Analysis of salt, total fat, trans fat and carbohydrate in junk food

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1. Introduction

India has been going through an epidemiological transition *i.e.* the proportion of disease burden attributable to non-communicable diseases (NCDs) is increasing. A 2016 analysis by the India State-level Disease Burden Initiative found that NCDs accounted for 61.8 per cent of deaths compared to communicable, maternal, neonatal diseases, and undernutrition, which together accounted for 27.5 per cent of deaths. National Capital Territory of Delhi is amongst the few states with the highest-middle epidemiological transition.[i] In 2012, the Centre for Science and Environment (CSE) had tested 23 samples of junk food across seven different categories such as chips, snacks, instant noodles, burger, pizza, fries, fried chicken, and carbonated beverage for salt, carbohydrate, fat and trans fat. The samples were collected from various outlets in Delhi.[ii] The tests were done using methods listed by the Association of Official Analytical Chemists (AOAC), which are accepted internationally and by the apex food regulator of the country – the Food Safety and Standards Authority of India (FSSAI).[iii] This study found high levels of sugar, salt and fat in junk foods tested which could be unhealthy to the consumers and it also highlighted misleading labeling on certain food products.

Junk food refers to foods which are often ultra-processed, low in nutritional value and high in fat, salt, sugar (HFSS) and calories. They are usually popular across all age groups and aggressively promoted particularly towards children.[iv,v,vi] Unlike junk foods, a balanced diet is one which provides nutrients in required quantities and proportions. It is recommended that around 50-60 per cent of total calories should be derived from carbohydrates, preferably from complex carbohydrates, about 10-15 per cent from proteins and 20-30 per cent from both visible and invisible fat, according to the Dietary Guidelines for Indians put forth by the National Institute of Nutrition (NIN), Indian Council of Medical Research (ICMR), Hyderabad.[vii] Consumption of junk foods have both short-term and long-term ill effects on the body as high fat, salt and sugar intake are linked to obesity and NCDs such as diabetes, hypertension and heart disease.[viii] Reducing unhealthy diet is one of the four modifiable risk factors to prevent NCDs in addition to physical inactivity, alcohol and tobacco, as per the World Health Organization (WHO).[ix]

High intake of salt (sodium chloride) which is 40 per cent sodium predisposes a risk for high blood pressure.[x] According to the WHO, salt intake of less than 5 grams per day for adults helps to reduce blood pressure and risk of cardiovascular disease, stroke and coronary heart attack. It has been identified as one of the most cost-effective measures countries can take to improve population health outcomes.[xi]

Fats are a combination of saturated fatty acids, monounsaturated fatty acids (MUFA), and polyunsaturated fatty acids (PUFA). The energy yield from a gram of fat is approximately 9 Kcal (37.7 kj)/g, which is higher compared to 4 Kcal (16.8 kj)/g from a molecule of protein or a carbohydrate. While saturated fatty acids have no double bond in their chemical structure, MUFA have one and PUFA have two or more. The double bonds of naturally occurring unsaturated fatty acids are often of the cis orientation, which means that the hydrogen atoms

attached to the double bonds are on the same side. If the hydrogen atoms are on opposite sides, the configuration is termed trans.[xii]Trans fats are unsaturated fatty acids that contain at least one double bond in the trans configuration. They are formed during industrial partial hydrogenation of vegetable oil, a process widely commercialized to produce solid fats or vanaspati. Trans fat content of such fats can account for upto 60 per cent of the fatty acid content and depends on parameters like time, catalyst, temperature, and hydrogen pressure during hydrogenation process as well as the composition of MUFA and PUFA in the oil used.[xiii, xiv]To minimize their health impact, trans fats should not exceed 1 per cent of energy intake. High levels of trans fats intake are known to effect blood lipid profile, including elevation of LDL (low density lipoprotein) cholesterol, which is a well-accepted biomarker for risk of cardiovascular disease.[xv]

Carbohydrates are compounds that contain carbon, hydrogen, and oxygen in the ratio of 1:2:1. They are directly transformed into glucose after digestion, or undergo oxidation into pyruvate, including some sugar alcohols in the body. Therefore, carbohydrate intake raises blood glucose and generates a positive energy balance, which is one of the reasons of obesity.[xvi,xvii]

Junk foods are not adequately regulated in India.[xviii]Nutritional analysis of popular junk foods is important to improve consumer awareness and help policy makers develop suitable interventions for regulating such foods.

2. Materials and methods

2. 1 Sample collection

A total of 33 junk food samples comprising 14 packaged foods and 19 fast foods were collected from retail outlets and fast food chain restaurants from different locations in Delhi between July and September of 2019. Packaged food belonged to four categories including chips (6), namkeen (4), instant noodles (3), soup (1), and fast food were from five categories namely burger (8), fries (3), fried chicken (1), pizza (4), and sandwich and wrap (3). Details of samples are provided in Annexure 1 (*see Annexure 1: Details of food samples tested*). All packaged food samples were tested before expiry date and fast food samples were tested within 30 days of purchase. Samples were tested for salt, total fat, trans fat and carbohydrate except instant noodles and soup, which were not tested for trans fat. Test for salt and total fat were run in triplicate and trans fat and carbohydrate were conducted in duplicate.

2.2 Sample preparation

Packaged food samples were weighed and stored in air-tight desiccator maintained at room temperature (20-25°C) for a maximum of upto 60 days until tests were complete. Fast food samples were transported in air-tight zip lock pouches in dry ice, weighed and stored at -20°C for a maximum of 30 days until tests were complete. Samples were ground to fine powder/paste

using a mixer grinder (Sujata) set at high speed for 2-3 minutes. All samples were cooled to room temperature before tests were conducted.

2.3 Sample testing

2.3.1 Salt

AOAC 937.09 (volumetric analysis for salt/Chlorine as Sodium Chloride) was used for testing salt in food samples. To summarize the method, 2g finely ground sample was mixed with 25mL AgNO3 (0.1M, Merck) in an Erlenmeyer flask.20mL HNO3 (concentrated, Merck) was added with boiling chips, followed by boiling until the test sample was completely digested. 50mL deionised water was added to the digested sample, boiled for 5 minutes and cooled to room temperature in a fume hood. Ferric alum indicator (5mL, Fischer Scientific) was added and gently mixed. Digestion and titration steps were performed in fume hood. Test sample was titrated with NH4SCN (0.1M, Merck) until a permanent, light brown endpoint was achieved. Calculation of salt was done as follows.

C=A-B

A= Added volume of 0.1M AgNO3

B= Titer volume of 0.1M NH4SCN

C= Consumed volume of AgNO3 for NaCl (calculate this difference as NaCl).

With 10g test sample each ml AgNO3 = 0.058 per cent NaCl.

Values of salt were converted to sodium content using the following formula:

Salt (g)/2.54= Sodium (g)

2.3.2 Carbohydrate

Anthrone method (colorimetric analysis) was used (Clegg KM, 1956).[xix] 100mg finely ground sample was mixed with 5ml HCl (2.5N, Merck) and kept in water bath maintained at 100°C for 3 hours for sample hydrolysis. Hydrolyzed samples were cooled to room temperature and neutralized by adding solid Na_2CO_3 (Qualigens),until the effervescence ceased. After adjusting the volume to 100ml by adding deionised water and centrifuged at 4000rpm for 10 minutes at room temperature, supernatant was collected in separate vials. Anthrone reagent (4ml, Loba Chem) was added to test vials with 1ml of supernatant, after which the test sample was boiled in a water bath kept at 100°C for eight minutes. After rapid cooling of the samples to room temperature at ice (4°C), absorbance was measured at 630nm (UV/VIS Spectrophotometer, Agilent). A blank sample (no test product), and quality control standards (30ppm and 140ppm) and six standards of glucose solution (20ppm, 40ppm, 60ppm, 80ppm, 100ppm and 200ppm) (Merck), each diluted in distil water, served as calibration controls.

2.3.3 Total fat

AOAC 922.06 (acid hydrolysis and gravimetric analysis) method was used. To summarize the

method, 2g finely ground test food sample was mixed with 2ml ethanol (Fischer Scientific) in a conical flask. 10ml HCl (concentrated, Merck) was added, followed by heating the sample in a water bath at 70-80°C for 40minutes with regular agitation. 10mlethanol (Fischer Scientific) was added and sample flask was cooled to room temperature before the contents were transferred to a separatory funnel. The conical flask with test contents was rinsed into the separatory funnel using 25 ml ether (Merck) in three portions. After shaking the contents in the separatory funnel for 1 minute, 25 ml petroleum ether (40-60°C, Qualigens) was added and the contents were thoroughly mixed for 1 minute. The test mixture was allowed to separate into layers by centrifuging at 600 rpm for 20 minutes. Of the two layers obtained, upper layer (of ether-fat solution) was collected in a new flask. The separatory funnel was rinsed into the new conical flask with 15ml 1:1mixture of diethyl ether and petroleum. The total test volume was reduced to about 5ml by slow evaporation in water bath at 70°C for 40 minutes. The fat obtained was dried in an oven at 100°C until a constant weight of contents was obtained. The weight of the fat (adjusted with the weight of the pre-weighed beaker) was recorded.

2.3.4 Trans fat

AOAC 996.06 (Hydrolysis, Gas Chromatography based) method was used. The protocol involves hydrolysis, extraction of fat into ether, methylation of extracted fat to FAME (fatty acid methyl esters), and finally, quantitative estimation of FAME using gas chromatography based method against a C11:0-triundecanoin internal standard. Details of FAME standard solution is provided in annexure 2 (*see Annexure 2: Details of FAME standard solution*). The method is outlined below.

2.3.4.1 Preparation of Fatty Acid Methyl Ester (FAME)

Foods excluding dairy products and cheese: Sample containing 30-50mg fat was mixed with 100mg pyrogallic acid (Merck), 596µg glyceryl triundecanoate internal standard (59.6µl of 10,000ppm working standard, Sigma), 2ml ethanol (Merck) and few boiling chips until these were completely dispersed. This was followed by addition of 10ml HCl (8.3M, Merck). Contents were placed in a water bath maintained at 70-80°C for 40 minutes with regular agitation.

Foods containing cheese: Sample containing 30-50mg fat was mixed with 100mg pyrogallic acid (Merck), 596µg glyceryl triundecanoate internal standard (59.6µl of 10,000ppm working standard, Sigma), 2ml ethanol (Merck) and few boiling chips until these were completely dispersed. This was followed by addition of 4ml distil water and 2ml NH4OH (58% w/v, Merck). Contents were placed in a water bath maintained at 70-80°C for 20 minutes with regular agitation. 10ml HCL(12M, Merck) was added followed by a steam bath for 20 minutes with regular agitation.

2.3.4.2 Fat extraction

After cooling the above-said contents to room temperature, 25mL ethanol (Merck) was added to

digested test sample and mixed gently. This was followed by adding 25ml diethyl ether (Merck), sealing the flask using a cork stopper and vigorous shaking for 5 minutes. The stopper was rinsed into the flask using a 1:1 mixture of diethyl ether and petroleum ether (40-60°C, HPLC grade, Spectrochem). Contents were transferred to a separatory funnel with 25 ml of petroleum ether. This was followed by rigorous shaking for 5 minutes to allow layer separation. The upper layer (containing extracted fat) was collected in a beaker, and was kept at 40°C in a water bath to allow slow evaporation under a Nitrogen stream. The residue in the beaker contains extracted fat.

2.3.4.3 Methylation of fat

Extracted fat was dissolved in 2-3 mL1:1 mixture of chloroform (LiChrosolv, HPLC grade, Merck) and diethyl ether (Merck). The mixture was transferred to a glass vial and evaporated in water bath maintained at 40°C under a Nitrogen stream until the mixture was completely dried. 2ml BF3 reagent (10% w/v, Sigma) and 1ml toluene (LiChrosolv, HPLC grade, Merck) were added to the dried mass obtained after evaporation in glass vial, which was sealed followed by heating in an oven at 100°C for 45 minutes with regular agitation. After cooling the vial contents to room temperature, 5ml distil water, 1ml hexane (LiChrosolv, HPLC grade, Merck) and 1g Na2SO4 (Merck) were added, followed by re-sealing the vial and rigorous shaking for 1 minute to allow layer separation. The upper layer (which contains FAME including that of internal standard) was transferred to a fresh vial containing 1g Na2SO4.

2.3.4.4 Detection of trans fat

Samples were analyzed *i.e.* trans fats were detected using Gas Chromatography (Thermoquest-Trace GC, Thermo Fischer Scientific) with Flame Ionization Detector. 2µl of test sample were injected in GC (*see Table 1: Gas chromatography conditions*). A five point calibration curve (range 25 to 200ppm) was employed for analysis. Internal controls (calibration check standard, matrix spiked samples, etc) were run in all batches. GC conditions are provided in the table below. Chromatograms of FAME with internal standard of few samples are provided in annexure 3 (*see Annexure 3: Chromatograms of standard and few study samples*). Trans fat was calculated as sum of individual eighteen fatty acids (as triglyceride equivalents).

Table 1: Gas chromatography conditions

Step	Process
Oven temperature programme (45 minutes)	• Initial Temperature 140°C • Hold time 1 minute; ramp 10°C/min up to 180°C • Hold time 1 minute; ramp 1.0°C/min up to 214°C • No hold time; ramp 4°C/min up to final temperature 230°C • Hold time 1 minute
SSL injector (10µL syringe, Hamilton)	• Capillary column HP - 88 (100 m x 0.25 mm i.d. x 0.20 ìm)Temperature 250°C with Split less time 0.8 minutes

Step	Process
Detector	• Temperature 280°C • Carrier gas (Helium) flow rate 1ml/min • Makeup gas (please mention) 30ml/min • Air and Hydrogen 350ml/min and 40ml/ min respectively

3. Results

Tests for salt, total fat, trans fat and carbohydrate in junk food samples were done. Results except for trans fat in instant noodles and soup which were not tested, are reported as mean values in Table 2 (*see Table 2: Quantitative analysis of salt, total fat, trans fat and carbohydrate in junk food*). Replicate test values are provided in annexure 4 (*see Annexure 4: Test results-replicate values*).

In chips, salt content was ranging from 1.38–3.23g per 100g. Too Yumm Multigrain Chips Chinese Hot and Sour by RP-Sanjiv Goenka Group had the highest salt. Total fat ranged from 17.17–36.70g per 100g with highest value in Pudina Treat Chips by Haldiram's. Trans fat varied from 0.08–0.33g per 100g with highest levels in Classic Salted Chips by Haldiram's. Carbohydrate levels were of the order 48.96–64.85 g per 100 g.

Namkeen samples had salt levels from 1.69–4.99g per 100g, total fat levels ranging from 34.03–44.79g per 100g and trans fat content ranging from 0.20–0.56g per 100g. Classic Nut Cracker by Haldiram's had the highest levels of salt, total fat and trans fat amongst all namkeens tested. Carbohydrate levels in namkeens ranged from 17.66–54.90g per 100g.

Instant noodles had salt ranging from 3.69–4.25g per 100g. Ching's Secret Schezwan by Capital Foods had the highest salt in this category. Total fat in instant noodles ranged from 14.93–22.06g per 100g and was highest in Atta Noodles Chatpata by Patanjali Ayurved. Carbohydrate was present in the range 51.23–62.18g per 100g in instant noodles tested.

Knorr Classic Thick Tomato Soup by Hindustan Unilever had 10.44g per 100g salt, 8.43g per 100g fat and 64.61g per 100g carbohydrate.

Burgers had salt ranging from 1.02–1.54g per 100g. Veg Zinger (with cheese) by KFC had the highest salt amongst burgers tested. Total fat content varied from 9.11–19.47g per 100g and trans fat content ranged from 0.05–0.20 g per 100g. Chicken Classic Zinger (with cheese) by KFC had the highest fat and trans fat in this category. Carbohydrate levels were of the order 12.51–33.16g per 100g.

Fries had salt content ranging between 0.47–0.85g per 100g. Highest salt was present in Fries (regular) by Burger King. Total fat in fries was from 13.60–14.90g per 100g and trans fat was in the range 0.12–0.15 g per 100g. Fries (medium) by KFC had the highest fat. Fries (medium) by KFC and Fries (medium) by McDonald's both had highest level of trans fat. Carbohydrate content

varied from 25.94–44.77g per 100g.

Hot Wings (4 pieces) by KFC fried chicken sample had 1.44g per 100g salt, 21.42g per 100g fat, 0.14g per 100g trans fat and 10.51g per 100g carbohydrate.

In pizzas, salt content ranged from 1.18–1.70g per 100g. Chicken Supreme (personal) by Pizza Hut had the highest salt. Total fat ranged from 7.40–12.31g per 100g with highest fat in Non-veg Supreme (regular) by Domino's. Trans fat values in pizzas ranged from 0.21–0.23g per 100g.Trans fat values were highest in Classic Tomato Margherita (personal) and Chicken Supreme (personal) by Pizza Hut. Carbohydrate levels in pizzas varied from 20.40–35.81g per 100g.

Sandwiches and wraps had salt ranging from 1.38–1.88g per 100g with highest content in Chicken Seekh Kabab (6 inch) by Subway. Total fat values ranged from 13.90–18.27g per 100g, with highest levels in Paneer Tikka (6 inch) by Subway. Trans fat levels varied from 0.22–0.24g per 100g and carbohydrate values ranged from 16.83–21.12g per 100g. Big Spicy Paneer Wrap by McDonald's had the highest levels of trans fat.

Table 2: Quantitative analysis of salt, total fat, trans fat and carbohydrate in junk food

Sample	Measured weight (g)	Salt (g/100g)	Total fat (g/100g)	Trans fat (g/100g)	Carbohydrate (g/100g)
Chips					
Lay's India's Magic Masala by PepsiCo	51.75	1.94	32.5	0.21	51.53
Lay's American Style Cream and Onion Flavour by PepsiCo	52.75	1.55	29.19	0.27	48.96
Uncle Chipps Spicy Treat by PepsiCo	55.25	2.81	35.04	0.17	51.81
Classic Salted Chips by Haldiram's	61.2	1.38	36.52	0.33	52.19
Pudina Treat Chips by Haldiram's	16.38	2.28	36.70	0.23	52.93
Too Yumm Multigrain Chips Chinese Hot and Sour by RP-Sanjiv Goenka Group	89	3.23	17.17	0.08	64.85
Namkeen					
Classic Nut Cracker by Haldiram's	231.65	4.99	44.79	0.56	17.66
Aloo Bhujia by Haldiram's	231.14	3.05	43.48	0.33	34.69
Bingo! Mad Angles Delight Achaari Masti by ITC	80.7	1.69	42.94	0.22	53.71
Kurkure Masala Munch by PepsiCo	49.97	2.49	34.03	0.20	54.90
Instant noodles					
Maggi Masala by Nestle	71.20	3.69	14.93	NT	62.18
Atta Noodles Chatpata by Patanjali Ayurved	60.40	3.95	22.06	NT	51.23
Ching's Secret Schezwan by Capital Foods	60.35	4.25	17.82	NT	53.80
Soup					
Knorr Classic Thick Tomato Soup by Hindustan Unilever	51.90	10.44	8.43	NT	64.61
Burger					
Cheese Whopper Veg by Burger King	259.47	1.36	13.88	0.19	20.22
Cheese Whopper Chicken by Burger King	258.08	1.35	10.65	0.16	12.51
Veg Zinger (with cheese) by KFC	250.31	1.54	10.89	0.10	19.69
Chicken Classic Zinger (with cheese) by KFC	252.84	1.22	19.47	0.20	16.41
McVeggie Burger by McDonald's	153.95	1.22	9.95	0.08	33.16
McAloo Tikki Burger by McDonald's	141.25	1.02	9.11	0.08	29.16
McChicken Burger by McDonald's	145.31	1.11	9.51	0.08	27.68
Chicken Maharaja Mac by McDonald's	317.40	1.45	10.05	0.05	20.25
Fries					
Fries (regular) by Burger King	92.26	0.85	13.6	0.12	25.98
Fries (medium) by KFC	91.76	0.47	14.9	0.15	25.94
Fries (medium) by McDonald's	79.25	0.71	14.48	0.15	44.77
Fried chicken					
Hot Wings (4 pieces) by KFC	88.91 (without bone)	1.44	21.42	0.14	10.51
Pizza					
Peppy Paneer cheese burst (regular) by Domino's	342.57	1.34	9.55	0.21	20.40
Non-veg Supreme (regular) by Domino's	355.01	1.41	12.31	0.22	26.53
Classic Tomato Margherita (personal) by Pizza Hut	221.78	1.18	7.4	0.23	35.81
Chicken Supreme (personal) by Pizza Hut	306.74	1.70	10.32	0.23	26
Sandwich and wrap					
Big Spicy Paneer Wrap by McDonald's	255.14	1.58	17.71	0.24	21.12
Paneer Tikka (6 inch) by Subway	263.61	1.38	18.27	0.23	16.83
Chicken Seekh Kabab (6 inch) by Subway	280.48	1.88	13.9	0.22	16.95

NT: Not tested; pizza samples were tested after sprinkling one sachet of oregano provided with the pizza.

Annexure-1 Details of food samples tested

Table 1: Packaged foods

Sample	Manufacturer	Date of manufacture	Best before/ date of expiry	Source of collection	Batch Number	Pack size/ serving quantity	Declared value			
							S (mg)	TF (g)	tf (g)	C (g)
Lay's India's Magic Masala by PepsiCo	Pepsico India Holdings Pvt Ltd., Village Channo, Patiala - Sangrur road, PO Bhawarigarh, Dist Sangrur, 148026, Punjab	May 22, 2019	4 months from manufacture	Big Bazaar, Kalkaji	N122051974	52g/30g	815	35.7	0.1	51.2
Lay's American Style Cream and Onion Flavour by PepsiCo	Pepsico India Holdings Pvt Ltd. Village Channo, Patiala - Sangrur road, PO Bhawarigarh, dist Sangrur, 148026, Punjab	June 10, 2019	4 months from manufacture	Big Bazaar, Kalkaji	N110061951	52g/30g	742	34.0	0.1	51.6
Uncle Chipps Spicy Treat by PepsiCo	MD Printing and packaging private limited, Plot Number 49&50, Sector-5, SIDCUL, Haridwar, Pin 249403, Uttarakhand	June 16, 2019	4 months from manufacture	Big Bazaar, Kalkaji	MD160619	55g/30g	1080	35.0	0.1	52.7
Classic Salted Chips by Haldiram's	Haldiram Snack Pvt. Ltd., A-11, Sector-68, Noida-201307, Gautam Budhnagar, UP	July 2, 2019	November 1, 2019	Haldiram's Lajpat Nagar	RAG02B14	60.5g/ND	629	36	0.1	53
Pudina Treat Chips by Haldiram's	Haldiram Snack Pvt. Ltd., A-11, Sector-68, Noida-201307, Gautam Budhnagar, UP	June 26, 2019	October 25, 2019	Jungpura Extension	RAF26B02	16.25g/ND	ND	36	0.1	52
Too Yumm Multigrain Chips Chinese Hot and Sour by RP-Sanjiv Goenka Group	Adiguru Food Processing and Packaging, Plot-A/11, Phase-1, New Industrial Estate, Jagatpur, Cuttack-754021, Odisha	April 11, 2019	6 months from manufacture	Big Bazaar, Kalkaji	M3101	90g/ND	760	17.7	0.2	68
Classic Nut Cracker by Haldiram's	Haldiram Snack Pvt. Ltd., A-11, Sector 68, Noida-201307, Gautam Budh Nagar, UP	June 27, 2019	5 months from manufacture	Big Bazaar, Kalkaji	RAF27A	230g/ND	ND	50	0.1	26
Aloo Bhujia by Haldiram's	Haldiram Snack Pvt. Ltd., C-3, Sector 67, Noida-201307, Gautam Budh Nagar, UP	June 21, 2019	6 months from manufacture	Sidhi Vinayak Departmental Store, Jangpura Extension	DAF21B	230g/ND	ND	41.5	0.1	42.4
Bingo! Mad Angles Delight Achaari Masti by ITC	Kanchan Metals Pvt. Ltd. Everest house, 19G, 19th Floor, 46C, Jawaharlal Nehru Road, Kolkata - 700071, At plot no.69, 70A, Sector-Ecotech Extension, Greater Noida, Dist-Gautam Buddh Nagar, UP 201306	June 20, 2019	6 months from manufacture	Sidhi Vinayak Departmental Store, Jangpura Extension	DR06	80g/ND	789	32.3	0.1	58.1
Kurkure Masala Munch by PepsiCo	Daawat Foods Ltd., 45 Km stone, GT road, Kamaspur, Distt Sonepat-131021, Haryana	June 21, 2019	4 months from manufacture	Reliance Fresh, Lajpat Nagar IV	DF21061908	50g/30g	892	34.6	0.1	55.2

Sample	Manufacturer	Date of manufacture	Best before/ date of expiry	Source of collection	Batch Number	Pack size/ serving quantity	Declared value			
							S (mg)	TF (g)	tf (g)	C (g)
Maggi Masala by Nestle	VPO- Nangal Kalan, Industrial Area Tahliwal, Tehsil-Haroli, Una- 174507, Himachal Pradesh	June, 2019	9 months from manufacture	Big Bazaar, Kalkaji	91586640DA	70g/70g	1172.3	15.7	0.13	63.5
Atta Noodles Chatpata by Patanjali Ayurved	SwasthaAahar Pvt. Ltd., 15km milestone, Delhi-Rohtak National Highway-10, Kharawar, Dist- Rohtak-124021, Haryana	June, 2019	9 months from manufacture	Shri Siddhi Retail, Kalkaji	APCH240619A9	60g/ND	1364	19	0	62.6
Ching's Secret Schezwan by Capital Foods	Indo Nissin Foods Pvt Ltd. 91kms, NH-8, Delhi-Jaipur road, Village-Deodhai, Tehsil-Bawal, District-Rewari, Haryana 123401	May 27, 2019	9 months from manufacture	Big Bazaar, Kalkaji	I1479SCN06B	60g/60g	452.8	3.2	0	19.0
Knorr Classic Thick Tomato Soup by Hindustan Unilever	Hindustan Unilever Limited, At plot A-8/9 MIDC industrial estate, Malegaon, Sinnar, Nashik-422103, Maharashtra	November 30, 2018	12 months from packaging	Reliance Fresh, Lajpat Nagar IV	A5770103	53g/13.25g	4029	5.7	0.05	69.3

S: Sodium, TF: Total fat, tf: Trans fat, C: Carbohydrate, ND: Not Declared

Table 2: Fast foods

Sample	Company/manufacturer	Source of collection	Declared values on website				
			Weight (g)	S (mg)	TF (g)	tf (g)	C (g)
Cheese Whopper Veg by Burger King	Burger King India Pvt. Ltd.	GF & Mezz Flr, E 8, Connaught Place	296	540.5	10.61	0	33.99
Cheese Whopper Chicken by Burger King	Burger King India Pvt. Ltd.	GF & Mezz Flr, E 8, Connaught Place	287	487.80	10.38	0	21.01
Veg Zinger (with cheese) by KFC	KFC (Sapphire Foods India Pvt. Ltd.)	6 & 7, Scindia House, Connaught Place	200	600	4	0	38.5
Chicken Classic Zinger (with cheese) by KFC	KFC (Sapphire Foods India Pvt. Ltd.)	6 & 7, Scindia House, Connaught Place	196	510	10.71	0	21.94
McVeggie Burger by McDonald's	McDonald's (Connaught Plaza Restaurants Pvt. Ltd.)	42, Janpath	169	432.5	8.28	0.06	33.14
McAloo Tikki Burger by McDonald's	McDonald's (Connaught Plaza Restaurants Pvt. Ltd.).	42, Janpath	146	371.9	8.22	0.07	34.25
McChicken Burger by McDonald's	McDonald's (Connaught Plaza Restaurants Pvt. Ltd.)	42, Janpath	173	454.9	8.67	0.12	27.75
Chicken Maharaja Mac by McDonald's	McDonald's (Connaught Plaza Restaurants Pvt. Ltd.)	42, Janpath	290	555.2	11.72	0.07	20.69
Fries (regular) by Burger King	Burger King India Pvt. Ltd.	GF & Mezz Flr, E 8, Connaught Place	74	270.3	14.32	0	50.95
Fries (medium) by KFC	KFC (Sapphire Foods India Pvt. Ltd.)	6 & 7, Scindia House, Connaught Place	100	200	14	0	40
Fries (medium) by McDonald's	McDonald's (Connaught Plaza Restaurants Pvt. Ltd.)	42, Janpath	109	234.9	15.6	0.09	37.61
Hot Wings (4 pieces) by KFC	KFC (Sapphire Foods India Pvt. Ltd.)	6 & 7, Scindia House, Connaught Place	155	903.2	20	0	7.10

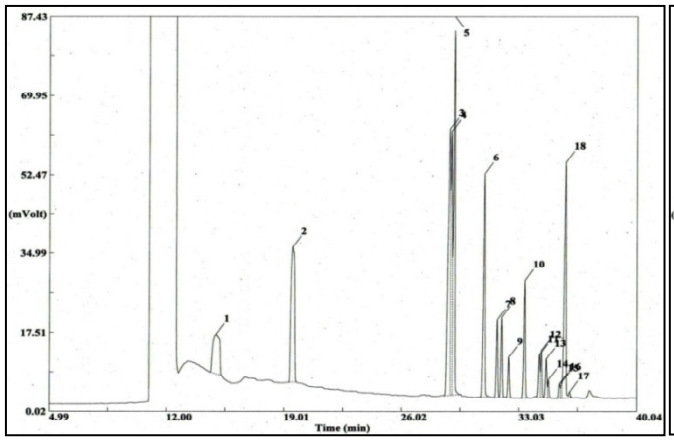
Sample	Company/manufacturer	Source of collection	Declared values on website				
			Weight (g)	S (mg)	TF (g)	tf (g)	C (g)
Peppy Paneer cheese burst (regular) by Domino's	Domino's Pizza (Jubilant FoodWorks Limited)	M 40, Connaught Circus	272	660.9	6.62	ND	36.47
Non-veg Supreme (regular) by Domino's	Domino's Pizza (Jubilant FoodWorks Limited)	M 40, Connaught Circus	320	560.7	4.75	ND	34.75
Classic Tomato Margherita (personal) by Pizza Hut	Pizza Hut (Devyani International Ltd.)	Shop No. 58, Janpath, Connaught Place	256	390.6	7.88	<0.1	38.61
Chicken Supreme (personal) by Pizza Hut	Pizza Hut (Devyani International Ltd.)	Shop No. 58, Janpath, Connaught Place	346.8	495.7	9.69	ND	25.72
Big Spicy Paneer Wrap by McDonald's	McDonald's (Connaught Plaza Restaurants Pvt. Ltd.)	42, Janpath	272	644.8	16.54	0.22	23.16
Paneer Tikka (6 inch) by Subway	Subway (A Unit of Aarbee International LLP)	M-08, Barakhamba road, Connaught place	238	410.1	11.76	ND	16.81
Chicken Seekh Kabab (6 inch) by Subway	Subway (A Unit of Aarbee International LLP)	M-08, Barakhamba road, Connaught place	238	259.2	6.3	ND	16.81

S: Sodium, TF: Total fat, tf: Trans fat, C: Carbohydrate, ND: Not Declared

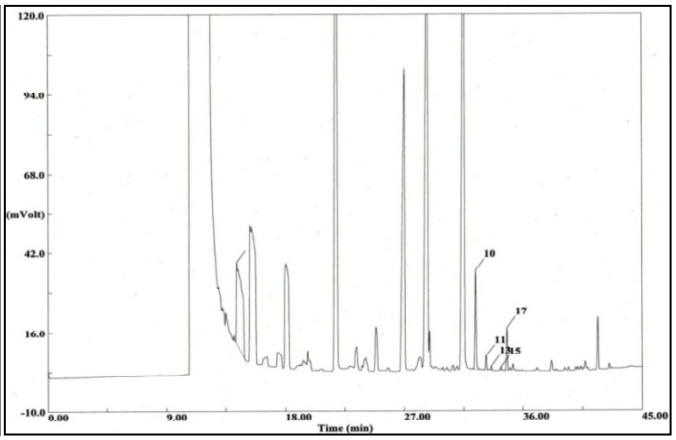
Annexure 2 Details of FAME standard solution

Name	Peak	IUPAC Name	Carbon	Retention time (minutes)
Internal Standard– glyceryl triundecanoate	1			14.94
Myristelaidic acid methyl ester	2	*trans*-methyl tetradec-9-enoate	C14:19*t*	19.52
Petroselaidic acid methyl ester	3	*trans*-methyloctadec-6-enoate	C18:16*t*	28.88
Elaidic acid methyl ester	4	*trans*-methyloctadec-9-enoate	C18:19*t*	28.99
Vaccenic acid methyl ester	5	*trans*-methyloctadec-11-enoate	C18:111*t*	29.15
Linoleic acid methyl ester	6	*trans,trans*-methyloctadeca-9,12-dienoate(50%)	C18:29*t*,12*t*	30.94
	7	*cis, trans*-methyl octadeca-9,12-dienoate (20%)	C18:29c, 12*t*	31.71
	8	*trans, cis*-methyloctadeca-9,12-dienoate (20%)	C18:29*t,12c*	31.98
	9	*cis,cis*-methyloctadeca-9,12-dienoate (10%)	C18:29*c*,12*c*	32.42
Linolenic acid methyl ester	10	*trans, trans, trans*-methyl octadeca-9,12,15-trienoate(30%)	C18:39*t*,12*t*,15*t*	33.36
	11	*trans,trans,cis*-methyloctadeca-9,12,15-trienoate(15%)	C18:3 9*t*,12*t*,15c	34.23
	12	*trans, cis, trans*-methyloctadeca-9,12,15-trienoate(15%)	C18:39*t*,12c,15*t*	34.35
	13	*cis, trans, trans*-methyloctadeca-9,12,15-trienoate(15%)	C18:39*c*,12*t*, 15*t*	34.65
	14	*cis,cis, trans*-methyloctadeca-9,12,15-trienoate(7%)	C18:39*c,12c,* 15*t*	34.77
	15	*cis, trans,cis*-methyloctadeca-9,12,15-trienoate(7%)	C18:3 *9c,12t,15c*	35.43
	16	*trans, cis, cis*-methyloctadeca-9,12,15-trienoate(7%)	C18:39*t,12c,15c*	35.55
	17	*cis,cis, cis*-methyloctadeca-9,12,15-trienoate(4%)	C18:39*c*,12*c*,15c	36.03
Eicosenoic acid methyl ester	18	*trans*-methyleicos-11-enoate	C20:111*t*	35.78

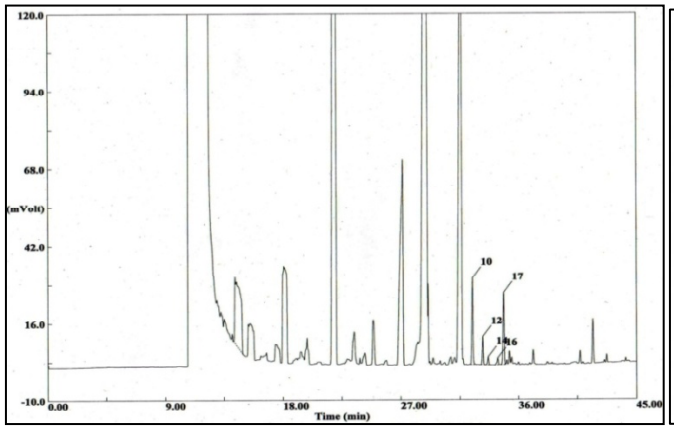
Annexure 3 Chromatograms of standard and few study samples



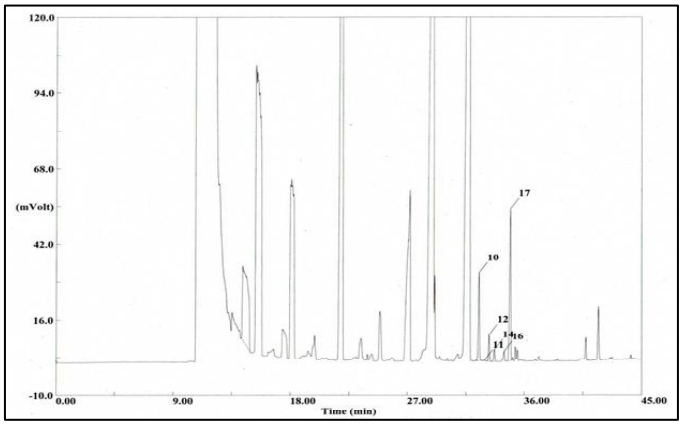
FAME profile of standard



FAME profile of Peppy Paneer cheese burst (regular) by Dominos's



FAME profile of Big Spicy Paneer Wrap by McDonald's



FAME profile of Paneer Tikka (6 inch) by Subway

Annexure 4: Test results -replicate values

Sample	Salt						Total fat						Trans fat			Carbohydrate		
	R1	R2	R3	Mean	STD	COV	R1	R2	R3	Mean	STD	COV	R1	R2	Mean	R1	R2	Mean
Chips																		
Lay's India's Magic Masala by PepsiCo	1.989	1.953	1.871	1.94	0.06	3.12	31.74	31.83	33.94	32.50	1.25	3.83	0.212	0.2112	0.21	54.3	48.76	51.53
Lay's American Style Cream and Onion Flavour by PepsiCo	1.543	1.493	1.627	1.55	0.07	4.36	28.39	28.23	30.96	29.19	1.53	5.25	0.3005	0.237	0.27	48.29	49.62	48.96
Uncle Chipps Spicy Treat by PepsiCo	2.856	2.85	2.718	2.81	0.08	2.78	34.67	35.05	35.39	35.04	0.36	1.03	0.1627	0.1763	0.17	52.24	51.37	51.81
Classic Salted Chips by Haldiram's	1.384	1.382	1.371	1.38	0.01	0.51	36.54	37.53	35.5	36.52	1.02	2.78	0.3614	0.3064	0.33	51.35	53.02	52.19
Pudina Treat Chips by Haldiram's	2.24	2.288	2.315	2.28	0.04	1.67	35.68	36.67	37.76	36.70	1.04	2.83	0.235	0.2201	0.23	50.47	55.39	52.93
Too Yumm Multigrain Chips Chinese Hot and Sour by RP-Sanjiv Goenka Group	3.312	3.264	3.126	3.23	0.10	2.99	16.71	16.93	17.87	17.17	0.62	3.59	0.0709	0.0827	0.08	66.42	63.28	64.85
Namkeen																		
Classic Nut Cracker by Haldiram's	5.216	4.958	4.804	4.99	0.21	4.17	44.5	44.03	45.84	44.79	0.94	2.10	0.5635	0.5568	0.56	18.09	17.23	17.66
Aloo Bhujia by Haldiram's	3.114	3.007	3.027	3.05	0.06	1.87	43.83	44.27	42.35	43.48	1.01	2.31	0.3358	0.3284	0.33	35.67	33.71	34.69
Bingo! Mad Angles Delight Achaari Masti by ITC	1.717	1.66	1.69	1.69	0.03	1.69	41.49	43.28	44.06	42.94	1.32	3.07	0.2155	0.2257	0.22	54.05	53.37	53.71
Kurkure Masala Munch by PepsiCo	2.453	2.447	2.564	2.49	0.07	2.65	34.14	33.59	34.35	34.03	0.39	1.15	0.2015	0.2024	0.20	55.89	53.91	54.90
Instant Noodles																		
Maggi Masala by Nestle	3.72	3.69	3.656	3.69	0.03	0.87	15.05	15.44	14.3	14.93	0.58	3.88	NT			63.4	60.95	62.18
Atta Noodles Chatpata by	3.894	3.992	3.955	3.95	0.05	1.25	21.18	22.27	22.74	22.06	0.80	3.63				50.94	51.52	51.23

Sample	Salt						Total fat						Trans fat			Carbohydrate		
	R1	R2	R3	Mean	STD	COV	R1	R2	R3	Mean	STD	COV	R1	R2	Mean	R1	R2	Mean
Patanjali Ayurved																		
Ching's Secret Schezwan by Capital Foods	4.297	4.377	4.063	4.25	0.16	3.84	17.62	18.48	17.36	17.82	0.59	3.29				53.36	54.24	53.80
Soup																		
Knorr Classic Thick Tomato Soup by Hindustan Unilever	10.458	10.432	10.43	10.44	0.02	0.15	8.59	8.74	7.95	8.43	0.42	4.98	NT			65.25	63.96	64.61
Burger																		
Cheese Whopper Veg by Burger King	1.324	1.411	1.333	1.36	0.05	3.53	14.32	14	13.31	13.88	0.52	3.72	0.2112	0.173	0.19	20.41	20.03	20.22
Cheese Whopper Chicken by Burger King	1.376	1.402	1.265	1.35	0.07	5.40	11.14	10.58	10.23	10.65	0.46	4.31	0.1428	0.1688	0.16	12.43	12.58	12.51
Veg Zinger (with cheese) by KFC	1.505	1.491	1.631	1.54	0.08	5.00	10.35	10.52	11.79	10.89	0.79	7.23	0.1391	0.0509	0.10	19.51	19.87	19.69
Chicken Classic Zinger (with cheese) by KFC	1.191	1.14	1.338	1.22	0.10	8.41	19.81	20.6	17.99	19.47	1.34	6.88	0.2146	0.1795	0.20	16.89	15.93	16.41
McVeggie Burger by McDonald's	1.202	1.188	1.279	1.22	0.05	4.01	10.12	10.33	9.4	9.95	0.49	4.90	0.0886	0.081	0.08	32	34.32	33.16
McAloo Tikki Burger by McDonald's	1.057	1.02	0.979	1.02	0.04	3.83	9.18	9.16	8.98	9.11	0.11	1.21	0.0889	0.0678	0.08	29.1	29.22	29.16
McChicken Burger by McDonald's	1.077	1.087	1.179	1.11	0.06	5.05	9.43	9.62	9.49	9.51	0.10	1.02	0.0947	0.0747	0.08	27.05	28.31	27.68
Chicken Maharaja Mac by McDonald's	1.483	1.505	1.363	1.45	0.08	5.27	9.78	9.93	10.43	10.05	0.34	3.39	0.0448	0.0626	0.05	19.19	21.3	20.25
Fries																		
Fries (regular) by Burger King	0.896	0.86	0.792	0.85	0.05	6.22	13.76	13.07	13.97	13.60	0.47	3.46	0.1113	0.1297	0.12	25.21	26.75	25.98
Fries (medium) by KFC	0.453	0.456	0.494	0.47	0.02	4.89	14.69	15.15	14.86	14.90	0.23	1.56	0.168	0.1331	0.15	25.73	26.15	25.94
Fries (medium) by	0.698	0.74	0.677	0.71	0.03	4.55	14.59	14.98	13.87	14.48	0.56	3.89	0.119	0.1809	0.15	43.28	46.25	44.77

Sample	Salt						Total fat						Trans fat			Carbohydrate		
	R1	R2	R3	Mean	STD	COV	R1	R2	R3	Mean	STD	COV	R1	R2	Mean	R1	R2	Mean
McDonald's																		
Fried chicken																		
Hot Wings (4 pieces) by KFC	1.393	1.376	1.544	1.44	0.09	6.43	21.84	20.99	21.42	21.42	0.43	1.98	0.1698	0.1178	0.14	9.84	11.18	10.51
Pizza																		
Peppy Paneer cheese burst (regular) by Domino's	1.346	1.319	1.365	1.34	0.02	1.72	9.48	9.43	9.75	9.55	0.17	1.80	0.217	0.2081	0.21	20.4	20.39	20.40
Non-veg Supreme (regular) by Domino's	1.422	1.387	1.414	1.41	0.02	1.30	12.52	12.14	12.26	12.31	0.19	1.58	0.2277	0.2045	0.22	26.16	26.89	26.53
Classic Tomato Margherita (personal) by Pizza Hut	1.103	1.17	1.253	1.18	0.08	6.39	7.33	7.48	7.38	7.40	0.08	1.03	0.2397	0.2168	0.23	35.88	35.73	35.81
Chicken Supreme (personal) by Pizza Hut	1.663	1.732	1.717	1.70	0.04	2.13	10.27	10.42	10.28	10.32	0.08	0.81	0.2078	0.2428	0.23	24.91	27.09	26.00
Sandwich and wrap																		
Big Spicy Paneer Wrap by McDonald's	1.549	1.595	1.6	1.58	0.03	1.78	16.61	18.17	18.34	17.71	0.95	5.39	0.2316	0.2438	0.24	20.55	21.69	21.12
Paneer Tikka (6 inch) by Subway	1.375	1.394	1.377	1.38	0.01	0.76	18.36	17.49	18.97	18.27	0.74	4.07	0.2122	0.2423	0.23	15.97	17.69	16.83
Chicken Seekh Kabab (6 inch) by Subway	1.876	1.894	1.868	1.88	0.01	0.71	13.13	14.8	13.77	13.90	0.84	6.06	0.2167	0.2145	0.22	16.92	16.98	16.95

R: Replicate, STD: standard deviation, COV: coefficient of variation, NT: Not tested

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