had highest amount of cholesterol. On the other hand, rashamali contained lowest amount of cholesterol and chamcham showed lowest amount of TG (Table 3).

The fat content of sweet snacks would be derived mainly from frying medium. Other variations would be the contributions from content and composition of ingredients as well as preparation procedures for different sweets. For instance, kalojam and chamcham need oil frying in the process but rashagollah and saundesh need 'chana' and milk for their preparations. Lower amount of cholesterol in rashamalai (made from chana) may be due to its lower solid portion than the liquid.

Lassee, a milk shake, was found to contain lower amount of total fat, cholesterol and TG in comparison to other sweet snacks. Safran[14] reported a mean lipid content of 1.8 g/100 ml (ranged from 0.8 to 3.3 g/100 ml) after analyzing 10 samples of milk shakes (of various flavours) from fast food facilities. These results are in good agreement with our data from 12 samples (mean 1.22 g/100 ml; ranges 0.63 - 1.79 g/100 ml).

Table 4. Inter-shop variation in lipid contents of chicken burger*

Shops	Total lipid (g/100 g sample)	Cholesterol (mg/100 g sample)	Tracyglycerol (g/100g sample)
Shop 1	20.93 ± 11.22	141.67 ± 31.92	8.81 ± 2.99
Shop 2	24.96 ± 0.98[b]	138.22 ± 23.56[d]	8.18 ± 1.51
Shop 3	22.40 ± 4.85[c]	86.51 ± 15.58[d,e]	8.29 ± 0.43
Shop 4	10.93 ± 0.31[b,c]	112.96 ± 1.85[e]	8.30 ± 0.23

*mean ± s.d., n = 3
[b & c] value with same superscripts are significantly different at $p < 0.01$
[d & e] values with same superscripts are significantly different at $p < 0.05$

Intra and Inter-Shop Variations in Lipid Content

The content and composition of lipid for a fast food item may differ among different brands[15]. The food samples analyzed in the present investigation were not brand items. They were collected from four different popular fast food shops. Hence, there remains a possibility of intra and inter-shop variations in the content of total fat, cholesterol and TG, because these shops have their own speciality in preparations of FF and TS. To evaluate this, estimated values of total fat, cholesterol and TG of different FF and TS items from 4 shops were compared using one-way analyses of variance (ANOVA). Data were processed using SPSS 9.0 for Windows[16]. Results showed no significant differences in estimations between samples of the same shop. Similar observation was reported by Betty *et al.*[15], who found no significant differences between samples within a brand. On the other hand, majority of the food items showed either no inter-shop variation or variation at 10% level of significance in the content of total fat, cholesterol and TG (data not shown). The only food item that had inter-shop variations of total fat,

cholesterol and TG at • 5% level of significance was chicken burger (Table 4). Chicken burger from shop no. 4 showed nearly half cholesterol value than other shops. Such variations are difficult to explain.

Dietary Role of Fast Food and Traditional Snacks: Comparison with RDA

To understand the dietary role of FF and TS in the new phenomenon of eating out habit in our population, their lipid contents were compared with recommended dietary allowances (RDA). 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[17]. Since no local RDA has yet been set in Bangladesh, the data were compared with the 1990 U.S. Dietary Guideline and recommendation on fat consumption for Americans[18]. Although nominally concerned with cardiovascular disease, the recommendations have come to be used widely as general healthy eating advice. There is no RDA for fat and cholesterol but dietary intake to meet daily requirement and to avoid over consumption has been recommended in these two guidelines (77-87 g total fat, 37 gm saturated fat, 8.6-16.7 g unsaturated fat, 300 mg cholesterol, and a P/S ratio of 0.23-0.45 respectively). Most of the FF and TS studied provided at least 25 percent of the intake recommended (Table 2 & 3). For instance, beef pizza, which contained lowest amount of fat among all meat products, can provide 34.32 mg of cholesterol and 4.23 g of total fat per 100 g edible portion. These values of cholesterol and fat of an item are exclusive of the dressing materials. The fat and cholesterol intake would have been even greater, if dressing materials were included in the analysis, because all these dressing materials, when examined, showed a considerable amount of fat and cholesterol[5]. Therefore, from the nutritional point of view, some of these foodstuffs are very rich in fat while the others are not. However, a careful selection of the foodstuff may provide necessary fat for the day's requirement. Over consumption of some of these FF and TS, obviously, may not be healthful from nutritional considerations. The data provided may be helpful to construct food composition tables, which intern will be useful for dietitians, nutrition educators and nutrition policy makers. .

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