Commercial Fast Food and Traditional Snack Food of Bangladesh: II. Content of Proximate Nutrients, Sodium, Potassium, Dietary Fiber and Energy

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Abstract

Some selected commercial fast food (FF) and traditional snack (TS) foods (96 samples of 12 items) were analyzed for proximate composition, dietary fiber (DF), salt, and energy value. Results showed that nondairy FF contained lower amount of lipid than dairy products. The highest amount of protein, fat and carbohydrate was found in Beef burger (14.62 ± 4.57 g), Éclair (41.92 ± 1.67 g) and Chicken pizza (44.70 ± 9.40 g) respectively per 100 g fresh sample. A similar amount of DF (1.57 to 5.43 g per 100 g fresh sample) was found in all FF examined except Éclair, which contained the highest amount (5.43 g/100 g fresh sample). Comparison of estimated energy value of dairy and nondairy FF showed that dairy products contained approximately 50 to 150 Kcal of more energy per 100 g fresh sample than that of nondairy FF products. Among TS foods, sweets contained lower amount of protein and fat but higher amount of carbohydrate than nonsweet TS on fresh weight basis. However, both sweets and nonsweet TS food showed almost same amount of calories on fresh weight basis. The salt content of nondairy FF was found relatively higher than dairy FF and traditional sweets. The highest amount of sodium was found in Chicken patties (797.01 ± 164.49 g per 100 g fresh sample). On the other hand, nonsweet TS, Singara and Samocha contained more than 500 mg of sodium per 100 g fresh sample. The nutrient and energy content of the examined FF and TS foods were found comparable to reported values. The results presented here are significant because they emerged from the first attempt at obtaining direct analytical data for FF and TS foods "as consumed" by the Bangladeshi urban population.

Key Words: Fast Food; Traditional Snack Food; Proximate composition; Energy value; Salt; Dietary Fiber

Introduction

Urbanization involves changes in occupation pattern, lifestyle, family-strncture, and value system. These changes are reflected in many ways, of which alterations to dietary practices and level in physical activity are in the

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first place. For instance, fixed form of eating three meals a day has been changed especially among the younger urbanites. There is an increasing tendency to skip lunch among them. Because of irregular and unclear meal times, snack foods (a kind of "ready to eat" foods) have become more distinct. The new trend of eating out has increased among the Bangladeshis, with more and more urban people, especially the adolescents and the young, taking their snacks, lunch, and tiffin in FF shops. In fact, FF shops have become a characteristic feature of major cities in Bangladesh. Besides, TS foods like singara, chapatti, piazu, various kinds of sweets, and beverages viz., doi or lasee, which may be termed as "indigenous fast food" are also immensely popular. Some of these TS foods have long tradition of use while the others have evolved in the blending periods of different cultural and religious groups in the Mogul era and British-raj.

FF are recognized as having a very large role in urban food consumption and in some developing countries it has been reported that FF provide a very significant proportion of total food intake for many people[1]. But, FF are not always good in nutritional persist of view. Nutritionists have raised concern on the nutritive value of western type FF because nutrient density of these foods was found imbalanced[2]. Firstly, though density of fat is significantly higher for FF than food consumed at home, density of most nutrients like protein, carbohydrate, vitamin B-6, vitamin C, calcium, phosphorus, thiamin and riboflavin is lower[2]. Secondly, FF of western types usually contain high amount of sodium[2]. Thirdly, these types of foods have profound impact on individuals' food habits[3]. Moreover, in developing countries like Bangladesh the FF culture is associated with the disadvantages of poor hygiene and poor quality food.

The consequences of the FF culture and hence new way of dietary life may be found contributory to a steep rise in diet-related non-communicable diseases, obesity, certain cancers, stroke, dental caries, diabetes and other diseases in many developing countries[4]. Reports are now available indicating a significant rise of coronary heart disease (CHD) related mortality and morbidity in Bangladesh[5, 6].

As FF phenomenon has become a new eating-out trend in our society, so keep in view the importance of the subject, an investigation was undertaken on "Commercial Fast Food and Traditional Snack Food of Bangladesh". In this second paper we report the proximate composition, dietary fiber, salt content, and energy value of some selected FF and TS foods.

Materials and Methods

Sample Collection and Preparation

Freshly prepared FF and TS samples were collected from four fast food shops situated in two posh areas (Dhanmondi and Baily Road) of Dhaka city. A total of 96 samples of 12 items, each item in duplicate samples from each shop were purchased and brought immediately to the laboratory. Each sample was then cut into small pieces and a portion (5 g) was removed for moisture estimation. Rest of the sample pieces were dried over night at 80° C. Sample drying at 80° C was conducted to minimize the decomposition of food constituents at elevated temperature[7, 8]. Dried samples were first blended and then grinded into powder followed by passing through a 40 mm mesh. The powdered samples were stored in desiccators until analysis.

Analytical Assays

Proximate Composition

Proximate Composition of each sample of each item was determined in duplicate estimations and the mean value was recorded. Moisture content was determined by weight loss on drying of the sample in an oven at 105° C for 5 hrs[9]. The moisture-free samples were charred and heated to 550° C until a constant weight was achieved, the residue being quantified as ash[10]. Total nitrogen was estimated by semi-micro Kjeldhal method[10], crude protein content then being calculated from the total nitrogen by using the formula N x 6.25. Total lipid in each sample was estimated by the AOAC official method 922.06[10]. The nitrogen free extracts (NFE) were considered as total carbohydrate and were calculated by the following equation: carbohydrate (g/100g) = 100 - (moisture + protein + lipid + fiber + ash) g/100 g[9].

Dietary Fiber

DF was estimated according to the neutral detergent fiber (NDF) method of Van Soest[11] with necessary modifications as described earlier[12]. Samples were pre-extracted with ethanol to remove lipids followed by amylase treatment to gelatinize and hydrolyze starch. Enzyme treated samples were immediately (without cooling and filtration) subjected to NDF extraction according to the method of Van Soest[11]. Enzyme pretreatment rather than treatment during NDF extraction was preferred because no report, to our best understanding, indicated or elaborated the detergent stability of α-amylase.

Sodium and Potassium

Sodium and potassium content of the samples was estimated by Flame spectrophotometric method 9661.6 of AOAC[10]. Dry samples (0.5 g) were

digested with an acid mixture of sulphuric acid, nitric acid and perchloric acid (1:0.5:0.5)[10] followed by appropriate dilution with deionized water. Sample and standard solutions were directly aspirated into flame of the Flame photometer (Pyunicum, U.K.) and the sample readings were calibrated from a calibration curve with standard readings.

Calorific value

Energy value of the samples were estimated and expressed in kilocalories by multiplying the percentage of protein, lipid and carbohydrate by the Atwater-Bryant factors 4, 9 and 4 respectively[9].

Results

The content of proximate nutrients of commercial FF and TS are presented in Table 1 and 2 respectively while the amount of sodium and potassium is presented in Table 3. The calorie content of both FF and TS foods were calculated with and without adding the calorie contained by DF fraction (as a part of total carbohydrate content) and presented in Table 4.

Results obtained from the present study indicated that nondairy FF contained lower amount of lipid than dairy products (Table 1). The highest amount of protein was contained by Beef burger (14.62 ± 4.57 g), fat by Éclair (41.92 ± 1.67 g) and carbohydrate by Chicken pizza (44.70 ± 9.40 g) per 100 g fresh sample (Table 1). A similar amount of DF was found in all the FF examined (Table 1) except Éclair, which contained the highest amount (5.43 g/100 g fresh sample). When the estimated energy values of dairy and nondairy FF were compared, it was found that dairy products contained approximately 50 to 150 Kcal of more energy per 100 g fresh sample than that of nondairy FF products (Table 4).

Among TS foods, sweets were found to contain lower amount of protein and fat but higher amount of carbohydrate than nonsweet snack foods (Table 2). Traditional sweet-products were found poor in DF though they were rich in carbohydrate content indicating that these carbohydrates were mainly starch. Very low ash value (Table 2) in sweets was an indicative of a low mineral content in these foods. However, both sweets and nonsweet TS foods showed similar amount of calories (Table 4).

The salt content of nondairy FF was found relatively higher than dairy FF and traditional sweets (Table 3). The highest amount of sodium was found in Chicken patties (797.01 ± 164.49 g) per 100 g fresh sample (Table 3). On the other hand, traditional snacks Singara and Samocha contained more than 500 mg of so dium per 100 g fresh sample. Interestingly traditional sweets

Table 1. Proximate composition of selected fast food (g/100 g sample)[1, 2]

Item		Moisture	Ash	Protein	Lipid	Dietary Fiber	Carbohydrate
Dairy Products							
Éclair	Fresh	9.00 ± 4.44	0.86 ± 0.23	9.66 ± 3.73	41.92 ± 1.67	5.43 ± 0.39	43.95 ± 17.67
	Dry	-	0.94 ± 0.21	10.53 ± 3.61	46.11 ± 2.07	5.98 ± 0.70	47.79 ± 16.97
Chocolate Pastry	Fresh	27.21 ± 3.06	0.35 ± 0.19	9.38 ± 2.99	23.92 ± 5.12	1.57 ± 1.07	37.57 ± 7.46
	Dry	-	0.49 ± 0.28	12.89 ± 4.22	32.81 ± 6.78	2.12 ± 1.35	51.69 ± 10.77
Nondairy Products							
Beef Burger	Fresh	36.56 ± 1.36	1.10 ± 0.23	14.62 ± 4.57	11.52 ± 2.52	2.08 ± 0.46	34.12 ± 2.87
	Dry	-	1.73 ± 0.35	23.02 ± 6.96	18.14 ± 3.89	3.28 ± 0.74	53.83 ± 5.14
Beef Roll	Fresh	39.53 ± 2.39	0.89 ± 0.29	9.70 ± 3.45	14.72 ± 3.12	2.68 ± 0.36	32.48 ± 4.79
	Dry	-	1.47 ± 0.45	16.11 ± 6.07	24.25± 4.21	4.45 ± 0.73	53.73 ± 8.02
Chicken Patties	Fresh	31.13 ±2.49	1.38 ± 0.34	11.86 ± 1.02	18.72 ± 1.62	2.58 ± 1.23	34.34 ± 2.12
	Dry	-	2.00 ± 0.46	17.24 ±1.62	27.14 ±1.40	3.71 ± 1.71	49.91 ± 3.67
Chicken Pizza	Fresh	34.25 ±12.82	1.36 ± 0.45	7.91 ± 0.95	9.51 ± 2.82	2.27 ± 1.98	44.70 ± 9.40
	Dry	-	2.02 ± 0.33	12.43 ±3.26	14.46 ±2.79	3.26 ± 2.66	67.82 ± 1.25
Vegetable Roll	Fresh	53.59 ± 1.68	0.57 ± 0.08	4.07 ± 1.14	8.93 ± 2.21	2.01 ± 1.77	30.86 ± 3.98
	Dry	-	1.23 ± 0.19	8.82 ± 2.72	19.19 ± 4.41	4.26 ± 3.62	66.49 ± 8.81
Club Sandwich	Fresh	40.59 ± 6.68	0.73 ± 0.14	11.62 ± 4.30	17.28 ± 3.97	3.11 ± 1.13	28.26 ± 2.36
	Dry	-	1.23 ± 0.17	19.32 ± 6.18	28.90 ± 3.94	5.37 ± 2.43	47.95 ± 6.54

[1]Estimations were done on dry weight basis and results are expressed as mean ± s.d.
[2]Fresh weights were calculated by adding the moisture content to the total value.

Table 2. Proximate composition of selected traditional snack food (g/100 g sample)[1, 2]

Item	Moisture		Ash	Protein	Lipid	Dietary Fiber	Carbohydrate
Sweets							
Kalojam	Fresh	26.59 ± 4.92	0.44 ± 0.13	6.88 ± 3.11	12.41 ± 0.70	1.70 ± 0.85	51.97 ± 6.60
	Dry	-	0.60 ± 0.14	9.44 ± 4.39	16.98 ± 1.74	2.37 ± 1.26	70.62 ± 4.76
Jilapee	Fresh	23.96 ± 4.77	0.19 ± 0.09	3.00 ± 1.31	8.44 ± 1.23	0.89 ± 0.46	63.53 ± 2.45
	Dry	-	0.25 ± 0.13	3.89 ± 1.53	11.10 ± 1.01	1.15 ± 0.56	83.64 ± 2.50
Non-sweet Snacks							
Singara	Fresh	29.97 ± 2.08	1.67 ± 0.27	3.18 ± 0.45	16.90 ± 3.33	2.01 ± 2.05	46.27 ± 7.64
	Dry	-	2.38 ± 0.39	4.55 ± 0.74	24.24 ± 5.52	2.93 ± 3.06	65.90 ± 9.16
Samocha	Fresh	32.82 ± 5.85	1.08 ± 0.24	15.77 ± 4 .47	17.41 ± 5.63	1.92 ± 0.45	31.02 ± 5.75
	Dry	-	1.63 ± 0.51	23.91 ± 8.21	25.55 ± 6.43	2.91 ± 0.94	46.01 ± 5.57

[1]Estimations were done on dry weight basis and results are expressed as mean ± s.d.
[2]Fresh weights were calculated by adding the moisture content to the total value.

contained moderately higher amount of salts with respect to all foods examined. Highest amount of potassium was estimated in a popular TS food Samocha (291.57 ± 45.13 g/100 g fresh sample).

Discussions

Most of the food items collected for the present study was different except Kalojam, Beef burger, Chicken patties and Pizza from the items examined in our other study[13]. They were also collected from different shops as well. other. In our other paper we have examined the intra and inter shop variation of nutrient content[13]. We observed no significant differences in nutrient content between samples of same item from same shop (intra shop variation)[13]. On the other hand, majority of the food items showed either no inter-shop variation or variation at 10% level of significance[13]. Therefore, intra and inter-shop variation was not tested in this study.

In the present investigation moisture estimation and sample drying were conducted at two different temperatures (at 105° C for 5 hours and at 80° C for overnight respectively). Moisture loss from a sample during analysis is a function of time and temperature. Decomposition enters in the picture when time is too much or temperature is too high[7]. Thus, most methods for food moisture estimation involve a compromise between times at particular temperature at which limited decomposition might be a factor[7]. Moisture estimation of FF and TS samples was, therefore, conducted using ICOMR[9] method (at 105° C for 5 hrs) with the expectation that all free water were released at limited decomposition. However, for nutrient analysis, food samples were dried at 80° C for overnight. It is suggested by the experts that the physical process of drying must separate all the water without decomposing of any of the constituents that could release water[7, 8]. Furthermore, if decomposition is likely to occur, as with foods rich in sugars, proteins, and volatile constituents, use of a lower temperature under vacuum, such as 70° C, have been suggested[7, 8]. We used 80°C, a 10-point higher temperature than the recommendation to cope the lowering effect of humidity on the rate of loss of water.

The observed levels of total fat in all items examined were found little higher (Table 1 & 2) than the food items examined in the other study[13] except that of Chicken sandwich. This may be because of differences in sample preparation. Estimation of nutrients was carried out on dry weight basis in the present study and values for fresh sample were calculated by adding the moisture content to the total weight. However, the present findings about fat content of different FF and TS showed a similarity in richness with that of some common FF of famous brand shops of the west[14-16]. For example, per

serving size of hamburger from "Wendy" contained 18 g of fat and that from "Dairy Queen" contained 16 g of fat[14]. It has also been reported[16] that fat content ranged from 15 to 27 g per burger after analyzing a range of burgers from 7 fast food outlets based in the United Kingdom. A true comparison of nutrient content between two estimations were, however, only possible on the same scale i.e., either on the basis of per serving size or per 100 g sample. Due to lack of information, results of the present study were not compared with the reported values in that perspective. But, a similarity in richness of nutrients in FF and TS with the reported values might be comparable.

The proximate nutrients, salt content and total available energy of FF and TS, when compared with the brand FF of USA also revealed a similarity in richness of these nutrients. For instance, burger from fast food chain shops like Burger King, Wendy's and McDonalds contained 13 – 20 g total fat, 29 – 37 g carbohydrate, 15 – 25 g protein and 320 – 420 Kcal per serving size[14, 15] (weight of serving size was not available). A reasonable similarity of nutrients (11.52 ± 2.52 g total fat, 34.12±2.87 g carbohydrate, 14.62 ± 4.57 g protein, and 298.61 ± 17.38 Kcal energy/100 g fresh sample) in Beef burger (weight 82.37 ± 3.92 g/ serving size) was found (Table 1 & 4). Salt content of these foodstuffs were also found similar to published reports[14, 15].

In most cases carbohydrate usually determined by deference i.e., carbohydrate (g/100g) = 100 – (moisture + protein + lipid + fiber + ash) g/100 g. Dietary carbohydrates have by convention been given an energy value of 4 Kcal/g (17KJ/g)[9]. While the energy yield of carbohydrate delivered to the colon (by definition they are termed as DF) will vary according to the extent of colonic fermentation, there may be an argument for assigning a single energy value to all such carbohydrate. Published studies suggest that a caloric value of about 2 Kcal/g (8 KJ/gm) would be a reasonable average figure for carbohydrate that reaches the colon (i.e., DF)[17]. Therefore, when the energy from DF was added to total energy value of food, the resulted value become higher than that of conventionally calculated value (Table 4). This added energy to the total physiological energy of food might be useful for therapeutic and dietetic applications.

The content of proximate nutrients, DF, salt and energy value of FF and TS resulted in this study is significant in a nutritional sense. Because nutrient adequacy or nutrient density of a food item and its frequency of intake can profoundly affects the degree of compliance with a recommended healthful diet. If a FF item or a FF meal that is dense with particular nutrient(s) has

high frequency of intake might surplus alone the recommended level of dietary intake of the nutrient(s). As a result, the over all diet quality will be a

Table 3. Sodium and potassium content of selected fast food and traditional snack food (mg/100 g sample)[1, 2]

Item		Sodium	Potassium
Dairy Products			
Éclair Fresh	389.68 ± 1.44	156.48 ± 4.85	
	Dry	417.90 ± 11.17	167.90 ± 10.32
Chocolate Pastry	Fresh	237.89 ± 3.25	115.44 ± 20.61
	Dry	324.30 ± 13.44	158.20 ± 36.77
Nondairy Products			
Beef Burger	Fresh	496.46 ± 26.59	135.17 ± 0.90
	Dry	791.50 ± 53.88	215.40 ± 1.70
Beef Roll	Fresh	268.66 ± 21.31	134.44 ± 22.49
	Dry	439.20 ± 13.58	219.30 ± 26.10
Chicken Patties	Fresh	797.01 ± 164.49	243.41 ± 103.37
	Dry	1134.90 ± 242.82	346.90 ± 149.77
Chicken Pizza	Fresh	181.72 ± 16.40	79.15 ± 6.98
	Dry	248.40 ± 14.14	108.20 ± 5.94
Vegetable Roll	Fresh	420.42 ± 14.00	113.47 ± 9.50
	Dry	906.00 ± 19.00	244.93 ± 25.47
Club Sandwich	Fresh	373.97 ± 69.35	104.90 ± 29.21
	Dry	626.20 ± 44.17	174.53 ± 28.21
Sweets			
Kalojam	Fresh	48.97 ± 5.09	42.45 ± 4.14
	Dry	68.50 ± 2.40	59.40 ± 1.70
Jilapee	Fresh	79.54 ± 3.93	49.21 ± 1.15
	Dry	106.90 ± 2.69	66.20 ± 3.40
Nonsweet Snacks			
Singara	Fresh	510.11 ± 37.17	151.77 ± 14.13
	Dry	732.70 ± 24.75	217.90 ± 12.02
Samocha	Fresh	579.27 ± 50.78	291.57 ± 45.13
	Dry	898.30 ± 10.89	441.00 ± 35.95

[1]Estimations were done on dry weight basis and results are expressed as mean ± s.d.
[2]Fresh weights were calculated by adding the moisture content to the total value.

function of the quality of that kind of food item(s). For example, a FF-meal of Éclair and Chicken patties (100 g each), and 300 ml Coca cola from a well-known FF shop of Dhaka city, when estimated, contained approximately 993 calories (RDI- 2,000-2,700 calories), 61 g fat (RDI- no more than 50-80 g) and 1187 mg sodium (RDI- no more than 1,100-3,300 mg)[18]. This is the concern for present day nutritionist, dietitian and others for the contributory role of these foodstuffs for a steep rise of NCD in many countries. However, it does not mean FF food is bad in all sense but it does mean that it is still possible to eat FF infrequently and to follow a nutritious diet. Hence the consumers should fit FF into a balanced, healthy diet.

The study results are significant because they emerged from the first attempt at obtaining direct analytical data for these foods "as consumed" by the Bangladeshi urban population. The data presented provide most needed

Table 4. Energy value of selected fast food and traditional snack food[1, 2]

Item		Energy (Kcal/100 g sample)	
		Without addition of DF calories	With addition of DF calories
Dairy Products			
Éclair	Fresh	591.77 ± 97.72	602.62 ± 97.20
	Dry	648.30 ± 78.99	660.27 ± 78.10
Chocolate Pastry	Fresh	403.05 ± 31.33	406.12 ± 32.33
	Dry	553.61 ± 34.12	557.86 ± 33.89
Nondairy Products			
Beef Burger	Fresh	298.61 ± 17.38	302.77 ± 16.56
	Dry	470.65 ± 23.48	477.27 ± 22.01
Beef Roll	Fresh	301.18 ± 24.58	306.54 ± 24.20
	Dry	497.57 ± 20.95	519.79 ± 27.22
Chicken Patties	Fresh	353.21 ± 14.29	358.36 ± 15.86
	Dry	512.86 ± 5.97	520.28 ± 5.41
Chicken Pizza	Fresh	296.07 ± 56.61	300.62 ± 58.25
	Dry	451.20 ± 23.54	457.72 ± 18.54
Vegetable Roll	Fresh	219.95 ± 8.19	223.97 ± 11.72
	Dry	473.99 ± 11.93	482.51 ± 15.80
Club Sandwich	Fresh	315.04 ± 44.27	321.25 ± 42.47
	Dry	529.19 ± 17.01	539.94 ± 12.15
Sweets			
Kalojam	Fresh	347.10 ± 20.36	350.51 ± 19.16
	Dry	473.03 ± 4.16	477.76 ± 6.57
Jilapee	Fresh	342.11 ± 24.28	343.88 ± 24.74
	Dry	449.73 ± 5.15	452.04 ± 4.98
Nonsweet Snacks			
Singara	Fresh	349.92 ± 3.28	353.94 ± 5.15
	Dry	499.93 ± 14.82	505.79 ± 20.90
Samocha	Fresh	343.79 ± 54.08	347.63 ± 53.20
	Dry	509.59 ± 37.88	515.40 ± 35.99

[1]Estimations were done on dry weight basis and results are expressed as mean ± s.d.
[2]Fresh weights were calculated by adding the moisture content to the total value.

information which will assist nutritionists and epidemiologists in the assessment of diet-health relationships in our population.

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References

1. Latham MC. *Human Nutrition in the Developing world.* FAO 1997: p.432-37.

2. Reis CP, Kline K and Weaver SO. Impact of commercial eating on nutrient adequacy. J Am Diet Assoc 1987; 87: 463-8.

3. Greecher CP and Shannon B. Impact of fast food meals on nutrient intake of two groups. J Am Diet Assoc 1977; 70: 368-72.

4. Fernando E and Viteri MD. Nutrition-related health consequences of urbanization. Food Nutr Bulletin 1993; 9(4): 53.

5. Mallik A. A case of death in Dhaka Medical College Hospital. Heart Disease Foundation Bulletin 1978; p-3.

6. Salamatullah Q, Zaman MM, Hossain A, Ali SMK and Malek A. Blood cholesterol and other related risk factors of cardiovascular disease: An educated population based study. Dhaka Uni. Studies, Part E 1990; 5(1): 7-13.

7. Bradley RL. Moisture and total solids analysis. In *Introduction to the Chemical Analysis of Foods*, Nielses SS ed. Chapman & Hall, New York 1994, p. 93-111.

8. Kirk RS and Sawyer R. Pearson's composition and analysis of foods. 9th edition, Addison-Wesley Longman Ltd, Harlow, England 1991, p. 9-10.

9. Indian Council of Medical Research (ICOMR). *A manual of laboratory techniques*, National Institute of Nutrition, Hyderabad 1971, India.

10. Association of Official Analytical Chemists (AOAC) International. *Official Methods of Analysis*, 16th ed., New York 1995.

11. Van Soest PJ. Use of detergent in the analysis of fibrous feeds II. A rapid method for the determination of fiber and lignin. J Assoc Off Anal Chem 1963; 46: 829-35.

12. Akter S. Dietary fiber, cell wall polysaccharide and lignin contents of selected cereals and pulses by an enzymatic-gravimetric method. M.Sc. Thesis 2002, Institute of Nutrition and Food Science (INFS), University of Dhaka, Dhaka 2002.

13. Meher-un-Nessa, Rahim ATMA, Shaheen N and Kabir Y. Commercial fast food and traditional snack food of Bangladesh: I. Content of cholesterol and triacylglycerol. Bangladesh J Nutr 2002; 15: 62-70.

14. Cooper KH. Fat composition of commonly used foods and calorie, fat, cholesterol and sodium content of common fast foods. In: *Controlling Cholesterol*. Bantham Books, U.S.A. 1989; p.372-81.

15. Choose carefully when weighing fast-food calories. Fitness Magazine, 2001(August); http://www.jcoline.com/special_sections/health/indes.shtml

16. Anonymous. Better burgers. Which 1992(January): 12-15.

17. Roberfroid M, Gibson GR and Delzenne N. The biochemistry of oligofructose, a non-digestible fiber: an approach to calculate its calorie value. Nutrition Reviews 1993; 51:137-46.

18. Nutrition and Your Health. In: *Dietary Guidelines for Americans*. 3rd ed. Washington DC: US Dept. of Agriculture/Dept. of Health and Human Services, Home and Garden Bull 1990: p. 232.