INTRODUCTION

1. INTRODUCTION

The links between diet, nutrition and chronic diseases are well-established. Changes in diet and nutrition are the cause of Global Disease Transition. Economic transition, rapid urbanization and 21st century lifestyle have created an environment for the four major Non-communicable Disease (NCD) causing behavioral risk factors namely, tobacco use, unhealthy diet, insufficient physical activity and excessive use of alcohol (WHO, 2010).

Shift from communicable diseases to NCDs is termed as "epidemiological transition" which is largely propelled by "nutrition transition (Shetty, 2002). Nutrition transition is characterized by shifts in the structure of the diet towards a higher energy density diet, high salt, total fat, saturated fat (mostly from animal sources), added sugars, reduced intakes of complex carbohydrates, dietary fiber, and reduced fruit and vegetable intakes (Stamoulis et al, 2004; Popkin and Gordan-larsen, 2004). Nutrition transition has changed the diets qualitatively as well as quantitatively. The qualitative change refers to the change in type of food consumed i.e. inclusion of urban/modern/westernized foods like red meat, butter, bread, etc. The quantitative change means change in amount of food consumed e.g. increased consumption of high fat and sugary foods and diminished consumption of vitamin, mineral and fibre rich food. Nutrition transition is taking place all over the globe including India, South Africa, Tunisia, United Arab Emirates (UAE), Malaysia, etc. (Shetty, 2002; Vaz et. al, 2005; Crush et. al, 2011; Vorster et. al, 2005; Aounallah-Skhiri et. al, 2011; Ng et. al, 2011; Noor, 2002).

The two major forces that are instrumental in accelerating nutrition transition are globalization and urbanization. It is well established that globalization plays a central role in the development of dietary pattern linked with the nutrition transition and subsequent escalation of diet-related chronic diseases in the developing world. Globalization is marked by radically altering the nature of agri-food systems which alter the quantity, type, cost and desirability of foods available for consumption (Hawkes, 2006). In terms of food commodities, globalization can also be defined as the global agribusiness and transnational shifting of raw materials to processed foods, high calorie soft drinks and snacks. It is characterized by shift in diets (nutrition transition), dietary convergence of low to high income country patterns, consumption of foods high in fats and sweeteners, urbanization, eating outside home and

surfacing of supermarkets (Shaffer and Brenner, 2007). Globalization has led to a decrease in the price of processed foods relative to fruits and vegetables, extension of fast food restaurants, time constraints from current employment conditions and social lifestyles and adaptation to energy saving technological change (Duffrey et. al, 2010; Chou et. al. 2008; Cutler et. al. 2003; Lakdawalla and Philipson 2009; Philipson and Posner 2003). Dietary pattern and physical activity travel across the countries and are transferable from one population to another affecting disease pattern globally. These are coming to the fore as a major modifiable determinant of chronic disease (Matsudo et. al, 2002; WHO, 2003).

With the process of globalization among various countries, the process of urbanization is also taking place collaterally within countries. The world urban population is expected to increase by 72% by 2050, from 3.6 billion in 2011 to 6.3 billion in 2050. It is expected that urban growth in the world would be concentrated in the urban areas of the less developed regions, whose population is projected to increase from 2.7 billion in 2011 to 5.1 billion in 2050 while in developed regions the increase would be from 1 billion to 1.1 billion during the same period. High urbanization rates have negatively affected lower income countries as the populations in these countries have now easy access to modern diet which includes more fats and sugars and less of the traditional diet rich in fiber and protein. Moreover, the urban migrants look for cheap and quick-to-cook products to accommodate their fast-paced and expensive lifestyle in city areas (Yadav and Krishnan, 2008). The picture in rural households is also not very different. The consumption of ready-to-eat foods in rural areas of developing regions is also increasing due to the "circular migrants" who carry novel urban food ways back to rural areas which in turn is speeding the nutrition transition (Krause, 2011).

Association between increasing urbanicity and NCDs and their risk factors has been found in various developing countries namely India, Pakistan, Kenya, Mexico, South Africa, Malaysia, Thailand and Tanzania (Shetty, 2002; Khan et. al, 2013; Mathenge et. al, 2010; Rivera et. al, 2004; Vorster, 2002; Noor, 2002; Kosulwat, 2002; Maletnlema, 2002). In India, if the transition continues as expected, by the year 2020 the balance of disease burden will shift to 25 per cent from communicable disease and over 57 per cent due to non-communicable disease (Gupte et. al, 2001).

Individual preferences and beliefs, culture, traditions, as well as geographical, environmental, social and economic changes bring about dietary changes (WHO,

2003). To add to it, migration, urbanization and sedentarism lead to nutrition transition which in turn causes epidemiological transition and an epidemic of obesity and other NCDs (Shetty, 2002). Some of the socio-economic changes that brought nutrition transition are,

- Changing prices of commodities (WHO, 2003).
- Changes in the role of women (increasing number of working women).
- Changes in income patterns (dual income families/increasing per capita disposable incomes) (KPMG 2005).
- Changes in household food-preparation technology (indigenous method of food preparation is replaced by semi-processed foods, ready-to-cook foods, etc.). Earlier, women used to spend a lot of time in the preparation and cooking of food, now allocate less time doing so because of technological advancements (Drewnoski, 2004; Caplan 2002).
- Changes in food production and processing technology.
- Changes in family and household composition (increasing number of nuclear families) (Popkin, 1998).
- Increasing education and health awareness (KPMG, 2005).

From the above background, it is apparent that diets have changed immensely from traditional to westernized diets around the globe. Traditional diets were characterized by high fibre, low fat, low salt/sodium and sugar content and westernized diets are characterized as high in sugars, high in fat and low in fibre, vitamins and minerals. Consumption of processed foods is a part of westernized diet and they are high in unfavorable nutrients (i.e. fat, salt/sodium, sugar and trans fat) and low in favorable nutrients (i.e. fiber, vitamins, minerals and antioxidants). Therefore, processed food consumption needs to done judicially according to their nutrient content and physiological requirements.

Processed foods can be defined as "any food other than a raw agricultural commodity, including any raw agricultural commodity that has been subject to washing, cleaning, milling, cutting, chopping, heating, pasteurizing, blanching, cooking, canning, freezing, curing, dehydrating, mixing, packaging, or other procedures that alter the food from its natural state. Processing may also include the addition of other ingredients to the food, such as preservatives, flavors, nutrients and other food additives or substances approved for use in food products, such as salt, sugars and fats. Processing of foods, including the addition of ingredients, may reduce, increase or leave unaffected the nutritional characteristics of raw agricultural

commodities" (Dwyer et al, 2012). Processed foods are becoming popular because they have certain advantages like they are convenient, have long shelf-life, involve fewer steps in preparation and fewer utensils to use and wash up, less time in supervision, have uniform taste, rational packaging and standardized recipes which results in no/small food wastage, eliminates toxins, spoilage enzymes and pathogenic micro-organisms, improves quality of life for people with allergies, availability of foods round the year, prevent food losses, alleviates food shortages and improves overall nutrition of population by food fortification, shortens preparation and cooking time, increases food consistency, adds variety, easy to transport, market and distribute (Schmidt, 2009). However, while purchasing processed foods consumers place more value on non-nutritional factors namely, packaging, aroma and taste, easy to cook, rare ingredients, convenience in buying, quick turnaround time, price, family preferences and discount on the product (Vijayabaskar and Sundaram, 2012; Chan et. al, 2005; Grunert et. al, 2010b; Epstein et. al, 2007; Drichoutis et. al., 2005; Annunziata and Vecchio, 2012).

Despite several advantages, processed foods have some disadvantages too. To enumerate, in some processed foods nutrients are deliberately removed from the food to improve longevity, appearance or taste. As compared to essential nutrients they are usually high in salt and sugar. Cheap chemically hardened vegetable oils are used in place of expensive natural saturated fats or cold pressed oils to provide desired texture and taste. Food additives, such as flavorings and texture enhancing agents are unavoidable hazards that are found in processed foods. Preservatives added to extend the 'shelf life', such as nitrites or sulphites have direct ill-effects on health. As processed in bulk, sometimes hygienic standards become difficult to maintain. The disadvantages of consuming processed foods are associated with their adverse health effects. Processed foods are not preferred as they contain high sodium, sugar, high fructose corn syrup (HFCS), trans fat and artificial sweeteners. They also contain artificial flavors or colors, chemicals with long and complex names which are difficult to interpret and have lower nutritional value, thereby making processed foods unhealthy to consume (Schmidt, 2009). According to Chan (2011) foods like soft drinks and processed ones which are high in salt, fat and sugar are "unhealthy commodities." These unhealthy commodities in addition to consumption of tobacco and alcohol are the leading risk factors for chronic NCDs. Studies have shown that processed foods contain more sodium per 100g as compared to their "natural" counterparts (WHO, 2007). In Britain largest contributors to sodium purchases are table salt (23%), processed meat (18%), bread and bakery products

(13%), dairy products (12%) and sauces and spreads (11%). More than one-third of sodium purchases (37%) are contributed by 5 food categories namely, bacon, bread, milk, cheese, and sauces (Mhurchu et al, 2011). Similarly in Australia, sauces and spreads (1283 mg/100 g) and processed meats (846 mg/100 g) are the major sodium providing culprits. Comparatively, cereal and cereal products (206 mg/100 g) and fruit and vegetables (211 mg/100 g) contribute less sodium. Mono-sodium glutamate which acts as a taste enhancer in processed foods has been linked with overweight among Chinese women (He et. al, 2008).

Another nutrient which is found in large quantity in processed foods is sugar. Added sugars in diets are largely contributed by sweetened grains (cookies, cakes) (12.9%), breakfast cereals (4.4%), sugars/sweets (table sugar, honey, syrups, candies, jams, jellies, gelatin desserts) (16.1%), soft drinks (33%), soft drinks-low calorie (0.1%), fruit drinks (9.7%), fruit drinks-low calorie (<0.1%) (Guthrie and Morton, 2000). These days empty calorie foods are been largely talked about. These are the processed foods that are unhealthy as they provide energy from solid fats and added sugars and therefore called SoFAS (Reedy et. al, 2010; USFDA, 2009). In US soft drinks, fluid milk, sugars, cakes, pastries and pies are the major food sources for intake of total sugar, total carbohydrates and total energy. Carbonated soft drinks have been the most significant source of sugar across the last three decades (Basu et. al, 2013). Among children, major portion of added sugars in the diet comes from "sweets, cakes and table sugar" (47.5%), "soft drinks"(17.9%) and "sweetened fruit juices" (17.7%) while only a small portion is contributed by fruit (5.6%), cereals (2.5%) and milk products (3.7%). The food products which form the major sources of added sugar are typically processed foods (Lyhne and Ovesen, 1995). Processed foods have also been found to have higher glycemix index as compared to their unprocessed counterparts (Brand et. al, 1985).

Processed foods high in total fat, saturated fat and trans fat are the most deleterious for human consumption. In Ireland high levels of total fat and saturated fats were found in several fast food items. Seventy-seven percent of the fast foods were found to be high in Trans fatty acids (TFA) (FSAI, 2008). In Brazil, the food item with the highest contribution towards trans fatty acids among adolescents was margarine, accounting for more than 30% of total intake, followed by filled cookies and meat among adults and the elderly (Castro et. al, 2009). An investigation by Tavella et. al. (2000) revealed that all the samples of cookies and crackers, margarine, butter and sliced bread had trans fatty acids. The trans fatty acids as percentage of total fatty

acids were 8.2% in slice breads, 10.5 % in cookies and crackers, 27.5% in margarine, 4.63% in butter, 6% in flavored sticks and nil in potato crisps and mayonnaise.

Therefore, owing to the unfavorable composition, there are disturbing outcomes of consuming large quantities of processed foods and hence it becomes a matter of public health concern. Studies have shown a positive association of excess sodium consumption with gastric cancer, decreased bone mineral density, impaired Endothelium-Dependent Dilation (EDD) and obesity (Tsugane et. al, 2004; Devine et. al, 1995; DuPont et. al, 2013; He and MacGregor, 2009). Consumption of ready-to-eat snack foods has been linked to increase in waist circumference among adults (Halkjaer et. al, 2009). Several cancers have also been linked with unhealthy dietary pattern. Among Iranian female patients with breast cancer, women with healthy dietary pattern had 75% decreased risk of breast cancer whereas women with unhealthy dietary pattern had a significantly increased breast cancer risk. The 'healthy' food pattern was defined as the consumption of vegetables, fruits, low-fat dairy products, legumes, olive and vegetable oils, fish, condiments, organ meat, poultry, pickles, soya and whole grains whereas, the 'unhealthy' food pattern was characterized by the consumption of soft drinks, sugars, tea and coffee, french fries and potato chips, salt, sweets and desserts, hydrogenated fats, nuts, industrial juice, refined grains and red and processed meat (Karimi et. al, 2013). "Processed" meat has been linked with a 30% higher rate of cardiovascular disease (CVD) and also higher cancer mortality as compared to consumption of "unprocessed" meat. The preservatives present in the processed foods are leading risk factors for these morbidities (Micha et. al, 2013).

Prevalence of obesity in children has been linked with the consumption of sugar-sweetened drinks. In Brazil, sugar and soft drinks consumption was found to be responsible for 13.4% of household energy availability and was correlated to the obesity prevalence (Lobato et. al, 2009). According to a study, for each additional serving of sugar-sweetened drink consumed, both body mass index (BMI) and frequency of obesity increased after adjustment for anthropometric, demographic, dietary and lifestyle variables. Hence, the consumption of sugar-sweetened drinks is directly associated with increasing obesity rates among children (Ludwig et. al, 2001).

High consumption of trans fat has been linked to the risk of coronary heart disease (CHD). Total dietary trans fatty acid content was significantly correlated with formation of erythrocytes, increased plasma low density lipoprotein (LDL) cholesterol, decreased plasma high density lipoprotein (HDL) cholesterol and increased plasma LDL/HDL ratio (Sun et. al, 2007). There are evidences that long-term TFA consumption is an independent factor in weight gain. Diets high in TFA were found to increase weight and intra-abdominal fat deposition in monkeys. TFAs enhance intra-abdominal deposition of fat, even on low calorie diet and are associated with insulin resistance due to impaired post-insulin receptor binding signal transduction (Kavanagh et. al, 2007). TFA consumption may also increase the risk of colorectal neoplasia, gallstone and distal colorectal cancer (Vinikoor et. al, 2008, Tsai et. al, 2005 and Vinikoor et. al, 2010). The prime source of TFAs is partially hydrogenated vegetable oils (PHVOs). Higher intakes of PHVOs are associated with elevated concentrations of inflammatory biomarkers, whereas higher intakes of non-hydrogenated vegetable oils are associated with lower plasma concentrations of the same (Esmaillzadeh and Azadbakht, 2008). PHVOs in the form of shortening and margarine can lead to adverse health effects (Tsai et. al, 2005). Therefore, to combat ill-effects of trans fatty acid consumption, immediate recommendations are required to limit TFA in diet and processed foods.

The increasing demand and supply of processed foods is attributed to their low production cost, long shelf-life and high retail value. There is parallel increase in economic status and consumption of processed foods in Low-Middle Income Countries (LMIC). The pace at which consumption is rising in LMICs is even faster than it took place in High Income Countries (HICs) in the past (Stucker et. al, 2012). There has been decline in the price of ready to eat foods and food prepared away from home over the years which has lead to increased intake of energy, sugar and fat (Powell, 2009; Drewnowski, 2007; Chou et. al, 2004; French and Stables, 2003; Epstein et. al, 2006; Ni-Mhurchu et. al, 2010; Finkelstein et. al, 2005; Chan et. al, 2008; Lakdawalla et. al, 2005; Christian and Rashad, 2009). Another study found that price rise has lead to reduced soft drink sales (Block et. al, 2010). A 10% increase in fast food prices has directed to 0.7% decrease in obesity rate (Chou et. al, 2004). Consumers tend to buy more of the same food product, even if the food has already been bought when prices of the commodities are slashed down or there are discounts on the product (Ni-Mhurchu et. al, 2010; Chandon and Wansink, 2002). Psychologically, price reductions of the commodities diminish the feeling of guilt among the consumers even if they buy unhealthy food (Thomas et. al, 2011).

Econometric studies propose that lower food prices have led to increased energy intake (Finkelstein et. al, 2005; Powell, 2009; Christian et. al, 2009; Lakdawalla et. al, 2005; Drewnowski, 2007)

A theory of "dietary dependency" proposes that integration into the global economy makes a country's food systems dependent on imports and investments by large multinational processed food firms (Stuckler and Siegel, 2011). When this happens in LMICs, their population's consumption choices and habits are invariably affected by shifts in food type, price, availability and marketing which in turn favor availability of unhealthy commodities (Rayner et. al, 2006).

Over the time, new systems of food provisions have also developed namely, supermarkets specializing in processed foods, upcoming of restaurants and a range of styles of fast foods, accelerating transition towards western dietary pattern (Caplan 2002). Increased consumption of biscuits, salted snacks, prepared sweets, edible oils, and sugar has been reported over the last two decades in urban areas (Vepa, 2004).

The Indian consumers have been responding to changes in quality of food intake and are becoming more conscious about nutritional diet, health and food safety issues (Deininger and Sur 2007). Traditionally, Indian consumers have preferred fresh and unprocessed food over processed and packaged food, however the recent changes in consumption patterns, particularly in middle and high income groups have shown generous opportunities for processed food segments in the country (Deininger and Sur 2007; Goyal and Singh, 2007). There is also increasing penetration of multinational companies which is fuelling processed food consumption (Stuckler et. al, 2012).

Therefore, to enumerate, factors responsible for increasing demand of processed foods are:

- Changing family structure: increasing nuclear families, singles living away from home.
- Increasing number of working women.
- Eating out pattern.
- Convenience seeking behavior and dislike for cooking (Anderson et. al, 2011; Dave et. al, 2009).
- Adding variety to menu.

- Affordability of processed foods as they are comparatively cheaper than fresh fruits and vegetables (Powell, 2009).

Food processing dates back to pre-historic times but rapid advances in food processing took place during the 20th century that continued to promote preservation and safety with more innovative techniques like refrigeration, freezing, dehydration, acidification, irradiation, extrusion, extraction, filtering, concentrating, microwaving, sterilizing, and packaging (Floros et. al, 2010). Processed foods have been assigned a set of definitions by International Food Information Council (IFIC), (2010) on the basis of processing level under which a food is subjected. They are classified as (A) Minimally processed foods, (B) Foods processed for preservation, (C) Mixtures of combined ingredients, (D) Ready-to-eat processed foods, (E) Prepared foods/meals. Ready to eat processed foods contribute more of unhealthy nutrients (energy-34%, total sugar-45% and added sugars-60%) and relatively less healthy ones (Vitamin C-25%, Vitamin D-23%, Calcium-23, Potassium-24%). ''Minimally processed'' foods provide proportionally low contributions to daily energy and sugar intake with a large percentage of contributions to the daily intake of several nutrients essential for nutrient adequacy, disease prevention and overall good health (fiber-20% and protein-26%) (Eicher-Miller et al, 2012).

Over the last three decades, the household consumption of "minimally processed foods" and "processed culinary ingredients" foods has been steadily replaced by consumption of "ready to eat food products", both overall and in lower and upper income groups. In the 2002-2003 survey, "ready to eat food products", items represented more than one-quarter of total energy (more than one-third for higher-income households). The overall nutrient profile of "ready to eat food products", compared with that of "minimally processed foods" and "processed culinary ingredients" items, revealed more added sugar, more saturated fat, more sodium, less fibre and much higher energy density (Monteiro et. al, 2010c). Meanwhile, the food industry spends massive amounts of money marketing calorie-dense, nutrient-poor foods, and its marketing specifically targets children. The obesity crisis cannot be solved without dramatic changes to the obesogenic marketing environment that surrounds children (Harris et. al, 2009).

Therefore, with the increasing consumption of processed foods and thereafter their ill-health effects, it has become important for the consumers to be aware of how to

make healthy food choices from the wide range of processed foods available. This can be done by knowing the importance and understanding food labels.

Food label/ nutrition labeling is a medium which helps the producers to communicate the nutritional properties of the food to the consumers. It is a tool to promote and protect public health by providing nutritional information to the consumers while on the other hand it acts as an instrument of marketing and product promotion for the producers (Kumar and Ali, 2011b). Therefore, "Nutrition Labeling includes any written, printed or graphic matter that is present on the label, accompanies the food, or is displayed near the food, including that for the purpose of promoting its sale or disposal." (Codex, Guidelines on Nutrition Labeling, CAC/GL 2-1985)

Nutrition labeling of foods began in 1970s and initiated by Food and Drug Administration (FDA). It began with the aim of containing nutritional deficiencies. Nutrition labeling was voluntary during that time however, the same was mandatory if a nutrient was added to a food or a nutrition claim was made. During 1980s, with the increasing evidences about diet and health, consumer interest about healthy diets also began to rise. Consequently, food manufacturers took advantage of consumer's interest and therefore nutrition claims on the labels proliferated. With the increasing number of claims about the food products, the question about their credibility soon began to come up among consumers. This led the US Congress to pass Nutrition Labeling and Education Act (NLEA) in 1990, amending 1938 Federal Food, Drug, and Cosmetic Act. The NLEA directed the FDA to develop regulations regarding the declaration of certain nutrients on the packaged food labels. It also allowed manufacturers to voluntarily use nutrition and health claims provided that they should be truthful and non-misleading. FDA had the responsibility of protecting consumers from fraudulent labeling and also to encourage manufacturers to formulate foods with better nutrient profiles (e.g. foods with low sodium and saturated fat) (NLEA, 1990). Gradually, with the increasing consumption of processed foods among the populations of the world nutrition labeling regulations were laid down in almost every nation of the world to protect the health of the people. Internationally, Codex Alimentarius takes care of the food regulations around the world. However, each country has its own food regulations based on Codex. For example in US it is NLEA and US-FDA, UK it is Food Standards Agency (FSA) and in India-Food Safety and Standards Act (FSSA). FSSA was established in 2006 by repealing eight food laws/orders which were followed in India earlier. Therefore, to end the confusion in the minds of consumers, traders, manufacturers and investors due to multiplicity of

food laws, FSSA was established to consolidate the food laws. However, it is still in its infancy stage and nutrition labeling laws are underway.

Nutrition labeling serves several purposes for consumers as well as manufacturers such as,

- Nutrition labeling reduces the search costs in terms of time for consumers to meet their desired food choices (Kumar and Ali, 2011b).
- Nutrition Labeling enable informed dietary choices which helps in preventing and managing health conditions.
- Nutrition labeling provides standardized presentation of nutrition information which reduces consumer confusion.
- It allows comparisons among variety of foods available in the market.
- It encourages producers in healthy product development and reformulation.

To make use of the nutrition labels it is very important for the consumers to understand and comprehend the given information on the product label. The information on the label is given at the front-of-pack (FOP), back-of-pack (BOP) and/or side-of-pack (SOP), according to the kind of package. FOP labeling is characterized by short, precise declaration about nutrients or ingredients in the form of nutrition claims (e.g. low in fat, source of calcium) and health claims (e.g. good for heart, for healthy bones). It also contains symbols and logos which help in identifying a quality and authentic food product. Examples of symbols and logos are vegetarian and non-vegetarian symbol, Agricultural Marketing (AGMARK), Hazard Analysis Critical Control Point (HACCP), Fruit Product Order (FPO), Healthy Choice, Smart Choice, etc. Symbols and logos, nutrition and health claims can be declared either on FOP or BOP or both. As compared to FOP labeling, BOP labeling provide more detailed information about the food. It includes ingredients list, allergen information, Nutrition Facts Panel (NFP), information about preservatives, colors, flavors with other miscellaneous information like best before and expiry date, batch number, manufacturer's address, etc. (Codex Alimentarius, amendment 2010; FSSA, 2011).

Consumer awareness on food labels has an impact on usage, understanding and healthy food habits. Merely providing nutrition information on food labels does not lead to healthy food choices. In fact, there is a wide gap between having information about foods and possessing the ability or willingness to act on the given nutrition information. Like any other tool, nutrition labels also require some elementary skills to read, understand and comprehend (Taylor and Wilkening, 2008). Though the

practice of looking at the nutrition labels at the point of purchase vary from region to region, still it is low almost everywhere (Signal et. al., 2007). Consumer reading of nutrition labels is low because they find the information on labels too technical to understand (Annunziata and Vecchio 2012). Nutrition label usage depends on various demographic factors namely, gender, age, educational level, occupation, income group, family type (single/nuclear/joint family), medical condition, lifestyle and race. Studies have shown that females, youngsters, higher educational level, higher income group, families with children, individuals with medical conditions, hedonist individuals make use of nutrition information while making a food choice (Grunert et. al, 2010; Grunert et. al., 2010b; Ranilovic and Baric, 2011; Vijayabaskar and Sundaram, 2012; Stran and Knol, 2013; Pelletier et. al, 2004; Rothman et. al, 2006; Berreiro-Hurle et al, 2010a; Satia et. al, 2005; Gracia et. al, 2007; Annunziata and Vecchio, 2012; Lewis et. al, 2009). No correlation is established between occupation and nutrition label usage (Basil et al, 2009). Consumer studies have shown that consumers do not read nutrition labels because of time constraints and disinterest in reading (Barreiro-Hurle, 2010a). As consumer understanding and usage of food labels is low due to time constraints therefore it is very important for the regulating agencies to develop easy to understand "user friendly" and less time consuming nutrition labeling in order to facilitate better usage of nutrition labels in making healthy food choices. Many countries have already initiated in this direction. Some of the initiatives towards easy to understand FOP labeling by various countries are Keyhole Program (Sweden, Denmark, Norway), Facts Up Front (USA), Traffic light Labeling (UK), Guideline Daily Amounts (GDAs) (UK), Pick the Tick Program (New Zealand), Healthy Choices Program (Netherlands), Smart Choice Program (USA), Guiding Stars Program (USA) and Healthier Choice Pyramid (Singapore) (Bozhinov and Chrysochou, 2012; FSA, 2007a; Grunert et al, 2010b; Young and Swinburn, 2002; Vyth et. al, 2010; www.FactsUpFront.org; http://www.smartchoicesprogram.com; www.guidingstars.com; http://www.hpb.gov.sg). In India no such programs have been initiated yet. Sometimes, nutrition labeling does not comply with the food regulations and therefore, it is a must to verify the nutrition labeling information from time to time in order to prevent consumers from any fraud. Studies on reported versus estimated nutritional values of the processed foods are scanty in India, except the one done by Centre for Science and Environment, New Delhi (Johnson et. al, 2012).

Chandorkar and Joshi (2012), reported poor compliance of the processed food labeling with regard to reporting of sugar (76%) and fat (87%). A similar study done

by National Institute of Nutrition (NIN), India, reported non-compliance of energy values on the food packages (Laxmaiah et. al, 2009). Several studies have been done to assess the nutritional quality of the processed foods in various parts of the world. Studies in Brazil and Canada have shown that processed and ultra-processed products are more energy dense, have more free sugars, sodium and saturated fats and have less fiber than their unprocessed or minimally processed counterparts (Monteiro et. al, 2011; Moubarac et. al, 2013). Therefore, diets that include a large amount of ultra-processed foods are likely to be nutritionally unbalanced and unhealthy (Monteiro, 2009; Monteiro et. al, 2011). This calls for the need to understand and comprehend food labels correctly so as to make healthy food choices.

Thus, the rationale of the study is:
- There is a parallel increase in processed food consumption and incidence of NCDs.
- Inconsistencies in labeling are prevalent as the nutrition labeling regulations are still underway.
- In India, not much has been done on the consumer awareness on nutrition labeling and compliance of nutrition labels with the guidelines.
- No database on composition of processed packaged foods is available in India.

Broad Objective

To study the food labels, their compliance with Food Safety and Standards Act (FSSA) of India and Codex Standards, composition of processed packaged foods and to understand the consumer knowledge, attitude and practices towards consumption of the same.

Specific Objectives
- To assess frequency and consumption of processed packaged foods among consumers of Urban Vadodara.
- To examine in details various components of food labels of processed packaged foods commonly consumed by study population.
- To evaluate various components of food labels for their compliance with Food Safety and Standards Act (FSSA) of India and Codex Alimentarius.

- To analyze the selected processed packaged foods for "nutrients of concern" namely, sodium, potassium, sugar, dietary fibre and fatty acid profile.
- To compare the analyzed values of nutrients of concern with those reported on food labels.
- To determine the factors associated with selection of processed packaged foods by the consumers.
- To assess the ability of consumers to comprehend food labels and identify the knowledge gaps.
- To carry out capacity building of consumers towards healthy food selection using appropriate intervention tools.