

**AWARENESS ON TRANS FATS AND PROMOTION OF
HEALTHY FOOD CHOICES AMONG SELECTED
CONSUMERS AND FOOD SERVICE OPERATORS**

By

K.M.AMILA SIDHEEKA

(11PD02)

**A THESIS SUBMITTED TO THE
AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND
HIGHER EDUCATION FOR WOMEN, UNIVERSITY
COIMBATORE - 641 043.**

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE MASTER'S DEGREE IN**

FOOD SERVICE MANAGEMENT AND DIETETICS

MAY, 2013

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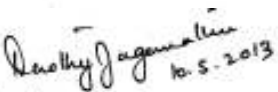
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CERTIFIED AS BONAFIDE RESEARCH WORK


Signature of the
Head of the Department


Signature of the
Guide

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1. INTRODUCTION

The world economy is more integrated with faster communication and hence forth, diet transition is more inevitable. Globalisation has played an enormous role in the transformation of food consumption pattern of the population. The mushrooming of shopping malls, convenience stores, vending machines and fast food outlets has created an alarming situation for population groups to expose for unhealthy eating habits (Pingali, 2004).

Food options, choices and eating behaviours are influenced by a complex number of factors including the nationality, culture, community, family and the individual's food likes and dislikes and are affected by global attributes (Goldstein *et al.*, 2005).

The growth of the fast food industry has led to an increased consumption of foods prepared away from home that is high in total and saturated fat, as well as sodium, but low in dietary fibre, calcium, and iron (Guthrie *et al.*, 2002).

The idea developed that changes in eating habits is based on people's values, embedded in social structures such as school, work, and family (Jastran *et al.*, 2009). As western fast food companies are expanding in developing countries such as India, there is a considerable concern that such countries are in danger of succumbing to the same obesity trends as in the Western countries (Daniel *et al.*, 2011).

Rapid changes in physical growth and psycho social development have placed the people especially young adults as nutritionally vulnerable groups with poor eating habits that fail to meet dietary requirements (Chin and Mohammed, 2009). Some common unhealthy eating pattern among young adults include skipping of meals, eating away from home, snacking and fast food consumption (Savige *et al.*, 2007).

The prevalence of eating out of the home is increasing, as is the range of eating outlets and types of food. The foodservice industry is commonly classified into two sectors, firstly, the profit, private or commercial sector and secondly, the cost, public or welfare/institutional sector, both of which are integral and growing components of most economies (Edward, 2013).

In the past few decades, foods prepared in a restaurant with limited service staff and from which the majority of meals are consumed off premises has been implicated as one of the contributors to increased population rates of obesity (Pereira *et al*, 2005).

In recent years, there has been a marked increase in the rates of obesity in countries such as India that has been attributed to unhealthy lifestyle practices associated with the introduction of Western-style fast foods that are higher in fat and refined carbohydrates (Yadav and Krishnan, 2008).

In accordance to a study by Kral and Rolls, 2004 adults eat approximately 30 per cent of their meals away from home, including 19 per cent of breakfasts, 54 per cent of lunches, and 20 per cent of dinners. Food eaten away from home may be related to increased weight because energy density is higher in these meals and portion sizes are larger. A number of studies have demonstrated that school age children and adults consume more when portion sizes are larger and research has demonstrated that both energy density and portion size contribute independently to energy intake.

Increased urbanisation has seen the rise of the middle class and it is predominantly the lifestyle preferences of this group that mark a change with the past (Yasmeen and Prabu, 2004).

Indians from a high income neighbourhood were more familiar with fast food as it is defined in the West, and they dined at fast food restaurants more frequently. Furthermore, they were more likely to report that they enjoy eating at Western-style fast food restaurants compared to their low-income neighbourhood counterparts. On the other hand, Indians living in a low-income neighbourhood were more likely to buy and report food sold by street vendors as fast food (Christopher *et al.*, 2013).

India has a wide and rich heritage of foods and recipes. Popular north Indian fast foods include aloo tikki, bhel puri, chaat, pakora, chole bhature, pav bhaji, dhokla, samosa and pani puri. Calorie and fat content in Indian fast food depends on the cooking method. Most of Indian fast foods are prepared by deep frying in fats especially trans fat and saturated fats (www.fatfreekitchen.com/nutrition/indian-foods.html).

Fast food chains are gaining popularity with nuclear families as working parents have less time for meal preparation at home. The vast majority of working parents with school going children are laboured with exhausting commutes, other household chores and stress (Jaya *et al.*, 2011).

For children skipping breakfast at home, fast food comes handy in school. A positive correlation of increased fast food consumption, skipped breakfasts and increased Body Mass Index was found among adolescents (Niemeier *et al.*, 2006).

Indian fast food industry stands at a massive size of 47 billion, driven by a growing number of working professionals and increasing westernization. Apart from this, busy life schedule, standardized food, and less time consuming processes are also fuelling the demand from domestic consumers in the industry. As demand for all types of fast food items are consistently on the rise, pizza, burger, and French fries have become the all-time favourite among people (<http://www.globalthen.com/qsr/pdf/Indian%20Fast%20Food%20Industry.pdf>).

Fast food was defined as food with distinctly “Western” characteristics, such as sandwiches, take-out pizza, deep fried chicken, or burgers. Researchers defined fast food establishments as restaurants that either had foods prepared or took little time to prepare, with limited service staff and the majority of business derived from take-out sales (Goyal, 2007).

The Dietary Guidelines for Americans 2010 and the Institute of Medicine recommend that individuals keep trans fatty acid consumption as low as possible (Dietary Guidelines for Americans, 2010). There are two main sources of dietary trans fatty acids (trans fat). Naturally occurring trans-fat is found in small amounts in the fatty parts of meat and dairy products. Artificial trans-fat comes from foods that contain partially hydrogenated oil and is formed when hydrogen is added to liquid oil turning it into solid fat. Often food manufacturers use artificial trans-fat in food products because it is inexpensive and it increases the food’s shelf life, stability, and texture.

Hydrogenated oil used in Indian cooking are rich in trans fats and have been replaced in many restaurants by refined vegetable oil. Trans fat content in Indian fast food are far higher than western foods. Trans fat content in bhatura, paratha and puris

is 9.5 per cent, 7.8 per cent and 7.6 per cent, respectively as compared to 4.2 per cent in regular French fries [[timesofindia.indiatimes.com/article show/1755418.cms](http://timesofindia.indiatimes.com/article/show/1755418.cms)].

The economic success in these Asian countries have resulted in considerable improvements of peoples quality of life. Large sections of the population have been experiencing a transition from ‘poverty’ to ‘adequate food and clothing’; today growing parts of the population are getting closer to ‘well to do’ lifestyles. These segments of society are not satisfied with only enough food and clothes, but are also eager to obtain a quality life of high nutrient food, comfortable living, health care, and other quality services (Hubacek *et al.*, 2007).

Lifestyle diseases like hypertension, diabetes mellitus, dyslipidaemia and overweight/obesity are the major risk factors for the development of Cardio vascular disease. With rapid economic development and increasing westernization of lifestyle in the past few decades prevalence of these diseases has reached alarming proportions among Indians in the recent years (Pappachan *et al.*, 2011).

Trans fatty acids are unsaturated fatty acids with at least one double bond in the trans configuration and has a straight chain that is similar to those structure of saturated fatty acid. Trans fatty acids are found in two major sources, natural and industrial. In natural source, trans fatty acids originate from milk fat and tissue fat of ruminants such as cows, goat and sheep. Bacteria in their stomach can be producing trans fatty acids by a biological hydrogenation process. Industrial trans fatty acids are mainly generated from vegetable oil polyunsaturated fatty acids, either during partial hydrogenation or during refining process (Pfeuffer and Schrezenmeir, 2006).

Major dietary sources of industrial trans fatty acids include bakery products (e.g., cakes, cookies and pies), deep fried and frozen foods (e.g., French fries, breaded chicken and fish), packaged snacks (e.g., popcorn), margarines and partially hydrogenated fats directly used for cooking and also ruminant derived foods (dairy products and meat) (Micha and Mozaffarian, 2008). Industrially produced trans fats are formed during partial hydrogenation, a process used by the vanaspathi industry to harden and stabilize liquid vegetable oils. This process maintains the taste and smell characteristics of oils while enabling a longer shelf life for final food products.

The majority of the trans fats in the food are industrially produced and are typically found in foods made with partially hydrogenated oil, baked and fried foods. Trans fats also occur naturally. They are found at low levels (generally two-five per cent of fat content) in ruminant based foods, such as, dairy products and meat. Trans fatty acids level in vanaspathi depends on multiple factors and could be as high as 50 to 60 per cent of total fat content. There are growing concerns about the potential health effects of trans fatty acids particularly those derived from vanaspathi. In India, vanaspathi, margarine, desi ghee, butter etc. are sources of trans fatty acids. Commercially fried, processed ready to eat bakery foods are potential source (Dhir, 2009).

Major contributors to artificial trans fat intake include fried items, savory snacks (like microwave popcorn), frozen pizzas, cake, cookies, pie, margarines and spreads, ready-to-use frosting, and coffee creamers. The amount of trans fat can vary among similar food categories. Trans fat are also found in restaurant and cafeteria foods that contain or are prepared with partially hydrogenated oil (Center for Science in the Public Interest, 2012).

Nutrition and dietary habits are closely related to most lifestyle-related diseases as well as people's quality of life. To improve people's nutrition and dietary habits it is necessary to encourage the individuals to change their lifestyle as well as develop the necessary underlying environment. Changes in life-styles, behavioural patterns, demographic profile (ageing population), socio-cultural and technological advancements are leading to sharp increase in the prevalence of Non-communicable Diseases like Diabetes, Cardiovascular diseases, Stroke and Cancer, etc. These diseases can be prevented by making simple changes in the way we live their out or simply by changing our life style (WHO 2005).

For many people, eating out is a way to relax and socialise. But if weight are concerned with watching healthy eating, dining out can be a challenge. The good news was that usually there are healthier options at every restaurant, even at fast-food outlet. Hence the study was undertaken with the objective to

- Assess the awareness on trans fat among the customers and food service outlets.
- Study the food choices of customers while dining out.
- Standardise the trans fat free recipes to be used at food service operations and
- Promote healthy food choices among the customers and food service operators.

2. REVIEW OF LITERATURE

The review of literature pertaining to the study entitled “**Awareness on Trans-fat and promotion of healthy food choices among selected consumers and food service operators**” is discussed under the following headings.

A. TRANS FATS - FOODS AND ITS DELITERIOUS EFFECTS

B. TRANS FATS - HEALTH RISK AND ITS EFFECTS

C. TRANS FATS - HEALTH REGULATIONS AND WAYS TO REDUCE
TRANS FAT

A. TRANS FATS – FOODS AND ITS DELITERIOUS EFFECTS

The latest Dietary Guidelines for Americans recommends getting less than ten per cent of calories each day from saturated fat. (Dietary Guidelines for Americans, 2010) The American Heart Association goes even further, recommending limiting saturated fat to no more than seven percent of calories. (Lichtenstein *et al.*, 2006) stated that framing diet recommendations in terms of “percentage of daily calories” is not terribly useful for the average consumer. That’s because people eat foods—not isolated nutrients.

Phillips *et al.*, 2010 stated trans fat comprises unsaturated fatty acids having one or more isolated double bonds in the trans geometric configuration. Trans fatty acids (TFA) occur naturally at low levels in ruminant fats and are also formed during the production of partially hydrogenated vegetable oils and contribute longer shelf-life, solidity at room temperature and greater stability during high temperature frying .

Demographics related to eating fast food or food away from home, although one study analysed cravings for a list of different foods. Using factor analysis White *et al.* found that, in addition to cravings for groups of foods that are, sweet, high fat, and carbohydrates/starches, there was a category of cravings that included fast foods (White *et al.*, 2002).

As diet globalisation, the influences of globalisation were much more marked with increased consumption of proteins, sugars and fats liberalisation has meant that large food chains have a strong incentive to enter the very large Indian market but

given their relative bargaining power this could have adverse effects on Indian suppliers (Pingali, 2004).

Using label information, lipid ingredients and fat profile are compared for pre and post labelling, composition data for more than 5000 chips and cookie products introduced for sale between 2001 (pre-labelling) and 2009 (post-labelling) were analysed. The share of chip and cookie introductions containing partially hydrogenated vegetable oil declined by 45 and 42 per cent points, respectively in cookies, there was an increase of 0.49 (98 per cent) in the average saturated fat content per 30 gram serving and an increase of nine (9 per cent) in the average ratio of saturated to total fat (Vancamp *et al.*, 2012).

A complication of the available information on a sample presentation and analytical methods for the determination of trans fatty acid in food stuffs was the basis of the present extensive bibliographic review. This review contributes for a better understanding of the analytical approaches adopted to determine trans fatty acid and to follow the tendency over the years to enhance the knowledge towards trans fatty acid contents found in food stuffs (Albequenque *et al.*, 2011)

In accordance to Bansal *et al.*, 2009 simulated frying experiments were performed on the different types of oils with french fries as the fried foods of frying samples was then made with cooking parts of oil samples heated with food. Three different methods were applied to quantify total trans fats. The total trans fats were found to be higher in the frying oil samples compared to the controlled samples, which might be due to the presence of a high amount of trans fats in the pre fried and frozen French fries.

Partially hydrogenated oils are considered to be the major source of trans fats in the diet. The most acceptable method to quantify trans fats is gas chromatography coupled with a flame ionization detector. Samples are derivatives to their methyl ester which are then injected to gas chromatography. Analysis of cis and trans isomers is best carried out using long, flexible, fused silica capillary columns coated with highly polar cyanopolysiloxane stationary phases containing various polar substituent (Sebedio, 2008).

Being a Hispanic adult, working outside the home, and cravings for individual food items were related to eating more meals away from home. In general respondent's cravings for some specific food items were also related to higher numbers of meals their child ate away from home. Cravings for both fast food and snacks were positively correlated with adult eating out. None of the respondents' scale scores were related to child's eating away from home (Siwik and Senf, 2006).

Cutler *et al.*, 2003 stated another example of technological innovation comes from the shift in the consumption of the potato. Before the 1960's potatoes were primarily prepared at home either by boiling, mashing, or baking whereas french fries were rarely prepared at home or in restaurants because of the significant labour to peel, cut, and fry the potato. Once the technology was available to create french fries at central production facilities and process them to the point where they just needed to be reheated, the french fry rapidly became the most commonly eaten form of the potato and represented a 30 per cent increase in potato consumption from 1977 to 1995.

Today, fat is taken less, getting about 33 per cent of calories from fats and oils, (Wright, 2010) yet 34 per cent of adults are obese and 11 per cent have diabetes, most with type 2 diabetes (Flegal, 2010).

More recently, several studies seemed to suggest that eating diets high in saturated fat did not raise the risk of heart disease a finding that ran counter to decades of dietary advice (Siri-Tarino, 2010).

One highly-publicized report analysed the findings of 21 studies that followed 350,000 people for up to 23 years. Investigators looked at the relationship between saturated fat intake and coronary heart disease, stroke, and cardiovascular disease. Their controversial conclusion: "There is insufficient evidence from prospective epidemiologic studies to conclude that dietary saturated fat is associated with an increased risk of coronary heart disease, stroke, or cardio vascular disease."(Micha, 2010)With headlines like "Saturated Fat is Not Your Heart's Enemy," and "NOT GUILTY: The Long-Standing Vilification of Saturated Fat Finally Turning to Vindication," (Moore, 2012).

Some of the media and blog coverage of these studies would have you believe that scientists had given a green light to eating bacon, butter, and cheese. Cutting back on saturated fat can be good for health if people replace saturated fat with good fats, especially, polyunsaturated fats (Siri-Tarino *et al.*, 2010).

In accordance to Daniel *et al.*, 2011 Western fast food companies are expanding in developing countries such as India, there is a considerable concern that such countries are in danger of succumbing to the same obesity trends as in the Western countries.

Jeyakumar *et al.*, 2011 stated the impact of industrial trans fatty acids on lipid metabolism and health remains elusive. Trans fatty acid ingestion had no effect on fasting plasma glucose, insulin levels or oral glucose tolerance, it significantly decreased muscle insulin – stimulated glucose uptake compared to poly unsaturated fatty acids. Trans fatty acid ingestion increase adipose tissue retinol – binding protein

In accordance to Upritchard, 2005 Saturated and trans fatty acids raise total cholesterol and low density lipoprotein cholesterol and are known to increase the risk of coronary heart disease. Margarine is an emulsion of water in oil that is stabilized by a network of fat crystals.

Trans fatty acids are stable to oxidative rancidity which allows them to have a long shelf life and also have an intermediate melting point between saturated and unsaturated fats. For these reason, they have been widely used by the food industry. However in recent years, a large number of epidemiological and clinical evidence has indicated that trans fats are a significant risk factor to suffer a cardio vascular event and appear to be involved in the process of inflammation such as diabetes and cancer. The increase of two per cent of the daily energy by trans-fat is associated with a 23 per cent increase in cardio vascular disease (Ballesteros *et al.*, 2012).

Nine different brands of commercially available vanaspathi (hydrogenated vegetable oil) in India were analysed for physic chemical characteristics Fourier transform infrared spectroscopy spectra showed the characteristic peak at 966 corresponding to trans fatty acids for all the samples examined. The fatty acids composition showed that the trans fatty acid (elaidic acid) content ranged from 5.9 to 30.3 per cent. The fat with the highest trans fatty acid content showed the highest

hardness index however there was no direct correlation between fatty acids composition and consistency (Jeyarani, 2005).

A possible association has been shown between the intake of trans fatty acids and the risk of coronary heart disease. They are proven to produce adverse effects on blood lipids, including increasing low density lipoprotein cholesterol concentration and decreasing high density lipoprotein cholesterol concentration. Vegetable oils are partially hydrogenated in the presence of a metal catalyst and hydrogen to produce a more stable product. As a result of this process, the double bonds in unsaturated fatty acids are reduced and some of them are converted from their natural cis to trans configuration (Khor *et al.*, 2008).

Trans fats are thought to promote cardio vascular disease by increasing levels of low-density lipoprotein “bad” cholesterol in the blood and decreasing levels of high-density lipoprotein “good” cholesterol (Ascherio, 2006).

A number of studies have examined demographic correlates of frequency of eating meals away from home, more research needs to be done on the range of factors associated with eating food away from home and on the type of restaurant and food that is chosen. In particular, it would be useful to know whether a parent’s craving for fast food does result in eating more often at fast food places, both for them and for their children (Violet *et al.*, 2006).

Albers and Borders, 2007 stated that in addition, our findings indicate that journalists opting to mention scientific evidence on health risk tended to explicitly link this evidence to the need for a governmental action – in the form of either mandatory nutrition labelling changes or a product ban. Food makers were effective in communicating through the news media that voluntary industrial action was the most commonly mentioned response to address health risks of trans fat in news coverage, it appears that food makers were effective in communicating through the news media that voluntary action was a credible route to reducing trans-fat in the united states diet.

In the case of children, the parents and family play an even more important role. Parents influence the child’s behaviour by determining the amount and type of food available, providing a role model for the child, and often directly controlling the eating behaviour of the child (Patrick, 2005).

The special trend about a non-home environment and the expectations from it has the reason and focus on expectation that arise from the anticipated eating and drinking in public is a fashionable and valued situation. The plain and predictable food that older people remember consuming has given way to meals that are full of variety and influences of European and Asian culinary cultures (Ban, 2012).

Traditionally, bakery frying oils have had higher melting points in order to accommodate glazing and sugaring requirements - a point easily obtained through the partial hydrogenation of the fats. During the partial hydrogenation process, liquid oils are turned into stable, more solid fats, which increase the shelf-life and flavour stability of a food product. Though those benefits make the process appealing to food manufacturers, partial hydrogenation also produces nutritionally undesirable trans-fatty acids (Stier, 2006).

When compared with the consumption of an equal number of calories from saturated or *cis* unsaturated fats, trans fat have been shown to raise levels of low-density lipoprotein, or “bad,” cholesterol; reduce levels of high-density lipoprotein, or “good,” cholesterol; and increase the ratio of total cholesterol to Higher Density Lipoprotein cholesterol a powerful predictor of the risk of chronic heart disease (Stampfer *et al.*, 2006).

Other studies have indicated links between trans-fats and an increased risk of Alzheimer’s disease cognitive decline, inflammation, and ischemic heart disease (Stender & Jyerberg, 2004).

Given these adverse health effects, the potential for harm from trans fatty acids is clear from a nutritional value, trans fats appear to have no intrinsic health value above their caloric value; thus, consuming trans-fats results in considerable potential harm but provides no apparent benefits (Mozaffarian *et al.*, 2006).

In accordance to Weise, 2004 because of the increased risk for heart disease and related co morbidities, the U.S. Food and Drug Administration enacted legislation in 2003 requiring food manufacturers to list the trans-fat content of all foods on nutrition labels by January 2006.

An extremely popular and versatile breakfast food. Though bagels and healthier breakfast items have gained in popularity, doughnuts still ranked as the

favourite breakfast food of Americans as recently as 2004 (Baking Management, 2004).

Despite their popularity, because they are deep fried doughnuts have also been a source of trans-fats. A typical doughnut usually contains nine to 20 grams of total fat, including two to four grams of trans-fat. A chocolate-frosted cake doughnut, for example, contains about the same amount of total fat and trans-fat found in a medium-size serving of McDonald's French fries (Abelson, 2007).

The trans configuration has an effect on the functional and physiochemical properties of these fatty acids which in turn effects their metabolism in humans. High levels of trans fatty acids are a public health concern due to some evidence associating trans fatty acid with coronary heart disease. There is also evidence that the risk of type 2 diabetes is directly associated with consumption of saturated fat and trans-fat and inversely associated with polyunsaturated fat from vegetable sources (Crupkin, 2008).

B. TRANS FATS – HEALTH RISK AND ITS EFFECTS

Even small amounts of trans fat in the diet can have harmful health effects. For every extra two per cent of calories from trans-fat daily, the risk of coronary heart disease increases by 23 per cent. Eliminating industrial produced trans fats from the United States supply could prevent between six and 19 per cent of heart attacks and related deaths, or more than two lakh each year (Mozaffarian *et al.*, 2006).

According to a meta-analysis of four prospective cohort studies, a two per cent increase in energy uptake from trans fats is associated with a 23 per cent increased risk of cardiovascular disease. Trans fats are also associated with sudden death from cardiac causes (Katan *et al.*, 2006).

Trans-fats also increase triglyceride levels more than other fat), increase levels of Lipoprotein (a) lipoprotein, and reduce the particle size of LDL cholesterol, all of which may further raise the risk of coronary heart disease (Mauger *et al.*, 2003)

A high intake of trans fat is a well-established risk factor for cardiovascular disease. Over the next decade, additional epidemiologic studies were published that showed a consistent adverse association of trans fatty acids with increased coronary heart disease risk (katan *et al.*, 2006).

Meta analyses evaluated the effects of substituting trans fatty acids for carbohydrate calories and demonstrated low density lipoprotein-c raising effect that was similar to saturated fatty acids; however, unlike saturated fatty acids, trans fatty acids did not raise high density lipoprotein-c, resulting in the conclusion that trans fatty acids low high density lipoprotein-c compared to saturated fatty acids and consequently increase the low density lipoprotein-c/ higher density lipoprotein- ratio, which is a strong independent risk factor for cardio vascular disease (Mensink *et al.*, 2003).

In a relatively short period of time, there has been an impressive evolvement of the evidence base demonstrating an adverse relationship between trans fatty acid intake and coronary heart disease risk. The epidemiologic studies were instrumental in establishing the rationale for conducting well-controlled clinical studies that definitively demonstrated the role that trans fatty acid intake played in coronary heart disease risk. The proliferation of the evidence base was key for the current actions/policies that have been implemented to decrease trans fatty acids in the food supply. The emerging data on trans fatty acid intake and diabetes incidence (Riserus *et al.*, 2009).

A prospective study among 40,757 persons, aged 26 to 69, participating in the Spanish cohort of the EPIC study individuals were followed-up until 2004 through record linkage with hospital discharge registers to ascertain coronary heart disease events. Two major dietary patterns were identified from factor analysis showed that the first pattern were labelled as westernized, because of the frequent consumption of refined cereals and red meats, second was Mediterranean pattern , because of the frequent intake of plant based foods and olive oil (Castillon *et al.*, 2012).

Javier *et al.*, 1999 stated fifteen samples of the most common industrial bakery products sold in Spain were analysed for their fatty acid consumption. Saturated fatty acids occurred in the largest proportion in all samples (mean = 52.8 per cent), followed by mono saturated (mean = 23.5 per cent) and poly unsaturated fatty acids (mean = 17.2 per cent). A small percentage of trans fatty acids, which were found in all samples, showed a mean value of 5.7 per cent.

A recent report suggests that pregnant mothers who eat high sugar and high fat diets have babies who are likely to become junk food junkies themselves, this happens because the high fat and high sugar diet leads to changes in the fetal brain's reward pathway, altering food preferences(Ong and Muhlhausler, 2011).

Today we know that eating trans fats increases levels of low-density lipoprotein (LDL, “bad” cholesterol), especially the small, dense LDL particles that may be more damaging to arteries. It lowers levels of high-density lipoprotein (HDL) particles, which scour blood vessels for bad cholesterol and truck it to the liver for disposal. It also promotes inflammation, (Hankinson *et al.*, 2004) an over activity of the immune system that has been implicated in heart disease, stroke, diabetes, and other chronic conditions.

A consistent adverse association of trans-fatty acids was associated with increased coronary heart disease risk as reviewed by Mozaffarian *et al.*, 2006. The emerging data on trans-fatty acids intake and diabetes incidence (Riserus *et al.*, 2009) insulin resistance and adiposity (Teegala *et al.*, 2009) could reinforce the importance of decreasing trans-fatty acids in the diet. Other emerging questions about trans-fatty acids to resolve include determining the effects of animal trans-fatty acids versus industrially synthesized trans-fatty acids (Willett and Mozaffarian, 2008) and the biological effects of the individual industrially synthesized trans-fatty acids (Lemaitre *et al.*, 2006).

A 2006 labelling law that forced food companies to list trans fats on the label has reduced trans-fat levels in the U.S. food supply, since many food makers have switched to using trans-free oils and fats in their products. Recent study from the Centers for Disease Control and Prevention finds that Americans’ blood-levels of trans fats dropped 58 percent from 2000 to 2009 - evidence that the labelling law has had its desired effect (Vesper, 2012).

The children are also more prone to diabetes, raised cholesterol, and high blood fat traditionally, bakery frying oils have had higher melting points in order to accommodate glazing and sugaring requirements—a point easily obtained through the partial hydrogenation of the fats (Brien, 2004). Though those benefits make the

process appealing to food manufacturers, partial hydrogenation also produces nutritionally undesirable trans-fatty acids (Stier, 2006).

Trans fats of natural origin and trans fats of vegetable origin but so far no scientific consensus has been found. Two Canadian studies, that received funding by the Alberta Livestock and Meat Agency and the Dairy Farmers of Canada (Lamarche *et al.*, 2010) have shown that the natural trans-fat, found in beef and dairy products, may have an opposite health effect and could actually be beneficial compared to hydrogenated vegetable shortening, or a mixture of pork lard and soy fat, by lowering total and LDL cholesterol and triglyceride levels (Proctor *et al.*, 2010). In lack of recognized evidence and scientific agreement, nutritional authorities consider all trans fats as equally harmful for health (Pierce *et al.*, 2010).

Doell *et al.*, 2012 stated trans fat intake has significantly decreased in the US as a result of efforts to increase awareness of its health effects, Nutrition Facts label changes, industry efforts to voluntarily reformulate foods, and some state and local governments' restriction of its use in restaurants and other food service outlets. However, on average Americans still consume 1.3 grams (0.6 per cent of energy) of artificial Trans-fat each day.

Eating good fats in place of saturated fat lowers the “bad” LDL cholesterol, and it improves the ratio of total cholesterol to “good” HDL cholesterol, lowering the risk of heart disease. Eating good fats in place of saturated fat can also help prevent insulin resistance, a precursor to diabetes (Riserus *et al.*, 2009).

Most cafeterias and fast-food places offer healthy choices that are also tasty, like grilled chicken or salads. Be mindful of portion sizes and high fat add-ons, like dressings, sauces or cheese. Choose meals that contain a balance of lean proteins, fruits and vegetables, and whole grains. That's why a turkey sandwich on whole wheat with lettuce and tomato is a better choice than a cheeseburger on a white bun. The portion sizes of American foods have increased over the past few decades so that we are now eating way more than we need. The average size of a hamburger in the 1950's was just 1.5 ounces, compared with today's hamburgers, which weigh in at eight ounces or more (Mary, 2012).

C. TRANS FATS - HEALTH REGULATIONS AND WAYS TO REDUCE TRANS FAT

In recent years, issues regarding safety and wellness of dietary oils and fats have received major attention. This is particularly so in the case of structured modified fats, which are being used extensively to meet the product – specific demand primarily in bakery industry as shortenings, cocoa butter substitute’s confectionary industry, and in margarine preparation as butter substitute.

In accordance to Puligundla *et al.*, 2012 during modification stages, native oils and fats are subjected to different physical and chemical treatments such as fractionation, hydrogenation and interesterification in order to produce fat with desirable physical as well as functional properties. Numerous studies have demonstrated the adverse effect of these modified oils and fats, especially trans fatty acids, using animal.

Most people don’t get enough of these healthful unsaturated fats each day. No strict guidelines have been published regarding their intake. The traditional Greek diet, for example, gets up to 30 per cent of its calories from monosaturated fats, mostly from olive oil. For polyunsaturated fats, the American Heart Association has set eight to ten per cent of calories as a prudent target; there is evidence, though, that eating more polyunsaturated fat – on the order of 15 per cent of daily calories in place of saturated fat can lower heart risk (Micha and Mozaffarian., 2010).

The nurse health study found that women who ate a spoon of stick margarine a day had a 50 per cent greater risk of heart disease (Shai *et al.*, 2008).

A 2006 labelling law that forced food companies to list trans fats on the label has reduced trans-fat levels in the united states food supply, since many food makers have switched to using trans free oils and fats in their products. And recent study from the centers for disease control and prevention finds that Americans blood levels of trans fat dropped 58 per cent from 2000-2009 evidence that the labelling law has had its desired effect (vesper *et al.*, 2012).

Some experts had feared that food makers would replace trans-fat with saturated fat, diminishing any health benefits from the switch. But 2010 survey of 83 major brand grocery store products and restaurants dishes offers encouraging news:

when most of these food makers reformulated their products, they cut back on trans-fat without increasing saturated fat (Jacobson *et al.*, 2010).

According to some experts, replacing artificial trans fats with healthier oils, such as olive oil or canola oil, could save 30,000 lives per year in the United states (American Medical Association, 2008).

In January 2008, The Food and Drug Administration required that nutrition label on food include information about trans-fat content. The Food and Drug Administration estimates that trans-fat labelling could save up to 500 lives states by reducing the incidence of cardio vascular disease.

The two main arguments for trans-fat bans are consequentiality in form according to the first argument, trans fat bans are justified in order to promote an important social good, public health. Trans fat bans can promote public health by reducing the consumption of trans fats, which could reduce the incidence and severity of cardio vascular disease. According to one estimate, totally eliminating artificial trans-fat from the food supply in the United States would save 50,000 lives per year (Center for science and the public interest, 2012).

Trans fat bans are cut from the same cloth as other laws that safeguard the food supply, such as quality and safety standards for restaurants and food manufacturers, regulation of food additives, and products labelling requirements (Fortin, 2009).

Niederdeppe and Frosch, 2009 the strength of the public health argument depends on the empirical premise that trans-fat bans will promote public health. While this assertion is highly plausible, given what we know about the adverse effect of trans fats on the cardio vascular system, it is not indubitable because trans-fat have been in effect for only a few years, very little is known about how they impact public health. One study has shown that mandatory labelling of products with trans fats reduces consumption of trans fat, but there have been no studies on the effects of trans fat bans.

The second argument for trans-fat bans is an economic one. According to this line of thoughts, bans on artificial trans-fat can save potentially billions of dollars in health care and related costs by reducing prevalence and severity of cardio vascular disease (Ban trans fats, 2009).

The trans-fat bans enacted by state and local government may meet three of these conditions. Trans fat bans probably may be effective because as mentioned previously, trans fat bans may help to promote public health, though more research is needed. Trans fat ban may also meet the proportionality conditions as well, because the public health gains could outweigh adverse social impacts and other morale conditions. Because few people have special preference for artificial trans-fat, trans fats bans probably do not have a significant impact of life, culture, ethnic, or religious traditions or family values (Mello, 2009).

A better way of dealing with the trans-fat problem would be given education and product labelling a chance to work, before resorting to the extreme measures of banning trans fats. By enacting food policies that limit the freedom to choose what one eats only as an option of last resort, the government can strike a fair balance between promoting public health and protecting human freedom (Mytton *et al*, 2007).

Given that cardio vascular disease is the leading cause of death, efforts to systematically reduce or eliminate consumption of trans fat could substantially affect mortality and disease burden in the United States.

When the revised dietary guidelines for Americans was released in 2005, the department of health and human services and the department of agriculture recommended to the public that trans fat consumption be “as low as possible” (United States Department of health and human services and United States Department of Agriculture, 2005).

In addition, many food manufacturers and restaurants announced voluntary reduction or elimination of trans fat in their products and some high profile lawsuits were filed against food makers for the use of trans fat in their products, although no case has resulted in large awards for the plaintiffs (Unnevehr *et al*, 2008).

Since 2006, at least ten local governments, the state of California, and Puerto Rico have enacted bans on the use of trans fat in restaurants fare (Mello, 2009).

In accordance to wise, 2010 using a “Mock news article” experimental approach found that exposure to a public health frame in favour of banning trans fat increased support for policy actions to reduce trans fat in the United States diet whereas exposure to a business frame against banning trans fat reduced support for

such government actions wise and brewer's study provides strong evidence that framing can affect the public's willingness to support legislative action on trans fat using a rigorous research design; however, it does not provide any direct evidence on how responsibility for solving the problem is framed in actual new stories.

Declining coverage may have conveyed the message that the problem of trans fat in the United States diet has been resolved. To date, it is unclear whether the federal labelling change and state and local efforts to ban products containing trans fat had an effect on the public consumption of trans fat in foods (Albers and Borders *et al.*, 2007).

The increased risk for heart disease and related co morbidities, the U.S. Food and Drug Administration enacted legislation in 2003 requiring food manufacturers to list the trans-fat content of all foods on nutrition labels by January 2006 (Weise, 2004).

The American Heart Association has since recommended that an individual's trans-fat intake not exceed one per cent of daily caloric intake; in other words, someone who consumes 2,100 calories a day should get no more than 21 of those calories from trans-fat. Given that fat has nine calories per gram; the American Heart Association recommended that trans-fat consumption be less than two and a half grams per day (American Heart Association, 2007).

Risks associated with trans-fats have led to other policy changes as well. For example, the World Health Organization's food standards rule making body, the Codex Alimentary Commission, recommended in its proposed action plan entitled "Request for comments on draft action plan for implementation of the global strategy on diet, physical activity and health" that governments around the world phase out partially hydrogenated oils if trans-fat labelling alone does not spur significant reductions (Wassell & Young, 2007).

In December 2006, New York City became the first major municipality to adopt legislation reducing/eliminating the use of trans-fats, banning the use of all but tiny amounts of artificial trans-fats in restaurant cooking by July 1, 2007, requiring restaurants to remove all menu items with more than a half of a gram of trans-fat per serving by July 1, 2008 (MSNBC, 2006).

Consumers have become increasingly aware and concerned about the amount of fat in their diet and the types of fat that they consume. Certain frying products containing typically high levels of trans-fat are now seen as undesirable and as such are becoming less popular (McSavage & Trevisan, 2001).

3. METHODOLOGY

The methodology pertaining to the study entitled “**Awareness on trans fats and promotion of healthy food choices among selected consumers and food service operators**” is discussed under the following headings.

PHASE – I Elicit food choices and awareness on trans fats among the selected customers

PHASE – II Observation of the functional areas at the selected food service operations

PHASE – III Standardisation of trans fat free foods

PHASE – IV Promotion of healthy food choices to customers and employees

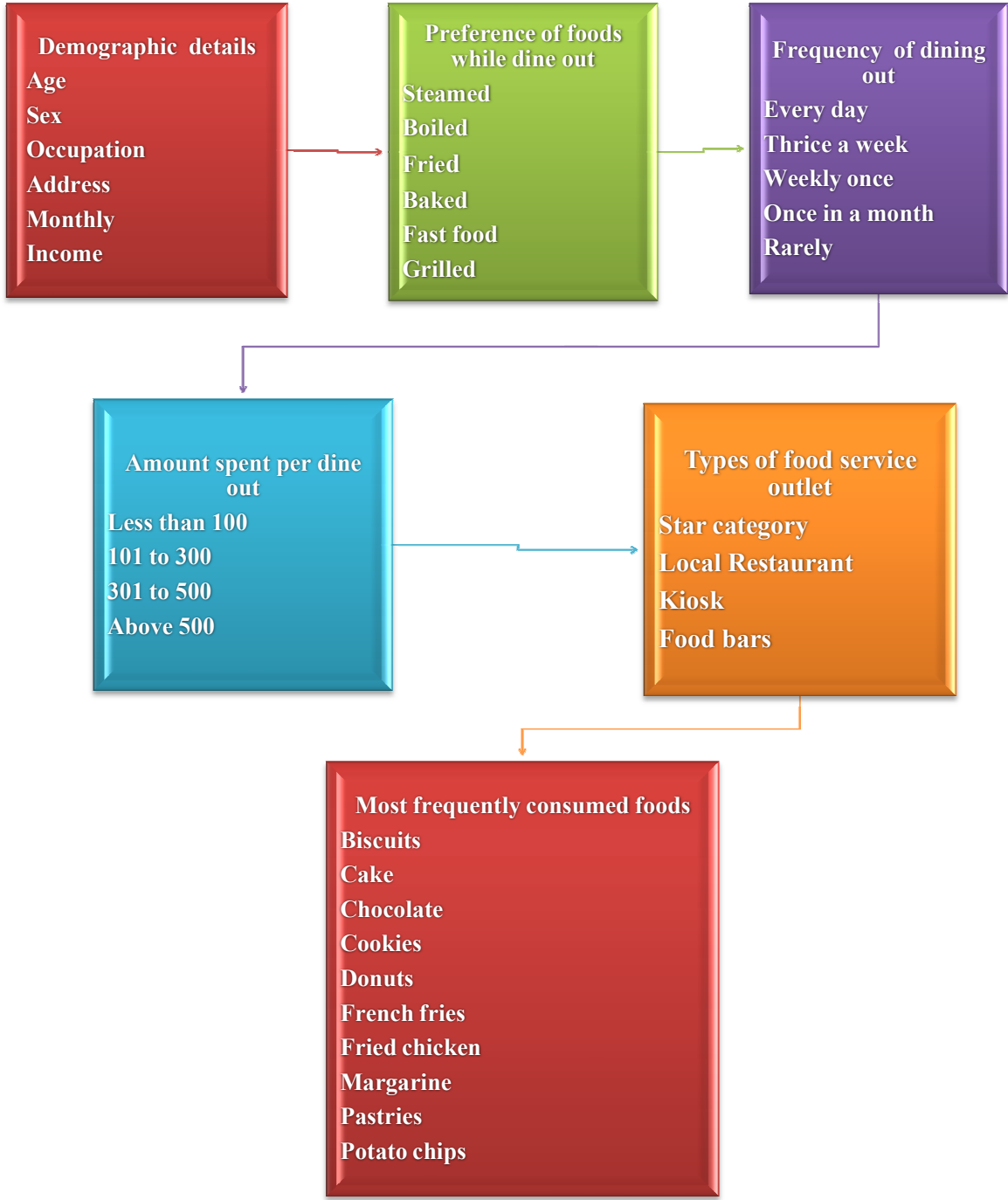
PHASE – I Elicit food choices and awareness on trans fats among the selected customers

A total of 500 customers from the selected food service operations in Coimbatore namely AKR Bakers, Donuts, Hotel Heritage Inn and Hotel Alankar Grande were identified to elicit food choices and awareness on trans fats among the selected customers by purposive sampling. A purposive sample, also commonly called a judgemental sample, is one that is selected based on the knowledge of the population and the purpose of the study. The subjects are selected because of some characteristic (Ashley, 2001)

A well designed questionnaire (Appendix I) comprising of demographic details of customers, name, age, sex, occupation, address, monthly income, food consumption details such as frequency of dining out, preference of food while dining out namely steamed, boiled, grilled, fast, fried or baked foods were elicited. The amounts spent per dine out of the customer and types of eatery visited were studied.

In order to study the awareness of the customers on trans fats, their knowledge on trans fat rich foods namely biscuits, cakes, chocolate, cookies, donuts, french fries,

PHASE I
Food choices of the customers
(N=500)



fried chicken, pastries or potato chips were elicited. The types of oils used at home were also obtained. d. The sources through which the customers were aware of trans fat through books, newspapers or media were elicited and statistically interpreted by using chi-square analysis.

In accordance to Kishore, 2005 high income and growing urbanization have also contributed to a shift in the traditional Indian food habit. High income urban dwellers seek variety in their choice of foods and spend more on international cuisine, including fast foods. Consequently, a growing number of domestic fast food outlets, home delivery, take away restaurants, and American restaurant chains, such as Kentucky Fried Chicken, Domino's Pizza, Pizza Hut, McDonald's, Baskin Robbins have mushroomed out in the last few years.

As the results of phase I, on eliciting food choices and awareness on trans fats among the selected customers revealed that the customers preferred foods that are fat rich and deep fried and as they were not aware on the effects of trans fats in fried foods, the study extended education to customers on fats and oils, quantity of fats and oils, different types of fat, trans fat and its ill effects. Awareness was given to the customers using the pamphlet, poster and power point presented which educates them about trans fat, usage of fats and oils and ill effects about trans fat (Appendix II).

PHASE – II Observation of the functional areas at the selected food service operations

A total of four commercial food service operations comprising a two star Hotel category Hotel Alankar Grande, Hotel Heritage Inn and two bakery units A.K.R Bakers and Donuts were selected at Coimbatore by judgement sampling. The selected food service organisations were observed at various functional areas with a checklist to elicit details on the selected food service operations (Appendix III).

A well designed questionnaire including components such as name, communication details, type of ownership, category of recipes namely starters; main dishes, side dishes, baked items and ice creams were elicited with the cost. The details observed in the functional areas of the selected food service operations are as follows:

Observation at the functional areas of the selected food service operation



Food preparation area

Plate I



Food production area

Plate II



Food service area

Plate III

PURCHASING AREA

Purchasing good food is the basis for preparation and serving meal to the customers (Sethi, 2007), information on how the procurement of raw materials were noted in person. The method of purchasing, frequency of purchase of the raw materials, the quality check of the ingredients, using perishable foods within two days of purchase. When used fresh, use of packaged foods should be first in first out so that older packages are used first were observed in purchasing area.

RECEIVING AREA

In receiving area, the delivery note is checked with copy of the order placed, counts, weighs or volume are checked to tally with the amount of various items on the delivery note, the qualities of ingredients perishable, semi perishable, non perishable were checked and hygiene and sanitation of the area and employees were observed

STORAGE AREA

The types of storage like refrigerator or freezer storage is necessary for meat, dairy products, eggs, and cut fruits and vegetables. Then the storage of food is freeze on the day of purchase, use within a month, defrosts thoroughly before use and once opened use within three days were also elicited. In storage area it was checked whether all the foods and paper supplies are stored six to eight inches off the floor, the foods are labelled with name and received data, the foods are stored in containers with tight fitting lid with a labelled common name, the first in and first out was checked, there is no leakage or bulging in bags and cans, whether the surface is clean, chemicals are clearly labelled and stored away from food and food related supplies, and do they have regular cleaning schedule, sanitation and hygiene was maintained, storage adequacy at dry and cold storage areas, prevention of cross contamination was checked in storage area.

PRE PREPARATION AREA

In pre-preparation area rinsing and sanitising of the utensils before every use, the cleaning and washing of the pre cut food items, the use of clean equipments for cutting and also for placing the cut items were noted. Furthermore the importance on thawing of frozen food to conserve time and energy were seen. On the personnel front, their washing of hands before handling the food, wearing clean clothes and putting on

an apron was noted; hygiene and sanitation of both the personnel and work area were closely observed.

PRODUCTION AREA

Foods are prepared in small batches to limit the temperature danger zone, clean reusable towel are used for cleaning the equipment, food is handled using suitable utensil, tasting the prepared food is done using proper procedure.

Usage of trans fat in food products, amount of fat, type of oil used and type of fuel used like wood, and coal, liquid fuel like gasoline, fuel oil were obtained. The prepared food like fresh, washed, and dried fruits and vegetables, packed trays or plastic bags are used or not and if they have used for which purpose were elicited. The foods prepared were given separately as starters like french fries and potato chips, main dish like pastries, baked foods like donuts, biscuits, cookies, and cakes, the tandoor item like fried chicken, and chocolates all these foods are rich sources of trans fat were elicited. The production process for the above selected foods were studied the ingredients and method of production were elicited. The oils used in the establishment and the amount of fat used in the product were elicited.

FOOD SERVICE AREA

In service area, it was observed food is heated to the required safe internal temperature before placing in hot holding, hot holding unit is pre-heated before hot food is placed in unit, food is protected from contamination and type of service of food namely self-service, waiter service, buffet service, or door delivery adopted by the food service organisation were brought out.

WASTE DISPOSAL AREA

The mode of disposal of waste products like incinerators, bins, and whether it is bio-degradable or non-biodegradable were elicited. In garbage disposal certain activities were observed such as cleanliness of kitchen garbage cans, loading dock and area around dumpster.

SALES PROMOTION TECHNIQUES

The promotion of products and services with marketing and advertising tools like newspaper, media and catalogue were elicited.

PHASE II

Observation of the functional areas at the selected food service operations

PURCHASING AREA

Check list

Purchasing

- ✓ Method of purchasing
- ✓ Frequency of purchase of the raw materials either weekly, monthly or yearly
- ✓ The quality check of the ingredients
- ✓ Using perishable foods within two days of purchase (if used fresh)
- ✓ Rotating use of packaged foods so that older packages are used first.

RECEIVING AREA

Check list

Receiving

- ✓ Check the delivery note is checked with copy of the order placed
- ✓ Count, weighs or volume are checked to tally with the amount of various items on the delivery note
- ✓ Check the qualities of all ingredients.
- ✓ Hygiene and sanitation of the area and employees

STORAGE AREA

Check list

- ✓ All food and paper supplies are stored 6 to 8 inches off the floor.
- ✓ All food is labelled with name and received date.
- ✓ Open bags of food are stored in containers with tight fitting lids and labelled with common name.
- ✓ The FIFO (First in First Out) method of inventory management is used.
- ✓ There is no bulging or leaking of canned foods.
- ✓ All food surfaces are clean.
- ✓ Chemicals are clearly labelled and stored away from food and food-related supplies.
- ✓ Maintenance of sanitation and hygiene.
- ✓ Adequacy of storage at dry and cold storage areas
- ✓ Prevention of cross contamination in storage area.
- ✓ Regular cleaning schedule for all food surfaces.

PRE-PREPARATION AREA

Check list

- ✓ Wash the utensils, rinsed and sanitised before every use
- ✓ Thaw food before use
- ✓ Cut the food products, rinsed before cutting
- ✓ The pre cut foods are put in a clean utensil and at proper storage temperature.

PRODUCTION AREA

Check list

- ✓ Evaluation of foods with proper procedure
- ✓ Foods handled using suitable utensils
- ✓ Prepare food in small batches to limit the temperature danger zone
- ✓ Use of clean, reusable towel and sanitising equipment
- ✓ Reuse of oil
- ✓ Usage of Transfat in food products
- ✓ Amount and type of fat and oils

FOOD SERVICE AREA

Check list

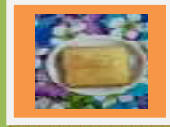
- ✓ Foods are heated to the required, safe internal temperature before placing in hot holding
- ✓ Preheating of hot holding unit before hot food is placed in the unit
- ✓ Food is protected from contamination
- ✓ Type of service
- ✓ Hygiene and sanitation at the service area



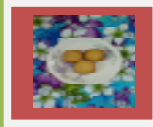
PHASE III Standardisation of trans fat free recipes

An unhealthy substance also known as trans fatty acids, is made through the chemical process of hydrogenation of oils. Hydrogenation solidifies liquid oils and increases the shelf life and the flavour stability of oils and food that contain those (Michael *et al.*, 2008). The ten commonly consumed and most preferred foods by the customers with trans fat like donuts, biscuits, pastries, chocolate, cakes, french fries, fried chicken, cookies and potato chips were chosen the procedure adopted for production were extracted. And these recipes were reformulated without the addition of trans fat to make trans fat free recipes. All the recipes were standardised by using olive oil instead of vanaspathi, margarine or butter. These procedures were adopted and the products were standardised and was statistically interpreted using the student‘t’ to find the difference the nutritive value for energy and fat of the recipes.

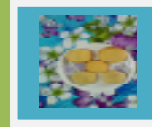
Most preferred foods by customers



Cakes



Biscuits



Cookie



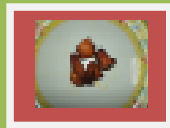
Chocolate



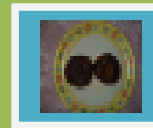
Potato chips



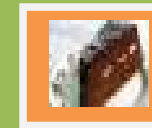
French fries



Fried chicken



Donuts



Pastries

General ways to reduce trans fat

- ❖ Do not use partially hydrogenated vegetable oil
- ❖ Use oil with antioxidants vitamin E,D,A
- ❖ Avoid reusing of oil
- ❖ Use good cooking oil like olive oil, fish oil, corn oil and refined vegetable oils.
- ❖ Use 0.5 gm of fat per serving not more than 0.5.
- ❖ Replace butter with a margarine spread or a dairy blend

National Heart Foundation, 2009

STANDARDISATION OF THE RECIPES



Olive oil at the frying temperature of 208°C

Plate IV



Frying process of french fries

Plate V



Preparation of biscuits

Plate VI



Baking in the oven

Plate VII

SENSORY EVALUATION OF THE RECIPES



Biscuits

Plate VIII



Cookies

Plate IX

For the sensory evaluation, a group of 20 women who gave their consent formed the panel. Information on the study, preparation method and scoring procedure were outlined to the panel members. The recipes were evaluated based on the sensory qualities like appearance, colour, flavour, texture and taste. Three trials were conducted and triplicate scores were taken and consolidated to get the mean values. It was found that the recipes prepared from olive oil had the best score and the score for the sensory evaluation for the trans fat free recipes were analysed for mean and standard deviation (Appendix IV).

PHASE IV Promotion of healthy food choices to customers and employees

The employees and customers were schooled with the help of flash cards, posters, power point presentation which includes awareness on general information on fats and oils, classification of fats and oils, amount and usage of fats and oils, trans fat and trans fat products and ill effects on the usage of trans fat. In each hotel there were two sessions conducted for half an hour with 30 employees depending upon shift works and imparting knowledge mainly focusing on trans fat. In addition, the reformulated recipes were also demonstrated, which brought the ways of reducing trans fat in foods and this is a healthier option (Appendix V).

4. RESULTS AND DISCUSSION

The results for the study “Awareness on trans fat and promotion of healthy food choices among selected consumers and food service operators” are discussed in the following headings.

- A. Information elicited from the selected customers**
- B. Data from selected food service operations.**
- C. Details of food production carried out**
- D. Details of employees in the selected food service operation**
- E. Evaluation on trans fat free recipes**
- F. Mean score for the sensory evaluation of trans fat free recipes**

A. Information elicited from the selected customers

i. Age wise distribution of the selected customers

Table I reveals the age wise distribution of the selected customers

TABLE I
AGE WISE DISTRIBUTION OF THE SELECTED CUSTOMERS

N=500

Age in years	Number	Percent
0-6	Nil	Nil
7-12	3	0.6
13-20	123	24.6
21-39	172	34.4
40-60	189	37.8
61-79	13	2.6

The details on age wise distribution of the selected customers reveal that 37.8 per cent of the customers ranged between 40 and 64 years followed by 21 to 39 years (34.4 per cent) and 24.6 per cent were 13 to 20 year old. The researchers found that 25 per cent of adults reported eating fast food. The study found that fast food provided

greater than 33 per cent of total calorie intake and found a positive association between fast-food consumption and overweight status (Bowman *et al*, 2004).

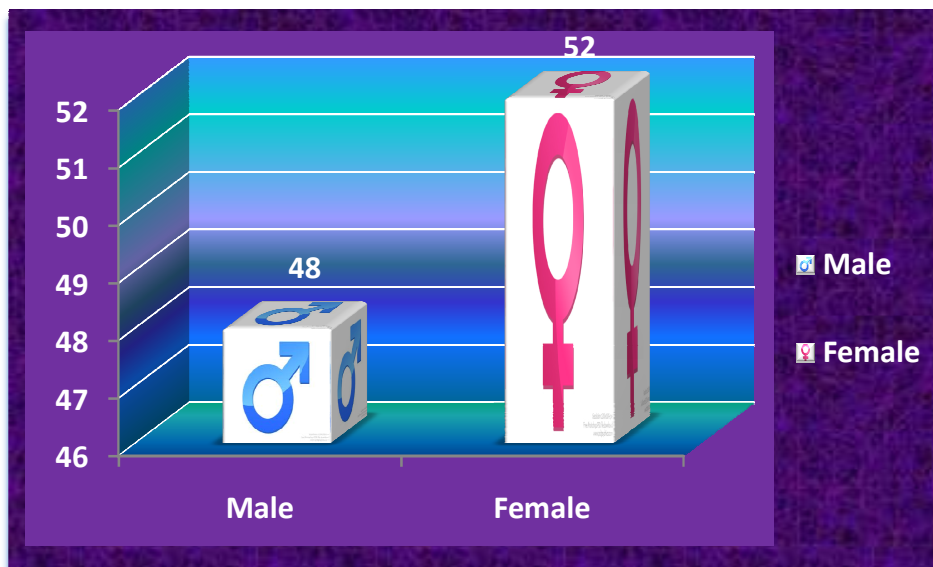
ii. Gender wise distribution of selected customers

Figure I discuss the gender wise distribution of selected customers

FIGURE I

GENDER WISE DISTRIBUTION OF SELECTED CUSTOMERS

N=500



In accordance to the study by Mancino *et al*, 2007 was observed that 52 per cent of the customers were females. It was found that low-income nonworking women spent the most time cooking per day (71 minutes) and that with increasing income and working time women spent less time cooking (38 minutes for high income full-time working women).

iii. Details of occupation of the selected customers

Table II predicts that details of occupation of the selected customers

TABLE II

DETAILS OF OCCUPATION OF THE SELECTED CUSTOMERS

N=500

Occupation	Number	Percent
Student	133	26.6
Homemakers	45	9
Self employed	46	9.2
Teacher	38	7.6
Accountant	21	4.2
Business	117	23.4
Marketing	55	11
Daily Labour	45	9

From the 500 selected customers, 26.6 per cent were students with more frequent dine outs since students prefer dine out with their friends and consume more junk and fast foods. Business men were found to have more dine outs with 23.4 per cent revealing the nature of work and movement to many places. Nine per cent were homemakers and 11 percent were the business men involved in marketing business and private business.

According to Paeratakul *et al.*, 2003 studies have found that younger adults eat away from home more frequently, although the proportion is lower among children under ten. There is evidence that men eat away from home more than women. The findings on ethnicity are mixed, with one study finding that ethnic minorities eat away from home more often, and another that there are similar rates. There are also inconsistent higher incomes, and another finding less.

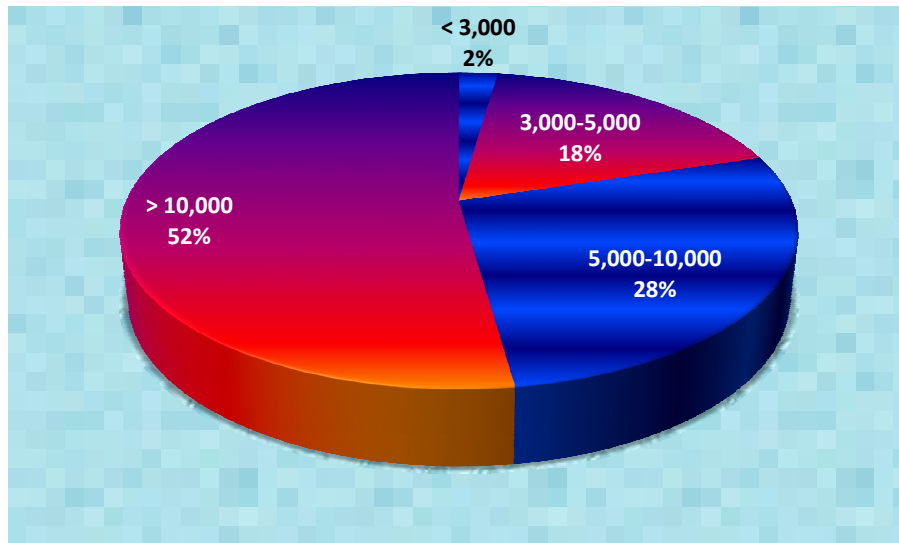
iv. Income range of the selected customers

Figure II reveals the income range of the selected customers

FIGURE II

INCOME RANGE OF THE SELECTED CUSTOMERS

N=500



HUDCO Classification, 2003

The customers with higher income had more frequent dine outs to the tune of 52.2 per cent. More amount of disposable income usually tends to the leisure and entertainment. Majority of the customers were with an income above 10,000 rupees per month.

Food consumption pattern is the most important factor explaining is the level of disposable income. It also increases the amount of calories consumed with rising income, but the share of animal products in overall diets also tends to rise. However, the studies with a wide range of countries at various income and consumption levels are not very strong variants and leaves room for additional explanatory factors like culture, religion and possible lifestyle choices (Reusswig *et al.*, 2004).

v. Frequency of dining out

Table III depicts that frequency of dining out by the selected customers

TABLE III

FREQUENCY OF DINING OUT

N=500

Frequency of dining out	Number	Percent	Chi-Square
Every day	29	5.8	31.475**
Thrice a week	43	8.6	
Weekly once	151	30.2	
Once in a month	244	48.8	
Rarely	33	6.6	

** - Significant at one per cent level

The details on the frequency of dine out, showed that 5.8 percent of the people dined out daily and they were the students. It is evident from this table though majority of the customer dined out once in a month (48.8 per cent) and it is alarming to know that the age group of adolescents and adulthood (30.2 per cent) had the habit of eating out once in a week. There was one per cent significance observed in the frequency of dine out.

According to Nielsen, 2010 the majority of global consumers (44 per cent) dine out between one and three times per week, as many as 38 per cent only enjoy a meal out-of-home once a month or less. Consumers in the Asia Pacific markets dine out more frequently than consumers in other regions, particularly in Hong Kong, where nearly one-third (31 per cent) say they eat at restaurants every day or more than once a day.

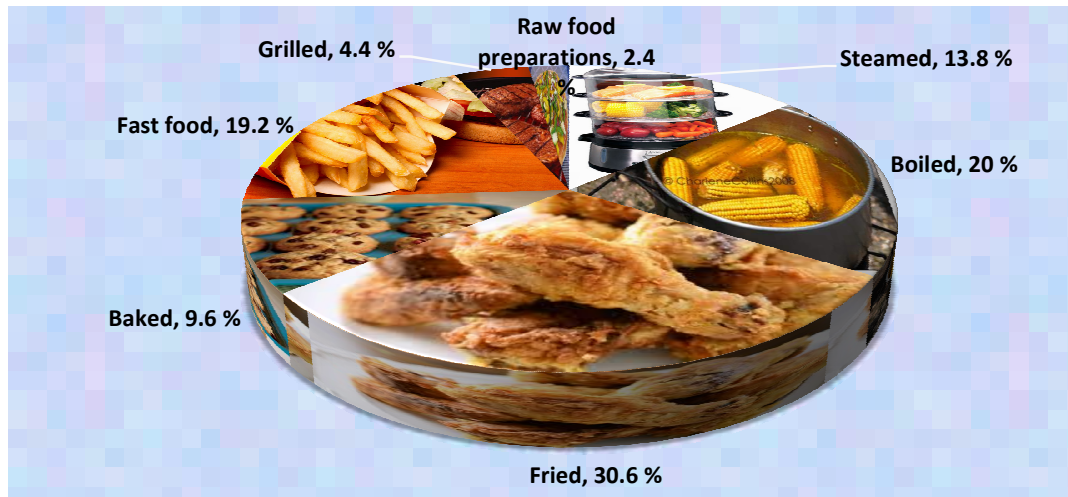
vi. Preference of foods while dining out

Figure III discusses the preference of food while dining out

FIGURE III

PREFERENCE OF FOODS WHILE DINING OUT

N=500



It was found that 30.6 per cent of the customers preferred fried foods like fried chicken and potato chips followed by 19.2 per cent fast foods like fried rice and chat items and only 2.4 per cent preferred raw food preparation such as salads.

This finding correlates with the findings of Siong (2002) which reveals that more families dine out and there was increased consumption of fried foods while dine out.

vii. Amount spent per dine out

Table IV shows that amount spent per dine out by the selected customers.

**TABLE IV
AMOUNT SPENT PER DINE OUT**

N=500

Amount in ₹	Number	Percent	Chi-square
Less than 100	224	44.8	36.052**
101-300	204	40.8	
301-500	50	10	
Above 500	22	4.4	

** - Significant at one per cent level

It was observed that 44.8 per cent customers spent less than 100 per dine out for the reason that the consumption at road side eateries and restaurants that provide variety of foods at low cost, followed by 40.8 percent spent from within 300 per dining out. There was one per cent significant level seen in the dine amount spent per dine out.

Eating out in India is sizzling-hot value, with budget restaurant meals for as little as ₹ 40 (even less at the more basic street eateries), and usually from around double that for a satiating midrange restaurant feed. At the more suave urban restaurants, main dishes generally hover between ₹ 150 and ₹ 350 to which you'll need to add the cost of side dishes, such as rice, and (usually) a tax of 10 per cent to 12.5 per cent.

viii. Type of eatery visited

Table V projects that type of eatery visited by the selected customers

TABLE V
TYPE OF EATERY VISITED

N=500

Eatery visited	Number	Percent	Chi-square
Star category	37	7.4	94.27**
Restaurant	395	79	
Kiosk	43	8.6	
Food bars	25	5	

** - Significant at one per cent level

This table represents that though people visit star category hotels, 79 per cent customers were found eating out in local restaurants because of accessibility and mushrooming of restaurants in Coimbatore. There was one per cent significance level found in the types of eatery visited.

It may not be surprising to that one-third of global consumers choose a restaurant based on the type of cuisine after all, food is the reason for eating out what may be more intriguing is that more than one quarter 27 per cent prefer their local cuisine over international fare. A Nielsen global survey of Internet users in 52 markets across Europe, Asia Pacific, the Americans and the Middle East also revealed that globally, reasonably priced food is consumers' second most important consideration 24 per cent, though diners in Japan, Estonia, the Netherlands, Portugal, the Philippines, Belgium, Malaysia and Italy say that prices are actually the most important factor in their restaurant choice.

ix. Types of oils used

Table VI shows that types of oils used by customers at home

TABLE VI
TYPES OF OILS USED

N=500

Types of oil used	Number	Percent	Chi-square
Coconut oil	10	2	41.68**
Corn oil	0	0	
Groundnut oil	30	6	
Olive oil	9	1.8	
Palm oil	15	3	
Safflower oil	20	4	
Soybean oil	3	0.6	
Sunflower refined oil	398	79.6	
Vanaspathi	15	3	

** - Significant at one per cent level

This table predicts that 79.6 per cent used sunflower refined oil in their home for cooking followed by very minimal usage of groundnut oil were six per cent, four percent used safflower oil and three per cent were using vanaspathi. Most of the customers are unaware about the corn oil. There was one per cent significant level found in the types of oils used by customers.

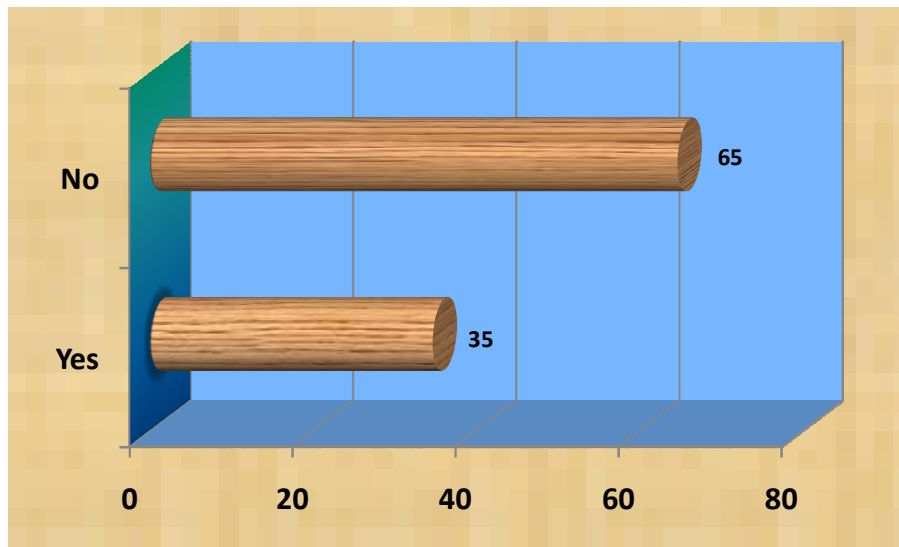
x. Awareness of trans fats

Figure IV reveal that awareness of trans fats by the customer

FIGURE IV

AWARENESS OF TRANS FATS

N=500



Trans fat is through the chemical process of hydrogenation of oils. Hydrogenation solidifies liquid oils and food that contain them and increase the shelf life of the product (Pfeuffer, 2006). 65 per cent of the customers were not aware of trans fat and only 35 per cent were aware of trans fats.

In 2004 and 2005, aware that the Food and Drug Administration had cautioned against the consumption of trans fat, plaintiff was trying to avoid products containing such fat. When he purchased food at the KFC in Northeast Washington, D.C., he was unaware that some of it was prepared with trans fat. Some food service operation did not display any warning or disclaimer informing customers of the presence of trans fat in its food (Hoyte, 2006).

xi. Information on trans fats

Table VII predicts that information on trans fats

**TABLE VII
INFORMATION ON TRANS FATS**

N=175

S.No	Source	Number	Percent	Chi-square
1.	Books	41	23.43	9.49*
2.	News paper	40	22.86	
3.	Media	79	45.14	
4.	Magazine	15	8.6	

* - Significant at five per cent level

This table shows the awareness of trans fat among customers was less. Some were aware about trans fat through sources such as the media (45.14 per cent) from advertisements followed by books (23.4 percent) as most of the students studied about trans fat from their education. There was five per cent significant level found in the information on trans fats by customers.

xii. Awareness on high fat foods

Table VIII depicts that the fast food and convenience foods are high in fat.

**TABLE VIII
AWARENESS ON HIGH FAT FOODS**

N=500

Reason	Number	Percent	Chi-square
Make the food cook faster	63	12.6	26.13**
Make the food taste good	378	75.6	
Increase the nutritional value of the food	35	7	
Easier to digest	24	4.8	

* - Significant at one level

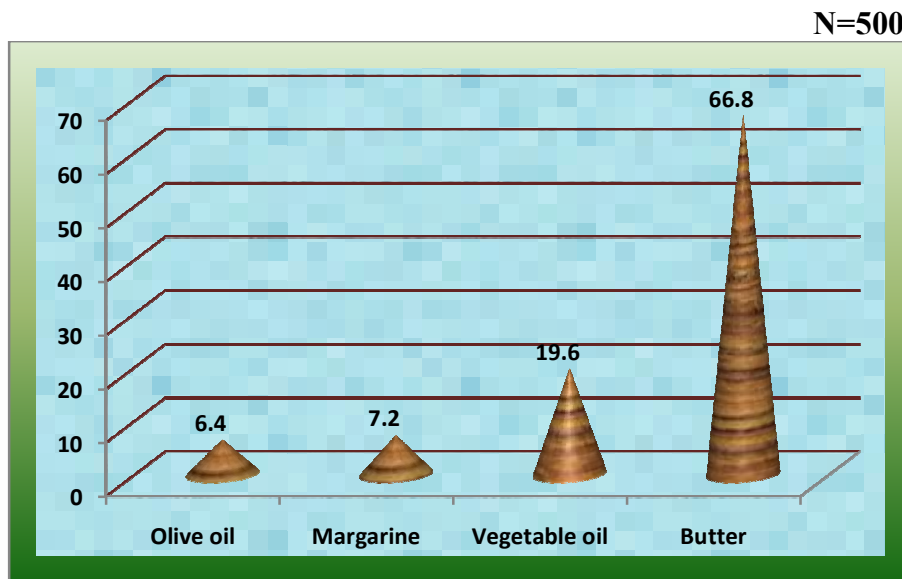
This table reveals that people feel that fast foods and convenience foods are high in fats because of the taste (75.6 percent). There was one per cent significant

level found in the awareness on high fat foods by customers. In a study by researchers tried to determine the most valued when eating out in terms of convenience, taste, and nutrition. The researchers tried to find out whether or not participants want healthy food when they eat out and if they apply their health knowledge to the food that they eat (Stewart et al., 2006).

xiii. The most preferred trans fat containing foods by the customers

Figure V shows that the selection of most preferred trans-fat containing foods by the customers

FIGURE V
THE MOST PREFERRED TRANS FAT CONTAINING FATS BY THE CUSTOMERS



This figure show the view on trans fat depicts the customers conveyed that butter contain higher concentration of trans fat (66.8 per cent), followed by vegetable oil (19.6 per cent).

In the 1990s, the average American was eating about six gram of trans fats a day, most of that from partially hydrogenated oils found in commercially prepared baked goods, margarines, snack foods, processed foods, French fries, and other fried foods prepared in restaurants and fast food franchises. (Allison *et al.*, 1999) Ideally that should be less than two grams a day, and zero from partially hydrogenated oils is best.

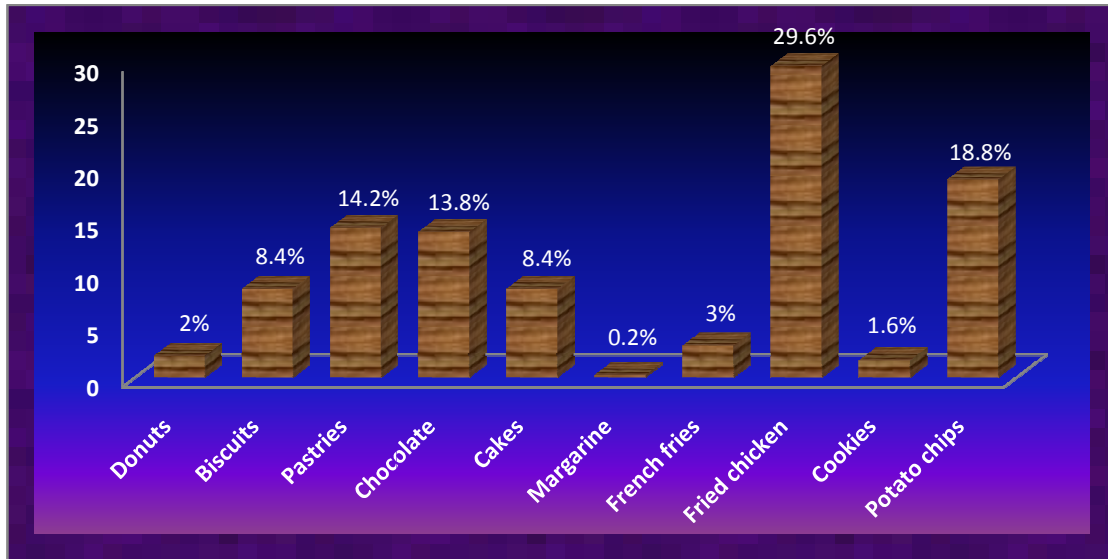
xiv. Foods most preferred by the customers

Figure VI presents the foods preferred by the customers

FIGURE VI

FOODS MOST PREFERRED BY THE CUSTOMERS

N=500



This figure depicts that nearly 29.6 per cent of the customers consumed fried chicken, followed by 18.8 per cent of customers for potato chips. Research Dynamics, 2009 stated that Chick-Fil-A (41 per cent) and KFC (27 per cent) were named by a combined 69 per cent of survey participants as the fast-food restaurant at which they most often purchase fried chicken.

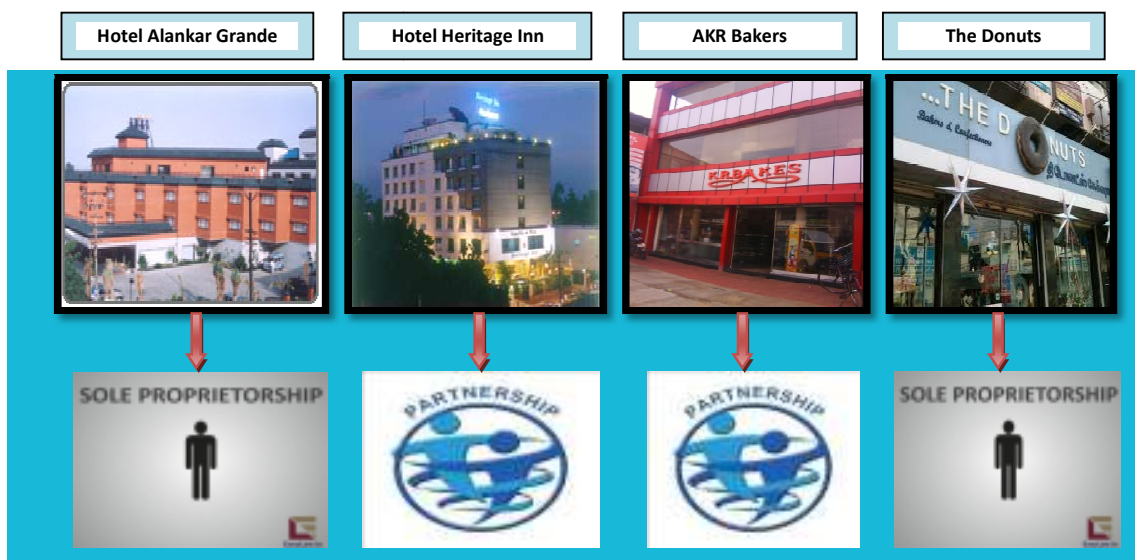
B. Data from selected food service operations

i. Types of the food service operation

Figure VII gives the basic information of the food service operation such as the type of ownership namely sole proprietorship, partnership, joint venture, trust or charity, government.

Figure VII

Types of the food service operation



The Alankar Grande and AKR bakers were with sole proprietorship form of organisation “sole proprietorship is a form of business organisation in which an individual introduces his own capital, uses his own skills and intelligence in the management of its affairs and is solely responsible for the results of its operation” (Bhushan, 2006).

Hotel Heritage Inn and The Donuts were with partnership form of organisation “A partnership is an association of two or more persons to carry on as co-owners a business for profit” (Angela, 2012).

ii. Details of employees in the food service organisations

Table IX reveals that number of employees in the food service operation

Table IX

Details of employees in the food service organisations

Number of employees	Hotel Alankar Grande (N= 160)	Hotel Heritage Inn (N= 95)	The Donuts (N= 50)	A.K.R Bakers (N= 60)
Male	150	70	30	40
Female	10	25	20	20

Employees play a major role in food service operation as the service has to be provided round the clock and customers choice is varied. Hotel Alankar Grande had the maximum employees of male and female in the ratio of 1:15. In Bakery AKR bakers had maximum employees in the ratio of 1:2.

Food workers play a critical role in ensuring food safety, those who do not practice proper personal hygiene, including hand washing at the appropriate times and using appropriate methods, can contaminate food (The FDA Report on the Occurrence of Food borne Illness Risk Factors in Selected Institutional Foodservice, Restaurant, and Retail Food Store Facility Types, 2009) identified risk practices and behaviours that contributed to food borne illnesses: improper holding/time and temperature; poor personal hygiene; and contaminated equipment/prevention of contamination. Studies have found that food safety training is positively associated with self-reported changes in food safety practices (Clayton *et al.*, 2002).

C. Details of food production carried out

i. Frequency of purchase of the raw materials

Table X reveals the frequency of purchase of the raw materials in food service establishment.

Table X
Frequency of purchase of the raw materials

Purchase of Raw Materials	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	A.K.R Bakers
Daily (Perishable)	✓	✓	✓	✓
Weekly (Semi perishable)	✓	✓	✓	✓
Monthly once (Non Perishable)	✓	✓	✓	✓
Yearly (Non Perishable)	X	X	X	X

The raw materials which were perishable foods like milk and meat were purchased daily, semi perishable foods like vegetables and fruits are purchased weekly and non perishable foods like cereals and pulses were purchased once in a month by all the four food service operations and none of the food service operation had the option of storing foods for a year. In accordance to McDonald's Corporation, 2008; the raw materials are the ingredients that will go into producing the finished product. For McDonald's, these will include the buns, beef patties, paper cups, salad ingredients and packaging. These are delivered to the restaurants between three and

five times a week. The raw materials arrive together on one lorry with three sections so that each product can be stored at a suitable temperature.

ii. Type of storage in food service operation

The type of storage in different food service operation is given in table XI.

Table XI
Type of storage in food service operation

Type of storage	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	A.K.R Bakers
Dry storage (20-25°C)	✓	✓	✓	✓
Cold storage (0-3°C)	✓	X	X	✓
Refrigerator (3-10°C)	✓	✓	✓	X
Walk in cooler (>10°C)	✓	X	X	X

Food and Drug Administration, 2000 stated that the plan review for storage needs to provide adequate refrigeration facilities for the proper storage, transportation, display, and service of potentially hazardous foods. Specific refrigeration needs will be based upon the menu, number of meals, frequency of delivery, and preparation in advance of service. All refrigerators must be capable of maintaining Potentially Hazardous Foods (PHF) at 41°F or below.

All the four food service operation had appropriate storage facilities. Hotel Alankar Grande was the only hotel which had dry storage, cold storage, refrigerator and walk in cooler. AKR Bakers and Donuts had only two types of storage facilities.

iii. Duration of storage of the foods in storage area

XII table reveals duration of storage of the foods in storage area

Table XII

Duration of storage of the foods in storage area

Duration of storage of the foods in storage area	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	A.K.R Bakers
Freeze on day of purchase	X	✓	X	✓
Use within a month	X	X	✓	X
Defrost thoroughly before use	✓	X	X	X
Best before date	X	X	X	X
Usage of Prepared foods				
Yes/No	Yes	Yes	No	No

Table XIX depicts that when the food was purchased Hotel Alankar and AKR bakers freeze on the day of purchase, the Donuts use within a month and Hotel Alankar Grande defrost thoroughly before use. Hotel Alankar Grande and Heritage Inn use prepared foods like fresh, washed and dried fruits and vegetables, packed trays or plastic bags. None of the food service operation kept the food beyond the expiry date (best before date).

A wide variety of fruits and vegetables are sold at Lotus Supermarket, packaged and processed indifferent forms such as canned, bottled, pickled and dehydrated, etc. Fresh produce are packed in nets, PolyStyrene (PS) trays with shrink wrap, cartons and transparent plastic bags. The majority of the fresh produce, however, remains unpacked. These are arranged in ‘field’ containers as per product type, with price tags attached (Alastair, 2001).

iv. The factors influencing the choice of food production

This figure depicts the factors influencing the choice of food production in food service operation.

FIGURE VIII

The factors influencing the choice of food production

Factors influencing the choice of food production	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	AKR Bakers
Lowest price				
	<p style="text-align: center;">✓</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>
Special offer	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">✓</p>	<p style="text-align: center;">X</p>
	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">✓</p>	<p style="text-align: center;">X</p>
Distance	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>
	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>
Nutritional content	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>
	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>
Simple to manage	<p style="text-align: center;">X</p>	<p style="text-align: center;">✓</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">✓</p>
	<p style="text-align: center;">X</p>	<p style="text-align: center;">✓</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">✓</p>
Ease to storage	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>
	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>	<p style="text-align: center;">X</p>

The figure reveals that the factors influencing the choice of food production was simple to manage such as system's ease of use is a large influence on which system a company chooses to implement across its production and distribution chain. An easy user interface allows a larger number of employees to use the system with a greater degree of success and this reduces the potential for errors. These were informed by Hotel Heritage Inn and AKR Bakers, the choice of food production for Hotel Alankar Grande was dependent upon the price, and for Donuts it was special offers of sales promotions such as vouchers. Each organisation had their own factors influencing the choice of food production.



Results from a survey of college and university foodservice directors in an agriculture-based Midwestern state show support for purchasing from local sources, primarily to support regional economies, provide fresher and higher quality food, good public relations, availability of safer food and the ability to purchase smaller quantities. Obstacles identified were adequacy, seasonality and reliability of supply, cost, dealing with more vendors, and getting approval for new suppliers (Mary et al, 2005).

v. Foods prepared in food service operation

This figure depicts the foods prepared in the food service operation

FIGURE IX

Foods prepared in food service operation

Foods prepared	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	A.K.R Bakers
 French fries	✓	✓	X	X
 Potato chips	X	✓	✓	✓

 Pastries	X	✓	✓	✓
 Donuts	X	X	✓	✓
 Biscuits	X	X	✓	✓
 cookies	X	X	✓	✓
 Cakes	✓	✓	✓	✓
 Fried chicken	✓	✓	X	X
 Chocolate	✓	✓	X	✓

Figure IX predicts that in Hotel Alankar Grande prepare french fries, cakes, fried chicken and chocolate, Hotel Heritage inn prepare french fries, pastries, cakes,

fried chicken and chocolate, the Donuts prepare pastries, donuts, biscuits, cookies, and cakes and AKR bakes prepare pastries, donuts, biscuits, cookies, cakes and chocolate. In accordance to British Dietetic Association, 2013 trans fats are found in cakes, biscuits, hard margarines, takeaways, pastry, pies and fried foods.

vi. Types of fats used for cooking

This table presents the fat used for cooking in food service operation

Table XIII
Fats used for cooking

Fat used for cooking	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	A.K.R Bakers
Butter	✓	✓	✓	X
Ghee	✓	X	✓	X
Palm oil	X	X	X	✓
Refined oil	✓	✓	X	✓
Vanaspathi	✓	X	✓	✓

The usage of vanaspathi were more in deep fat frying instead of oils and butter also were replaced with vanaspathi . Nine different brands of commercial vanaspathi were analyzed for their various physicochemical characteristics. The fatty acid composition showed that the trans fatty acid (elaidic acid) content ranged from 5.9 to 30.0 per cent. In India, about 1.1 million metric tons of vanaspathi is being produced annually, and a large amount is utilized in confectionery, bakery and ready-to-eat foods (Jeyarani and Yella, 2005).

Refined oils were not used in Donuts, palm oil was used by AKR bakers for shallow and deep fat frying, butter is used in all the food service operation except AKR bakers, and ghee was used by Hotel Alankar and Donuts.

vii. Reuse of heated oil and ways of reuse of heated oil in cooking

The details of reuse of heated oil and ways of reuse of heated oil in cooking in the food service operation were given in table XIV.

Table XIV
Usage of heated oil in cooking

Usage of reused oil	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	A.K.R Bakers
Yes/No	Yes	No	Yes	Yes
Ways of usage of heated oil in cooking				
Deep fat fry	✓	X	✓	X
Shallow fry	X	X	X	X
Added in curries	X	X	✓	✓

The reused oil was used for deep fat fry and was added in curries by Donuts and Hotel Alankar Grande. The Hotel Heritage inn does not reuse the oils. According to Nurhan, 1996 simplest deep-fat frying was conducted in a kettle of oil heated on a stove or over an open fire. Small batches of food are immersed in hot oil and removed when fried as determined by the experience of the cook. The first real technological advance in frying was the introduction of continuous cookers. The development of continuous fryers provided a boost for the commercial development of frying.

viii. Types of fuels used in food service operation

Table XV depicts the types of fuels used in food service operation.

Table XV
Types of fuels used in food service operation

Types of fuel	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	A.K.R Bakers
Solid fuels	X	✓	X	X
Liquid fuels	X	X	X	X
Gaseous fuel	✓	✓	✓	✓
Solar	X	X	X	X
Electric	✓	✓	✓	✓

The gaseous fuel and electricity are the most widely used in all the types of fuels selected food service operation because of the technological development and availability. The recent rebound in US oil and gas production, driven by upstream technologies that are unlocking light tight oil and shale gas resources, is spurring economic activity – with less expensive gas and electricity prices giving industry a competitive edge – and steadily changing the role of North America in global energy trade (International Energy Agency, 2012). Solar energy has to be used as a renewable source in food service operations.

ix. Information provided on dishes and products

Figure predicts the information provided on dishes and products

Figure X

Information provided on dishes and products

<p>Origin AKR Bakers and the Donuts</p>	<p>Nutritional content Nil</p>	<p>Organic Nil</p>
		
<p>Certificate Nil</p>	<p>Ingredients Nil</p>	<p>Method of preparation Hotel Alankar and Heritage Inn</p>
		

This figure X reveals that AKR Bakers and Donuts provide the information only on origin in the packaging products while the rest of the information such as certificate, ingredients, nutritional content and organic was not provided. The Hotel Alankar Grande and Heritage Inn gives information on method of preparation in their menu cards.

x. Types of service in food service operations

This figure depicts the type of service in food service operations

Figure XI

Types of service in food service operations

Hotel Alankar Grande and Heritage Inn (Waiter service and Buffet service)	The Donuts (Self service)	A.K.R Bakers (Self service)
		

Figure XI depicts that Hotel Alankar Grande and Heritage had waiter service as well as buffet service, Donuts and AKR bakers had self service. Silver service usually includes serving food at the table. It is a technique of transferring food from a service dish to the guest's plate from the left. It is performed by a waiter using service forks and spoons from the diner's left. In France, this kind of service is known as service à l'anglaise.

According to Buffet Service Guidelines, 2008 buffet service refers generally to any permanent, regularly occurring, or temporary operation in a permanent retail food facility where unpackaged prepared food is displayed, served and/or prepared for the general public from counters, tables or similar equipment or installations in dining rooms, lobbies, meeting rooms, bar areas, ballrooms, and other areas not traditionally used for food preparation.

xi. Ways of waste disposal

Table XVI reveals the ways of waste disposal

Table XVI
Ways of waste disposal

Ways of waste disposal	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	A.K.R Bakers
Bins	✓	X	✓	X
Incinerators	X	✓	X	X
Pits	X	X	X	✓

Hotel Alankar and Donuts dispose their waste by bins; pits were used to throw the waste by AKR Bakers and incinerators were used for waste disposal in Hotel Heritage inn. Food waste is immediately placed in the designated bin. Waste handler collects and disposes of food waste immediately after meal times. If offsite disposal is practiced, food waste should only be stored for up to 1 day. If on site disposal, waste handler buries food waste daily. It is highly recommended that food waste should be composted.

xii. Sales Promotion Techniques

Table XVII depicts the sales promotion techniques at the selected food service operations.

Table XVII
Sales promotion techniques

Sales promotion techniques	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	A.K.R Bakers
Catalogue	✓	X	✓	X
Media	X	X	X	X
Newspaper	X	✓	✓	✓

Among the sales promotion techniques, Newspaper was the major advertising, marketing and promotion tool for products. And senses at all selected food service operation.

D. Details of employees in the selected food service operation

i. Employee benefits

Table XVIII predicts the information about employee benefits.

Table XVIII
Employee benefit

Employees benefits	Hotel Alankar Grande	Hotel Heritage Inn	The Donuts	A.K.R Bakers
Contribution to pension	X	✓	X	✓
Medical/life insurance	✓	✓	✓	✓
Employment insurance	X	✓	✓	✓
Education plans	X	X	X	✓
Housing	X	X	X	X

Recognising the excellence in the performance of employees, the organisation offers competitive pay and benefits programs designed to attract and retain people. Package of benefit choices that meet employees financial security needs at an affordable cost and to promote and maintain good health, to provide for retirement, to help meet the cost of illness and accident, and to help provide financial security for employees and beneficiaries.

According to National Insurance contributions series, 2013 benefits to the employees to allow them to carry out their duties. Medical and life insurance is provided in all the four food service operation Hotel Heritage Inn and AKR Bakers offers contribution to pension after their retirement. AKR Bakers provide all the facilities to the employees except housing.

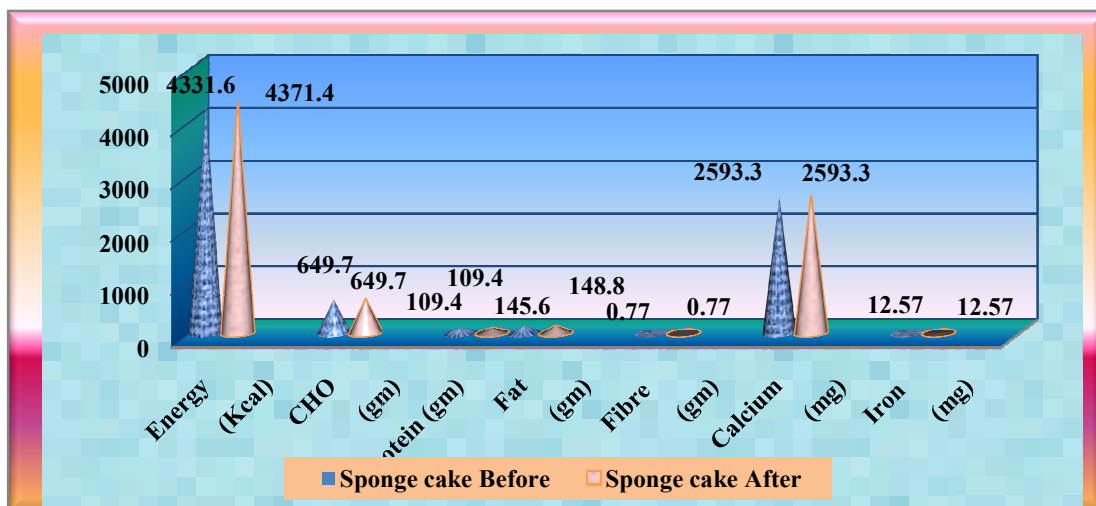
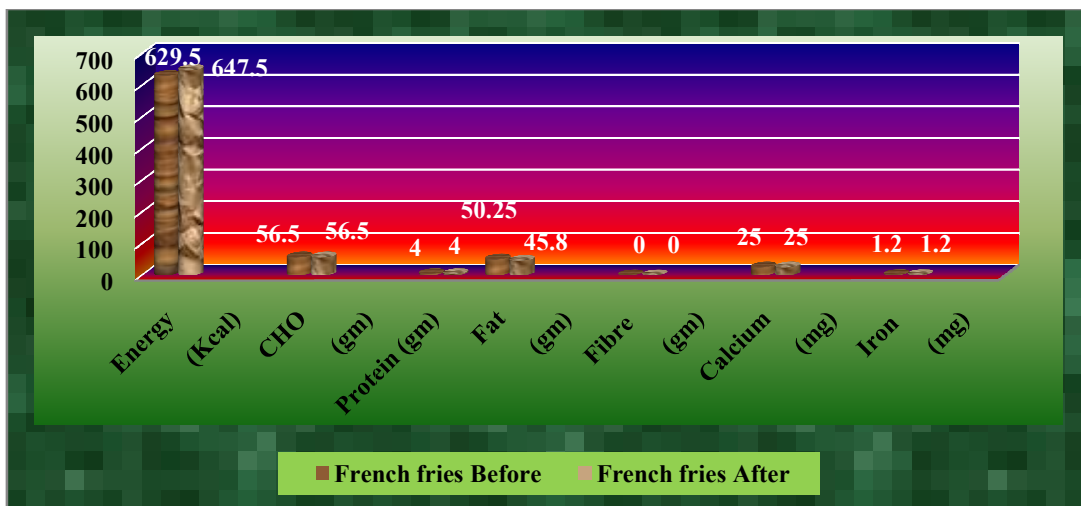
E. Evaluation on trans fat free recipes

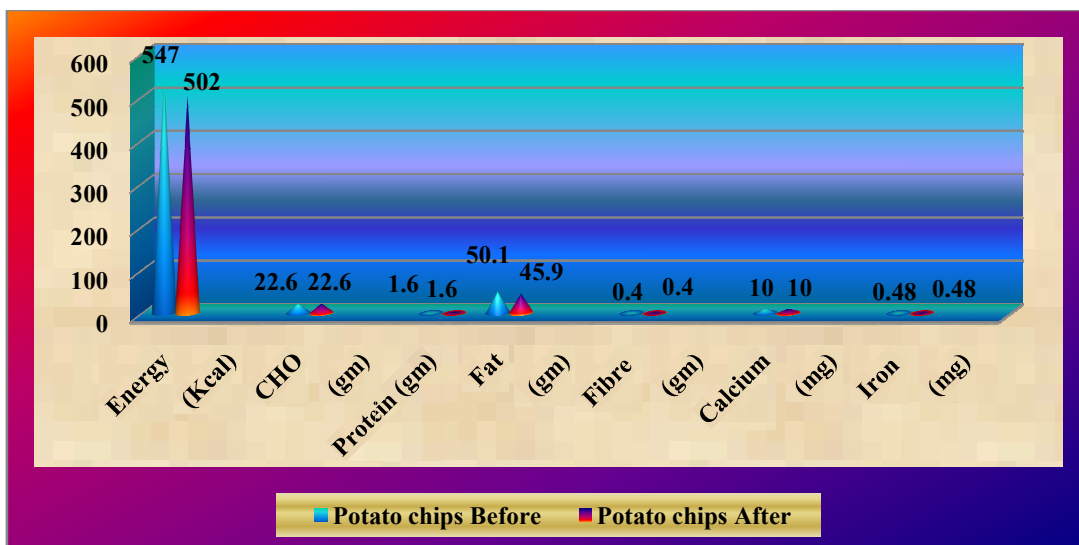
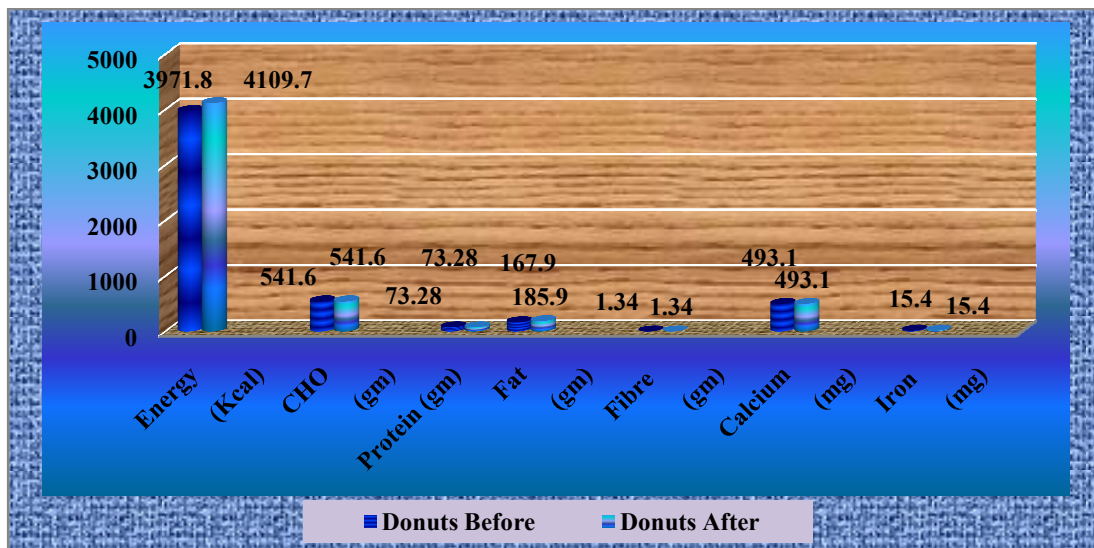
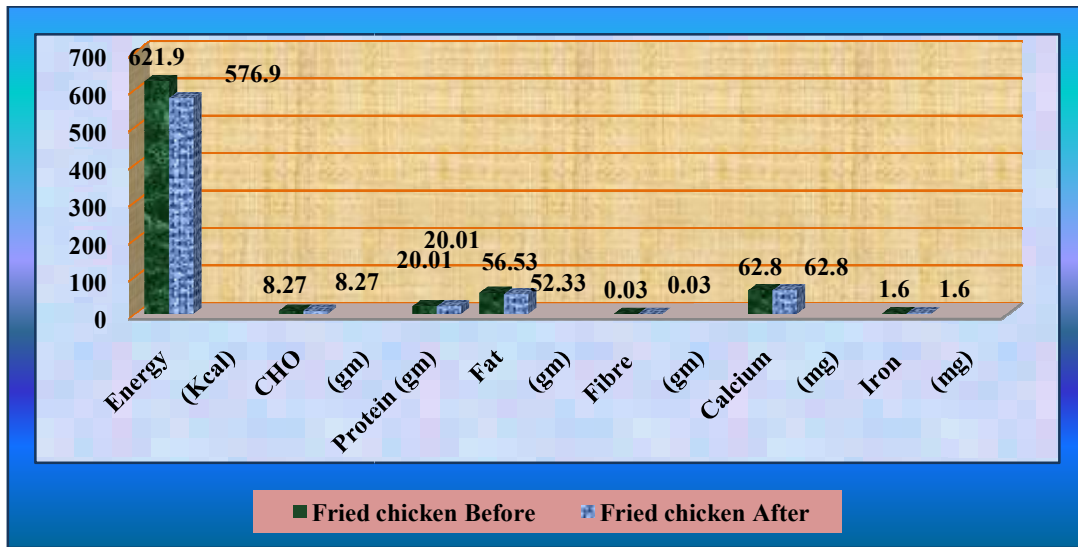
This table shows the evaluation on trans fat free recipes

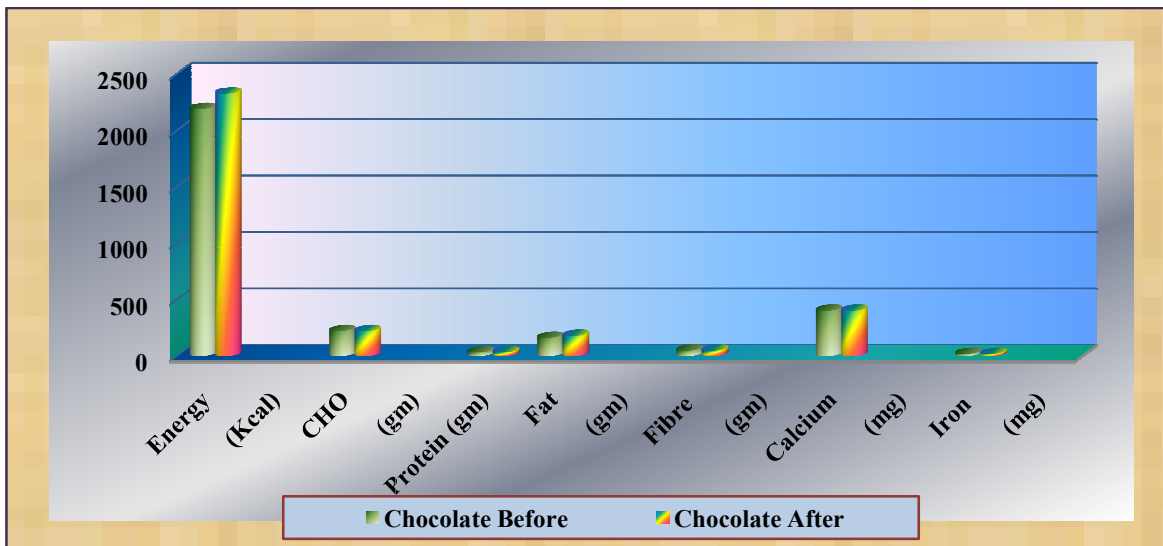
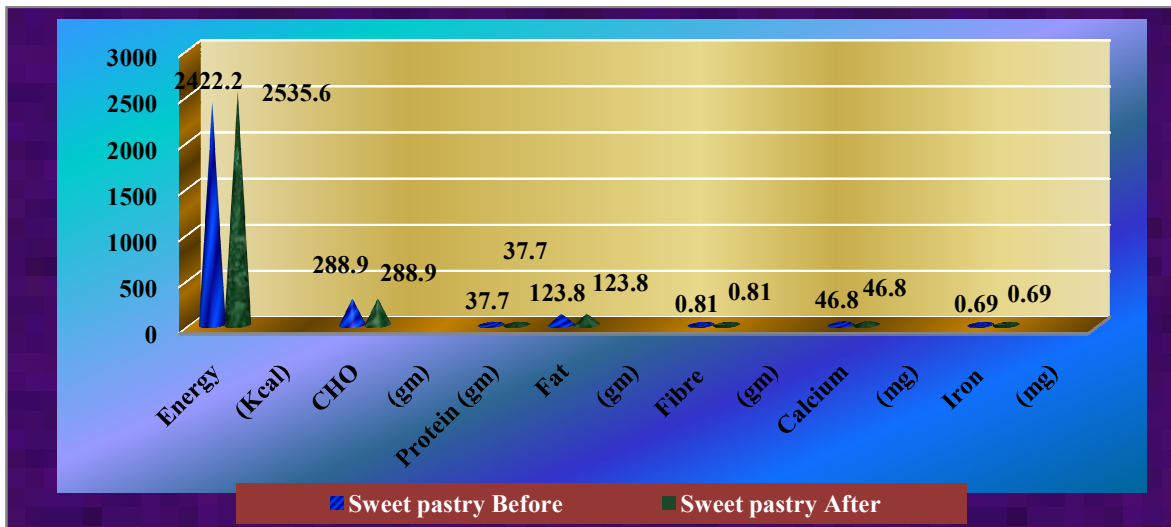
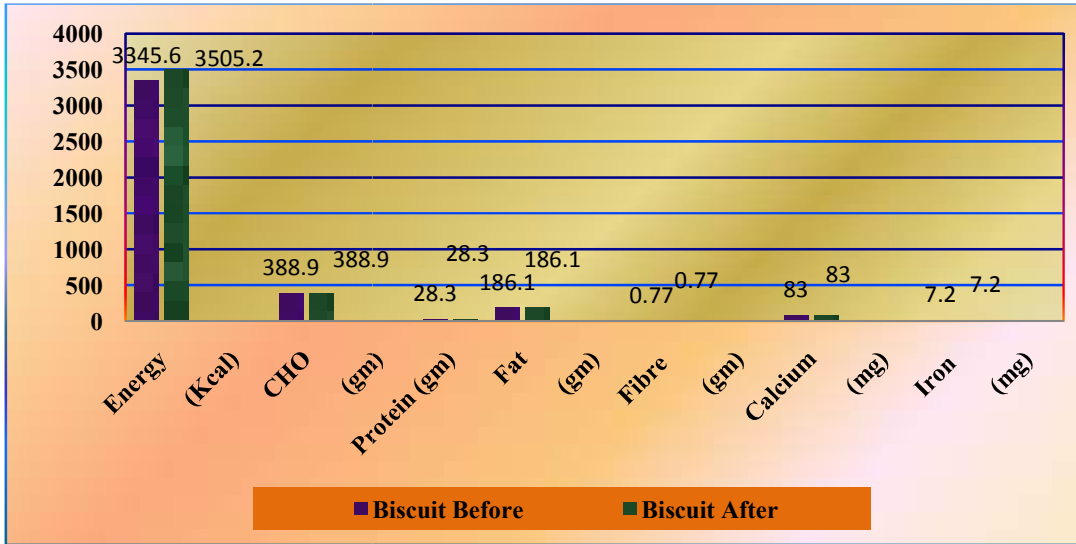
Table XIX

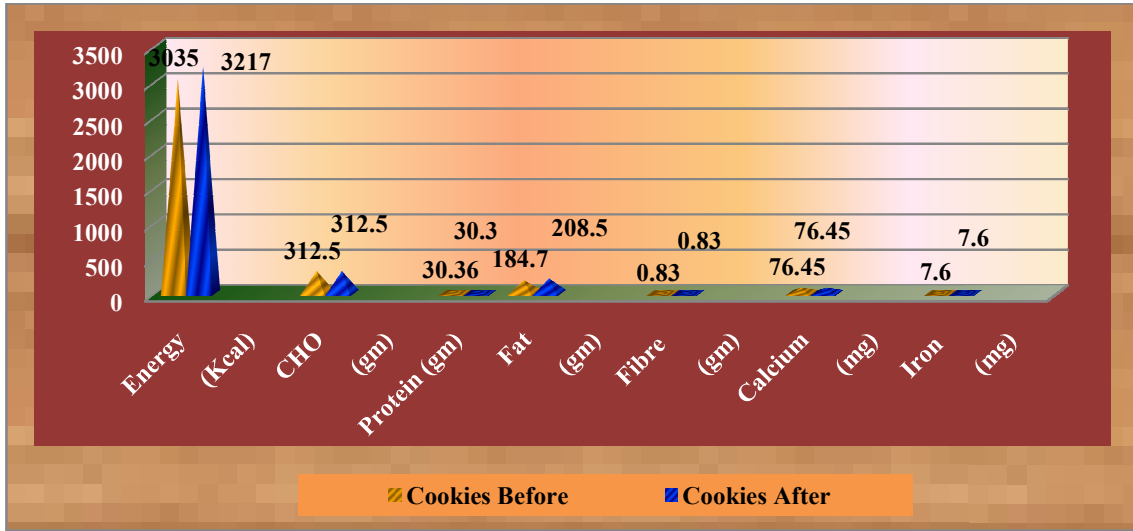
Evaluation on trans fat free recipes

PRE/POST NUTRITIVE VALUE FOR TRANS FAT FREE RECIPES









Nutritive value	French fries		Sponge cake		Fried chicken		Donuts		Potato chips		Biscuit		Sweet pastry		Chocolate		Cookies	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Fat (gm)	50.25	45.8	145.6	148.8	56.53	52.33	167.9	185.9	50.10	45.9	186.1	186.1	123.8	123.8	163.05	180.7	184.7	208.5
't' value	2.567*		0.894 ^{ns}		1.537 ^{ns}		5.381**		2.362*		0		0		7.215**		9.359**	
Energy (Kcal)	629.5	647.5	4331.6	4371.4	621.9	576.9	3971.8	4109.7	547	502	3345.6	3505.2	2422.2	2535.6	2191.7	2327.8	3035	3217
't' value	6.285**		2.068*		13.74**		35.282		11.559**		22.814**		8.426**		27.831**		18.635**	

** - Significant at 1%

* - Significant at 5%

NS – Not significant

The student 't' was employed to find the difference in the nutritive value such as energy and fat of the recipes prepared with butter and olive oil. There was a five per cent significance found in the fat content and one per cent significant of energy contents of french fries prepared with olive oil respectively. It was also found that the nutritive value such as fat and energy content of the donuts showed one per cent significance whereas in sponge cake there was five percent significance in the energy content.

There was one per cent significance seen in energy content of fried chicken. In potato chips fat content was found to be with five per cent significance and energy content was one percent significant. In biscuits the energy content was one per cent significant. Sweet pastry showed one percent significant in the energy content, in chocolate and cookies the fat and energy content was found to be one percent significant.

The recipes on making trans fat free showed a positive significance revealing the reduced energy and fat content in all the deep fried foods such as fried chicken, potato chips, and french fries. In all the other baked foods, though the energy content increased, the contribution of fat was from omega 3 unsaturated fat source, olive oil.

F. Mean score for the sensory evaluation of trans fat free recipes

This table shows the mean score for the sensory evaluation of trans fat free recipes on a five point scale.

Table XX

Mean score for the sensory evaluation of trans fat free recipes

Name of the dish	Mean ±
	Standard Deviation
Biscuit	21.4 ± 2.12132
Cakes	21.45 ± 3.535534
Cookies	22.45 ± 2.12132
Chocolate	21.8 ± 4.949747
Donuts	19.8 ± 2.828427
French fries	20.75 ± 5.656854
Fried chicken	21.9 ± 2.12132
Potato chips	20.45 ± 4.949747
Sweet pastry	22.7 ± 1.414214

On a total score of 25, the mean scores and standard deviation of the trans fat free recipes showed a fair acceptability to all the attributes such as appearance, texture, flavour, colour and taste.

5. SUMMARY AND CONCLUSION

The prevalence of eating out of the home is increasing, as is the range of eating outlets and types of food. The growth of the fast food industry has led to an increased consumption of foods prepared away from home that is high in saturated fat and trans fatty acid. The lack of knowledge of healthy food choices that may affect eating habits and nutritional status negatively. Hence the study was undertaken with the objective to assess the awareness on trans fat among customers food service operation and promote healthy food choices among customers among customers and food service operators.

A total of 500 customers who dine out at the selected food service operations in Coimbatore were identified to study the food choices and awareness on trans fats among the selected customers by purposive sampling. A total of four commercial food service operations comprising two star hotels and two bakeries were chosen to study the existing pattern in each functional area namely purchasing, receiving, storing, preparation, production, service and waste disposal using a checklist. Commonly consumed trans fat foods were standardised and sensory evaluation were done by the panel members. The employees were educated with the help of flash cards, posters, power point presentation.

The salient findings of the study are summarised as follows

Phase I Food choices and awareness on trans fats by customers

- The details on age wise distribution of the selected customers who dined out reveal that 37.8 per cent of the customers ranged between 40 and 64 years followed by 21 to 39 years (34.4 per cent) indicating the varied range of customers at the food service outlets and females dine out more frequently than males
- Among the customers, twenty seven per cent were students with more frequent dine out since they preferred dine out with their friends and consume more junk and fast foods. Also business men were found to have more dine outs with 23.4 per cent revealing the nature of work.

- The income range of the customers revealed that customers with higher income had more frequent dine outs. More amount of disposable income usually tends to the leisure and entertainment.
- The frequency of dine out showed that customers dined out once in a month (48.8 per cent) and was alarming to know that the age group of adolescents and adulthood (30.2 per cent) had the habit of eating out once in a week.
- Customers preferred fried food like fried chicken and potato chips followed by 19.2 per cent fast foods like fried rice and chat items and only 2.4 per cent prefer raw food preparation like fibre rich salad.
- Nearly 44.8 per cent customers spent less than rupees 100 per dine out for the reason that the consumption at road side eateries and restaurants that provide variety of food at low cost.
- Sunflower refined oil was used at home for cooking and was stated by 79.6 per cent of customers followed by safflower oil.
- Sixty five per cent of the customers were not aware of trans fat and only 35 per cent were aware of trans fat, 45 per cent were aware about trans fat through sources such as the media (45.14 per cent) followed by books (23.4 per cent).
- People felt that fast foods and convenience foods are high in fats because of the taste (75.6 per cent). The customers conveyed that butter contained higher concentration of trans fat (66.8 per cent) revealing a fair awareness on trans fats, followed by vegetable oil (19.6 per cent).

Phase II Awareness on trans fats at selected food service operation

- Hotel Alankar Grande had the maximum employees in the ratio of 1:15 than Hotel Heritage Inn. In Bakery AKR bakers had maximum employees in the ratio of 1:2 than the Donuts.
- The raw materials that were perishable foods such as milk and meat were purchased daily, semi perishable foods were purchased weekly and non-perishable foods were purchased monthly by all the four food service operations.
- All the four food service operations had appropriate storage facilities for dry and cold. The factors influencing the choice of food production was simple to manage was informed by Hotel Heritage Inn and AKR bakers, the choice of

food production for Hotel Alankar Grande was dependent upon the lowest price, and for Donuts was special offers.

- Usages of vanaspathi were more for deep fat frying instead of oils and butter also were replaced with vanaspathi. The reused heated oil was used for deep fat fry and was added in curries by Donuts and Hotel Alankar Grande. The Hotel Heritage inn did not reuse the oils
- Gaseous fuel and electricity are the most widely used in all the types of fuels at selected food service operation
- Hotel Alankar and Donuts dispose their waste by bins, pits were used to throw the waste by AKR Bakers and incinerators were used for waste disposal in Hotel Heritage inn
- Newspaper was the major sales promotion technique at all the food service operation except Hotel Alankar grande which used catalogue
- The trans fat free recipes when standardised and on making trans fat free showed a positive significance revealing the reduced energy and fat content in all the deep fried foods such as fried chicken, potato chips, and french fries. In all the other baked foods, though the energy content increased, the contribution of fat was from omega 3 unsaturated fat source, olive oil.

CONCLUSION

Consumers must be made aware of the nutritional information of the products available at food service operations especially on the consequences of trans fatty acids. The food service operations must ensure education to employees on ways to reduce trans fats in production and implement alternative strategies. With mushrooming of food service operations and increased eating out pattern, it will be a mutual benefit to the food service operators and consumers through promotion of healthy food choices and thereby ensure quality living of the population.

Scope for future research work

- Impact of the reformulation of fats on lipid profile and related Coronary Heart Disease risk factors.
- Analysis of trans fatty acids for products available as Ready to Eat (RTE) and Ready to Serve (RTS) foods.
- Awareness programmes to food service operators and consumers on healthy food choices at large scale.

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APPENDIX I

ELICIT DETAILS ON SELECTED CUSTOMERS TO UNDERSTAND FOOD CHOICES AND AWARENESS ON TRANSFATS

1. Name :
2. Age:
3. Sex:
4. Occupation:
5. Address:
6. Monthly income:
7. Frequency of dining out:
 Everyday thrice a week weekly once occasionally

 Not at all once
8. Preference of food while dining out?
 Steamed boiled fried baked

 Fast foods grilled others, specify _____
9. Amount spent on per dining out?
 Less than Rs 100 Rs 101-300 Rs301-500 above Rs 500

10. Types of food service outlet?
 Star category hotel

 Restaurant

 Kiosk

 Food bars

 Others, specify _____

11. Types of oil used?

- Canola oils Olive oil Safflower oil Sunflower refined oil
 Groundnut oil Vanaspathi Soybean oil Corn oil
 Palm oil Coconut oil

12. Are you aware of trans fat?

- Yes no

If yes from what source?

- Books News paper Media Magazines others, specify _____

13. Fast foods and convenience foods are high in fats because fat:

- Make the food cooks faster

 Make the food tastes good

 Increases the nutritional value of the food

 Easier to digest

14. According to you, which of the following most likely contains trans fatty acids?

- Olive oil margarine vegetable oil butter

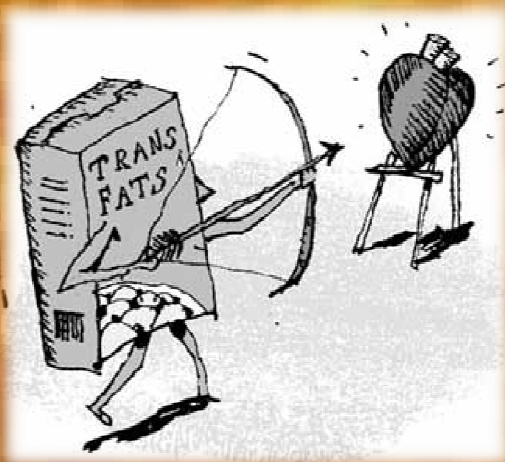
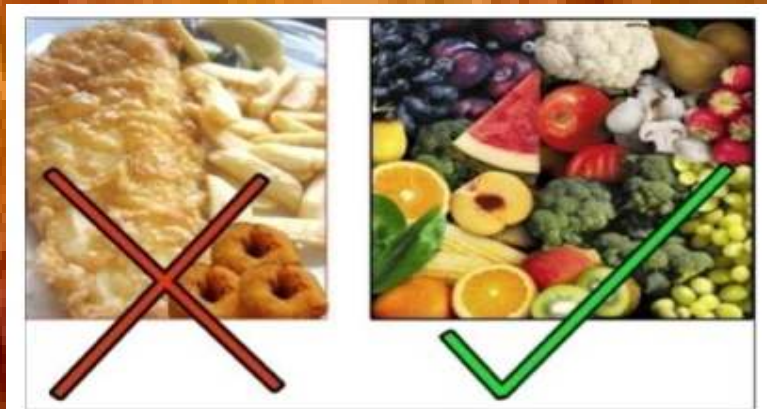
15. What foods do you consume the most?

- Donuts biscuits
 Pastries chocolate
 Cakes margarine
 French fries fried chicken
 Cookies potato chips
 Any other specify _____

APPENDIX II
Guidelines imparted for fats and oil – poster, pamphlet and power point



Amount/Serving	% DV*
Total Fat 16g	
Sat Fat 2.5g	25%
Trans Fat 0g	12%
lest 0mg	



Trans-fatty acids are found in fried foods, commercial baked goods, processed foods and margarine



FATS & OILS



AMILA SURESH K.N.M
M.Sc (Food Service Management and Dietetics)



What is fat?

FAT

- is a nutrient
- is a source of energy
- adds taste and texture to foods
- makes us feel full longer
- helps absorb fat-soluble vitamins



Where is fat found?

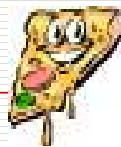
1. Easy to see

- **Fat added to foods**
 - Butter, margarine, oil
- **Fat on the outside of foods**
 - Chicken skin, outside trim on meat



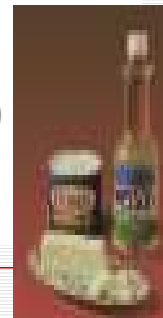
2. Hidden

- **Ingredient**
 - Snack foods, baked products, desserts
- **Added in cooking**
 - Fried foods, cream soups, sauces



Types of Fat

- All fat-containing foods have a mixture of different fats
- Types of fats include:
 - Polyunsaturated fats (PUFA)
 - Monounsaturated fats (MUFA)
 - Saturated fats (SFA)
 - Trans fats (TFA)



Polyunsaturated Fats

- Some are "essential" because the body cannot make them:
 - Omega-3 fats can help decrease the risk of heart disease
 - Omega-3 fats are found in fish, flaxseed and omega-3 eggs
- Other foods with PUFA are
 - vegetable oils (corn, soybean, sunflower), margarines made with vegetable oils, walnuts, sunflower seeds, sesame seeds

Monounsaturated Fats

- Considered "good" fats because they help decrease the risk of heart disease
- Examples: Olive oil, canola oil, margarine made with canola, peanuts, nuts (almonds, cashews, hazelnuts, pecans)

Saturated Fats



- Diets high in saturated fats can increase the risk of heart disease
- Examples: butter, cakes and pastries, chocolate bars, coconut, coffee whitener are all high in saturated fat
- Other sources of saturated fat include untrimmed meat and higher fat dairy products (e.g., cheese, cream)

Trans Fats

- Are made from hydrogenation
 - This makes oils more firm.
- Act like saturated fats in the body
- Most found in commercially prepared foods
 - some French fries, potato chips, donuts, cookies, crackers, cereals, shortening, muffins, pizza crusts, buns, cakes

FATS & OILS

- ❖ Health
- ❖ Selection of fats and cooking oil
- ❖ Preventive Measures

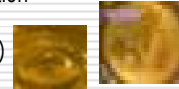


FRIED FOODS



Unsaturated F.A → saturated F.A
(Heart)

Over heating → carbon formation
(Stomach)

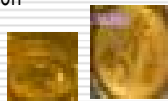


FRIED FOODS



Unsaturated F.A → saturated F.A
(Heart)

Over heating → carbon formation
(Stomach)



Finding Trans fat

January 2006

Ingredients:
Liquid Corn Oil, **Partially Hydrogenated Soybean Oil**, Salt, Vegetable Mono And Diglycerides And Soy Lecithin (Emulsifiers), Sodium Benzoate (To Preserve Freshness), Vitamin A Palmitate, Colored With Beta Carotene (Source Of Vitamin A), Artificial Flavor, Vitamin D3

Nutrition Facts	
Serving Size 1/2 Cup (125g)	
Amount Per Serving	
	% Daily Value
Total Fat	100%
Sodium	100%
Total Crap	100%
Trans Fat	100%
Cholesterol	100%
Fiber	100%
Sugar	100%
Protein	100%
*Percent Daily Values are based on a diet of pure evil.	

Restaurant Sources

INGREDIENTS:

- ❑ Commercial Fry Oils
- ❑ Vegetable shortening and margarine



BAKED GOODS:

- ❑ cakes, crackers, pastries, cookies, pies and hamburger buns



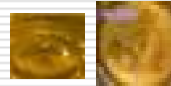
PRE-FRIED and PRE-MIXED FOODS:

- ❑ French fries, chicken nuggets, fish fillets, tortilla chips, donuts, pancake or cake mix



Preventive measures

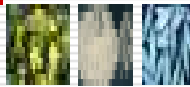
- ❖ Use Blended oil/Infused oil
- ❖ Use fry oil after draining
- ❖ Use oil with antioxidants vitamin E,D,A
- ❖ Use small pack jar
- ❖ Avoid reusing of oil



HOW TO CHOOSE COOKING OIL?

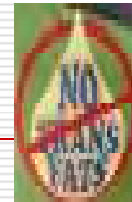
❖GOOD COOKING OILS:

- canola oil
- flax seed oil
- peanut oil
- Olive oil
- Fish oil
- non-hydrogenated soft margarine
- sunflower oil
- Rice bran oil
- Soyabean oil
- corn oil



❖Bad Cooking Oils:

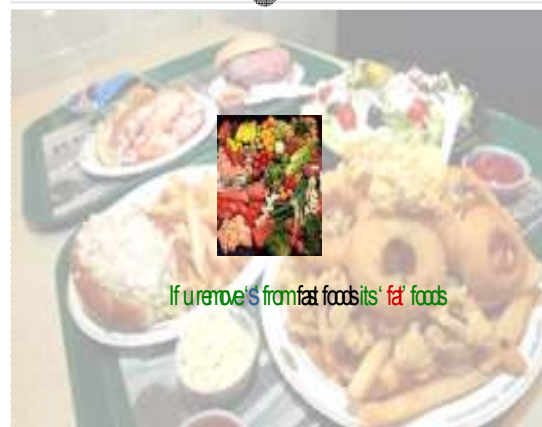
- Vegetable shortening
- Hard margarine
- Butter
- Palm oil
- Cottonseed oil
- Coconut oil



JUDICIOUS CHOICE (20-25 g/d)



AVOID FAT FOODS



APPENDIX III

QUESTIONNAIRE TO ELICIT DETAILS ON THE SELECTED FOOD SERVICE OPERATION

1. Name of the organisation:

2. Address:

3. Telephone No:

4. Email id:

5. Website address:

6. Type of organisation:

Commercial

Non – commercial

7. Type of ownership:

Sole proprietor ship

Partnership

Joint firm

Trust / charity

Government

8. Number of employees in the organization:

Male _____

Female _____

9. Employer portion of employee benefits?

Contribution to pension

Medical / Life Insurance plans

Employment insurance

- Education plans
- Housing
- Others, specify _____

10. List the different type of recipes prepared in your establishment:

Category	Recipes	Cost
<u>Starters:</u>		
<u>Main dish:</u>		
<u>Side dish:</u>		
<u>Baked:</u>		
<u>Ice creams:</u>		

11. The type of fuels used

- Solid fuels Liquid fuels gaseous fuels solar
- Electricity Any, other specify _____

12. How often you purchase the raw materials?

- Daily Weekly Monthly yearly

13. What are the factors that influence the choice of food production used in the establishment?

Lowest price

Special offers

Distance

Nutritional content

Simple to manage

Ease to storage

Others

14. Do you have storage facility?

Yes No

If yes, what type of storage and its capacity?

Dry storage room _____

Cold storage room _____

Refrigerator _____

Walk in cooler _____

Others _____

15. Storage of food?

Freeze on day of purchase

Use within one month

Defrost thoroughly before use

Once opened use within 3 days

16. Are there prepared foods used in the establishment / (i.e.)

(Fresh, washed and dried fruits and vegetables, packed trays or plastic bags?)

Yes

No

If yes mention _____

17. Foods prepared:

Starters:

French fries

Potato chips

Main dish:

Pastries

Baked:

Donuts

Biscuits

Cookies

Cakes

Tandoor:

Fried chicken

Ice cream / chocolates:

Chocolate

18. What is the production process for the above selected food?

Ingredients	Method of production

19. What are the oils /fats used for cooking the food in your establishment? _____

20. What is the amount of fats used in the food products? _____

21. Do you use reheated oils?

Yes No

If yes, how often you use?

22. Mention the ways of use of oils used in cooking?

Deep fat fry shallow fry added in curries

23. What kind of information is provided on dishes and products?

Origin nutritional content organic or other
Certificate Ingredients methods of preparation

Others _____

24. The type of service of food?

Self service waiter service Buffet service

Door delivery any other, specify _____

25. What are the ways of waste disposal?

Incinerators bins pits others, specify _____

I) Bio degradable _____

ii) Non –Bio degradable _____

26. Advertising, marketing and promotion of products?

News paper media catalogue other specify _____

APPENDIX IV

SCORE CARD FOR SENSORY EVALUATION

NAME OF THE RECIPE:

TIME:

DATE:

RECIPE	APPERARANCE	COLOUR	TEXTURE	FLAVOUR	TASTE	TOTAL

5 -EXCELLENT; 4- VERY GOOD; 3-GOOD; 2-FAIR; 1-POOR

Signature

APPENDIX VI

PRE AND POST TRANS FAT FREE RECIPES

Recipe: French fries

Category: starters

Portion size: 2 serving

Cooking time: 15 min

Before	After
<p>Ingredients</p> <ul style="list-style-type: none"> ➤ Potatoes – 250 gm ➤ Sun flower refined oil – 50 ml ➤ Coarse salt - to taste <p>Method</p> <ol style="list-style-type: none"> a. Peel potatoes, and cut into desired size and shape. To make thick French fries, slice potatoes lengthwise into 1/4-inch slices, and cut again into 1/4-inch strips. Place sliced potatoes in a large nonreactive bowl, and cover with water. b. Drain potatoes, and dry thoroughly with a towel. Heat 3 to 4 inches oil in a heavy-bottomed pot over medium heat. Use a thermometer to ensure the temperature is correct: 325 degrees for French fries, 375 degrees for shoestring and basket-weave fries. c. Carefully add potatoes to oil in small batches so as not to lower the temperature of the oil. French fries need to cook for 5 to 6 minutes, turning occasionally. They will not take on much colour at this point. 	<p>Ingredients</p> <ul style="list-style-type: none"> ➤ Potatoes – 250 gm ➤ Olive oil – 50 ml ➤ Coarse salt - to taste <p>Method</p> <ol style="list-style-type: none"> a. Peel potatoes, and cut into desired size and shape. To make thick French fries, slice potatoes lengthwise into 1/4-inch slices, and cut again into 1/4-inch strips. Place sliced potatoes in a large nonreactive bowl, and cover with water. b. Drain potatoes, and dry thoroughly with a towel. Heat 3 to 4 inches oil in a heavy-bottomed pot over medium heat. Use a thermometer to ensure the temperature is correct: 325 degrees for French fries, 375 degrees for shoestring and basket-weave fries. c. Carefully add potatoes to oil in small batches so as not to lower the temperature of the oil. French fries need to cook for 5 to 6 minutes, turning occasionally. They will not take on much colour at this point.

d. Transfer to a flattened brown paper bag that has been lined with paper towels, and let cool for a few minutes or until just before ready to serve. French fries need to be fried a second time: Raise oil temperature to 375 degrees. And fry for until crisp and golden, about 1 to 2 minutes. Remove from oil, and drain again on the paper bag. Sprinkle with salt, and serve.

d. Transfer to a flattened brown paper bag that has been lined with paper towels, and let cool for a few minutes or until just before ready to serve. French fries need to be fried a second time: Raise oil temperature to 375 degrees. And fry for until crisp and golden, about 1 to 2 minutes. Remove from oil, and drain again on the paper bag. Sprinkle with salt, and serve.



Recipe : Sponge cake

Category: Dessert

Portion size: 10 serving

Cooking time: 1 hour

Before	After
<p>Ingredients</p> <ul style="list-style-type: none"> ➤ Eggs - 4 ➤ Sugar - 2 cup ➤ Vanilla - 1 tsp ➤ Whole milk - 1 cup ➤ Butter - ¼ cup ➤ All-purpose flour - 2 cups ➤ Baking powder - 2 tsp ➤ Salt - ¼ tsp 	<p>Ingredients</p> <ul style="list-style-type: none"> ➤ Eggs - 4 ➤ Sugar - 2 cup ➤ Vanilla - 1 tsp ➤ Whole milk - 1 cup ➤ Olive oil- ¼ cup ➤ All-purpose flour - 2 cups ➤ Baking powder - 2 tsp ➤ Salt - ¼ tsp

Method

1. Beat eggs in large mixing bowl with paddle attachment for 4 minutes. Do not skip this step!
2. Add sugar, and continue beating for another 4-5 minutes until light and fluffy. Add vanilla and stir on low until just combined.
3. In a separate bowl, sift together dry ingredients. Add to eggs and sugar on low speed until just combined.
4. In a saucepan, heat milk and butter on low heat just until butter is melted. Add to batter, beat just until combined.
5. Pour into two greased and floured 8" round cake pans.
6. Bake at 325 until the middle springs back when touched, or a toothpick inserted in the center comes out clean. Remove from oven and let stand in pans for 10 minutes. Then turn out onto wire cooling racks and cool completely.

Method

1. Beat eggs in large mixing bowl with paddle attachment for 4 minutes. Do not skip this step!
2. Add sugar, and continue beating for another 4-5 minutes until light and fluffy. Add vanilla and stir on low until just combined.
3. In a separate bowl, sift together dry ingredients. Add to eggs and sugar on low speed until just combined.
4. In a saucepan, heat milk and oil on low heat just until oil is melted. Add to batter, beat just until combined.
5. Pour into two greased and floured 8" round cake pans.
6. Bake at 325 until the middle springs back when touched, or a toothpick inserted in the center comes out clean. Remove from oven and let stand in pans for 10 minutes. Then turn out onto wire cooling racks and cool completely.



Recipe: Fried chicken**Category: Side dish****Portion size: 1 serving****Cooking time: 10 mins**

Before	After
<p>Ingredients</p> <ul style="list-style-type: none"> • Chicken pieces – 50g • Milk – 20g • Eggs - 1 small • All-purpose flour – 10g • Salt – 1/2 tablespoons • Pepper - 1/2 tablespoons • Sun flower refined oil- 3 cups • Salt – to taste <p>Method</p> <ol style="list-style-type: none"> 1. Rinse chicken; pat dry and then set aside. 2. Combine milk and eggs in a bowl; whisk to blend well. 3. In a large heavy-duty resealable plastic food storage bag, combine the flour, salt, and pepper. 4. Dip a chicken piece in the milk mixture; let excess drip off into bowl. Put a few chicken pieces in the food storage bag and shake lightly to coat thoroughly. Remove to a plate and repeat with remaining chicken pieces. 5. Heat oil to 350°. Fry chicken, a few pieces at a time, for about 10 minutes on each side, or until golden brown and cooked through. Chicken breasts will take a little less time than other pieces. Pierce with a fork to see if juices run clear to check for doneness. 	<p>Ingredients</p> <ul style="list-style-type: none"> • Chicken pieces – 50g • Milk – 20g • Eggs - 1 small • All-purpose flour – 10g • Salt – 1/2 tablespoons • Pepper - 1/2 tablespoons • Olive oil - 3 cups • Salt – to taste <p>Method</p> <ol style="list-style-type: none"> 1. Rinse chicken; pat dry and then set aside. 2. Combine milk and eggs in a bowl; whisk to blend well. 3. In a large heavy-duty resealable plastic food storage bag, combine the flour, salt, and pepper. 4. Dip a chicken piece in the milk mixture; let excess drip off into bowl. Put a few chicken pieces in the food storage bag and shake lightly to coat thoroughly. Remove to a plate and repeat with remaining chicken pieces. 5. Heat oil to 350°. Fry chicken, a few pieces at a time, for about 10 minutes on each side, or until golden brown and cooked through. Chicken breasts will take a little less time than other pieces. Pierce

With a slotted spoon, move to paper towels to drain; sprinkle with salt.

with a fork to see if juices run clear to check for doneness. With a slotted spoon, move to paper towels to drain; sprinkle with salt.



Recipe: Donuts

Category: Dessert

Portion size: 1 serving

Cooking time: 2 hours

Before	After
<p>Ingredients</p> <ul style="list-style-type: none"> ➤ Dry yeast - 2 TB ➤ Milk - 1 cups ➤ Butter - 1/4 cup ➤ Salt - 1 tsp ➤ Sugar - 1 cup ➤ Nutmeg - 1/4 tsp ➤ Cinnamon – 1/2 tsp ➤ Eggs - 2 ➤ Flour - 3 1/2 cups <p>Method</p> <ol style="list-style-type: none"> 1. Dissolve yeast in 1/2 cup luke-warm water. Set aside. 2. Heat 1 cups milk in microwave for 2-3 minutes. 	<p>Ingredients</p> <ul style="list-style-type: none"> ➤ Dry yeast - 2 TB ➤ Milk - 2 cups ➤ Olive oil - 1/2 cup ➤ Salt - 2 tsp ➤ sugar - 2/3 cup ➤ Nutmeg - 1/2 tsp ➤ Cinnamon - 1 tsp ➤ Eggs - 4 ➤ Flour - 6 1/2 - 7 1/2 cups <p>Method</p> <ol style="list-style-type: none"> 1. Dissolve yeast in 1/2 cup luke-warm water. Set aside. 2. Heat 1 cups milk in microwave for 2-3 minutes.

<p>3. While milk is heating add butter to a large bowl. Pour hot milk over it and whisk until mixed. Add salt, sugar, nutmeg, and cinnamon. Mix well with a wooden spoon. Add 2 eggs and mix well.</p> <p>4. Add yeast mixture to batter and mix. Add 1 cup of flour and mix with a wooden spoon. Mix well. Add 2 more cups and mix. Add 2 more cups and mix. At this point, the batter should not be runny. Add 1 more cup of flour, give or take 1/2 cup. Sprinkle flour onto a clean surface and pour batter onto it. Gently knead dough batter until the surface is not sticky to the touch. Place the soft dough into a lightly greased bowl. Cover the bowl and let rise for 1 to 1 1/2 hours. Dough should be about double in size when done.</p> <p>5. Place dough on a lightly floured surface and roll out to about a 1 inch thickness. Cut the doughnuts out as closely as possible. You can save the middles for doughnut holes. Move donuts and holes to a clean surface. Cover and let rise for 1 to 1 1/2 hours.</p> <p>6. Once the donuts and holes are done rising, fry them in a large frying pan with olive oil until golden brown.</p> <p>7. While donuts are frying make your Glaze. To make glaze mix 3 cups powdered sugar with 1 cup water and 1 tsp. vanilla. Add donuts to glaze as soon as they are done frying and make sure both sides are covered. Place on a plate to let excess glaze drain.</p>	<p>3. While milk is heating add oil to a large bowl. Pour hot milk over it and whisk until mixed. Add salt, sugar, nutmeg, and cinnamon. Mix well with a wooden spoon. Add 2 eggs and mix well.</p> <p>4. Add yeast mixture to batter and mix. Add 1 cup of flour and mix with a wooden spoon. Mix well. Add 2 more cups and mix. Add 2 more cups and mix. At this point, the batter should not be runny. Add 1 more cup of flour, give or take 1/2 cup. NOTE: You do not want your dough to be tough. Mix until your dough is smooth.</p> <p>5. Sprinkle flour onto a clean surface and pour batter onto it. Gently knead dough batter until the surface is not sticky to the touch. Place the soft dough into a lightly greased bowl. Cover the bowl and let rise for 1 to 1 1/2 hours. Dough should be about double in size when done.</p> <p>6. Place dough on a lightly floured surface and roll out to about a 1 inch thickness. Cut the doughnuts out as closely as possible. You can save the middles for doughnut holes. Move donuts and holes to a clean surface. Cover and let rise for 1 to 1 1/2 hours.</p> <p>7. Once the donuts and holes are done rising, fry them in a large frying pan with olive oil until golden brown.</p> <p>8. While donuts are frying make your Glaze. To make glaze mix 3 cups powdered sugar with 1 cup water and 1 tsp. vanilla. Add donuts to glaze as soon as they are done frying and</p>
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make sure both sides are covered. Place on a plate to let excess glaze drain.



Recipe: Potato chips

Category: Snacks

Portion size: 3 serving

Cooking time: 30 mins

Before	After
<p>Ingredients</p> <ul style="list-style-type: none"> • Potatoes – 100g • Ice cubes and water • Salt – to taste • Sun flower refined oil – 50g • Chilli powder (optional) • Turmeric powder <p>Method</p> <ul style="list-style-type: none"> • In a bowl, mix a tea spoon salt with half cup water and a pinch of turmeric powder. Keep it aside. • Wash the potatoes well. Do not peel off the skin. Using a slicer, make thin slices. • Place them in a bowl with ice cubes (7-8) and water for about ten minutes. • Spread them over a paper or cloth for about 20 – 30 minutes till they get dried up. • Deep fry them in hot oil. 	<p>Ingredients</p> <ul style="list-style-type: none"> • Potatoes – 100g • Ice cubes and water • Salt – to taste • Olive oil – 50g • Chilli powder (optional) • Turmeric powder <p>Method</p> <ul style="list-style-type: none"> • In a bowl, mix a tea spoon salt with half cup water and a pinch of turmeric powder. Keep it aside. • Wash the potatoes well. Do not peel off the skin. Using a slicer, make thin slices. • Place them in a bowl with ice cubes (7-8) and water for about ten minutes. • Spread them over a paper or cloth for about 20 – 30 minutes till they get dried up.

- When the chips are almost done, add salted water in the frying pan.
- When the bubbling sound disappears, remove the chips from the frying pan. Spread them on a paper so that much of the oil is absorbed by the paper.
- Red chilli powder may be sprinkled over the chips when they are hot. You can store them in an airtight container when they are cooled to room temperature.

- Deep fry them in hot oil.
- When the chips are almost done, add salted water in the frying pan.
- When the bubbling sound disappears, remove the chips from the frying pan. Spread them on a paper so that much of the oil is absorbed by the paper.
- Red chilli powder may be sprinkled over the chips when they are hot. You can store them in an airtight container when they are cooled to room temperature.




Recipe: Butter biscuit

Category: Snacks

Portion size: 10 serving

Cooking time: 30 mins

Before	After
<p>Ingredients</p> <p>Butter - 1 cup Powdered sugar - 1 cup Cardamoms (elaichi) - 4 to 5 Plain flour (Maida) - 2 cups</p> <p>Method</p> <ul style="list-style-type: none"> • Cream butter till soft. • Add sugar a little by little and cream well till soft and fluffy. • Add powdered elaichi • Gently mix in the maida and make dough. • Take small balls of the dough, shape 	<p>Ingredients</p> <p>Olive oil - 1 cup Powdered sugar - 1 cup Cardamoms (elaichi) - 4 to 5 Plain flour (Maida) - 2 cups</p> <p>Method</p> <ul style="list-style-type: none"> • Cream oil till soft. • Add sugar a little by little and cream well till soft and fluffy. • Add powdered elaichi • Gently mix in the maida and make dough. • Take small balls of the dough, shape

<p>them round and flatten slightly between palms.</p> <ul style="list-style-type: none"> • Arrange on a greased baking tray and bake in a preheated oven at 200 degrees centigrade for 20 - 25 minutes, till slightly brown. 	<p>them round and flatten slightly between palms.</p> <ul style="list-style-type: none"> • Arrange on a greased baking tray and bake in a preheated oven at 200 degrees centigrade for 20 - 25 minutes, till slightly brown. 
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Recipes: Sweet pastry

Category: Dessert

Portion size: 5 serving

Cooking time: 40 mins

BEFORE	AFTER
<p>Ingredients</p> <ul style="list-style-type: none"> • Butter - 140g • Slightly softened caster Sugar - 90g • Egg - 1 large • Plain flour - 270g <p>Method</p> <ul style="list-style-type: none"> • Put the butter in a bowl with the sugar and cream together using a wooden spoon or hand-held electric mixer. • Add the egg to the butter mixture and 	<p>Ingredients</p> <ul style="list-style-type: none"> • Olive oil - 140g • Slightly softened caster sugar - 90g • Egg - 1 large • Plain flour - 270g <p>Method</p> <ul style="list-style-type: none"> • Put the oil in a bowl with the sugar and cream together using a wooden spoon or hand-held

<p>beat until smooth and completely incorporated.</p> <ul style="list-style-type: none">• Mix the flour with a pinch of salt and fold into the butter mixture gradually, in batches, until absorbed. Be sure to incorporate all the butter sticking to the sides of the bowl.• Turn the pastry onto a lightly floured surface and knead it quickly until it all comes together.• Wrap the dough in cling film and chill for 30 minutes. This resting stage is essential.• Remove the pastry from the fridge. Place on a lightly floured surface and, with a floured rolling pin, roll to the thickness required. Turn regularly to achieve an even shape before using to line your tart tin.	<p>electric mixer.</p> <ul style="list-style-type: none">• Add the egg to the oil mixture and beat until smooth and completely incorporated.• Mix the flour with a pinch of salt and fold into the oil mixture gradually, in batches, until absorbed. Be sure to incorporate all the oil sticking to the sides of the bowl.• Turn the pastry onto a lightly floured surface and knead it quickly until it all comes together.• Wrap the dough in cling film and chill for 30 minutes. This resting stage is essential.• Remove the pastry from the fridge. Place on a lightly floured surface and, with a floured rolling pin, roll to the thickness required. Turn regularly to achieve an even shape before using to line your tart tin.
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Recipe: Chocolate**Category: Dessert****Portion size: 15 serving****Cooking time: 20 mins**

Before	After
<p>Ingredients</p> <ul style="list-style-type: none">✓ Cocoa powder - 2 cups✓ Butter - $\frac{3}{4}$ cup✓ Sugar - $\frac{1}{2}$ cup✓ Milk - $\frac{2}{3}$ cup✓ Plain flour - $\frac{1}{4}$ tsp✓ Powdered sugar - $\frac{1}{4}$ cup✓ Water - 1 cup <p>Method</p> <ul style="list-style-type: none">✓ Place cocoa and butter in processor and mix until they form a paste.✓ Fill the pan about $\frac{1}{4}$ full with water. Then place the bowl on top of the water.✓ Put the chocolate paste in the bowl and then heat until hot. Put the mixture back in the processor and mix till smooth.✓ Then warm the milk to room temperature. Add sugar, flour and milk to the paste and mix well.✓ Pour the mixture into molds and place it in the fridge till they	<p>Ingredients</p> <ul style="list-style-type: none">✓ Cocoa powder - 2 cups✓ Olive oil - $\frac{3}{4}$ cup✓ Sugar - $\frac{1}{2}$ cup✓ Milk - $\frac{2}{3}$ cup✓ Plain flour - $\frac{1}{4}$ tsp✓ Powdered sugar - $\frac{1}{4}$ cup✓ Water - 1 cup <p>Method</p> <ul style="list-style-type: none">✓ Place cocoa and butter in processor and mix until they form a paste.✓ Fill the pan about $\frac{1}{4}$ full with water. Then place the bowl on top of the water.✓ Put the chocolate paste in the bowl and then heat until hot. Put the mixture back in the processor and mix till smooth.✓ Then warm the milk to room temperature. Add sugar, flour and milk to the paste and mix well.✓ Pour the mixture into molds and place it in the fridge till they become hard.✓ Take the pieces out and serve.

become hard.

- ✓ Take the pieces out and serve.



Recipe: Cookies

Category: Snacks

Portion size: 15 serving

Cooking time: 20 mins

Before	After
<p>Ingredients</p> <ul style="list-style-type: none">➤ Butter - 225 g➤ Caster sugar - 110 g➤ Plain flour - 275 g➤ Ground spices, or finely grated zest (optional)	<p>Ingredients</p> <ul style="list-style-type: none">➤ Olive oil - 225 g➤ Caster sugar - 110 g➤ Plain flour - 275 g➤ Ground spices, or finely grated zest (optional)
<p>Method</p> <ol style="list-style-type: none">1. Preheat the oven to 170C.2. Cream the butter in a large bowl or in a food mixer until soft and creamy. Add the sugar and beat until the mixture is pale and fluffy.3. Sift in the flour and spices or grated zest (if using) and bring the mixture together to form firm dough.4. Using your hands, roll the dough into walnut-sized balls and place them slightly apart on a baking tray (no need to grease or line). Flatten them slightly with the back of a damp fork and bake in the oven	<p>Method</p> <ol style="list-style-type: none">1. Preheat the oven to 170C.2. Cream the oil in a large bowl or in a food mixer until soft and creamy. Add the sugar and beat until the mixture is pale and fluffy.3. Sift in the flour and spices or grated zest (if using) and bring the mixture together to form firm dough.4. Using your hands, roll the dough into walnut-sized balls and place them slightly apart on a baking tray (no need to grease or line). Flatten them slightly with the back of a damp fork and bake in the oven for 13–15

for 13–15 minutes, or until they are light golden brown and slightly firm on top.
5. Carefully transfer the cookies to a wire rack to cool.

minutes, or until they are light golden brown and slightly firm on top.
5. Carefully transfer the cookies to a wire rack to cool.

