2. REVIEW OF LITERATURE

The review of literature pertaining to the study “ASSESSMENT OF NUTRITIONAL, MICROBIAL AND HYGIENIC ASPECTS OF FOODS SOLD BY SMALL MOBILE FOOD VENDORS IN SALEM DISTRICT” is reviewed under the following headings:

2.1. Overview about vending foods
2.2. Nutrition related Literature
2.3. Food adulterant
2.4. Microbial quality of street foods
2.5. Food safety knowledge and attitudes towards vendors
2.6. Importance of Personal Hygiene Practices

A street vendor is broadly defined as a person who offers goods for sale to the public without having a permanent built-up structure from which to sell. Street vendors may be stationary in the sense that they occupy space on the pavements or other public/private spaces or, they may be mobile in the sense they move from place to place by carrying their wares on push carts or in baskets on their heads. In this essay, the term ‘street vendor’ includes stationary as well as mobile vendors and it incorporates all other local/region specific terms used to describe them.

Street vended foods are interpreted by Von Holy and Makhoane (2006) as “foods and beverages prepared and/or sold by vendors in streets and other public places for immediate consumption or consumption at a later time without further processing or preparation.”

2.1. Overview about mobile vending foods

A mobile food vending vehicle is any means of transport, whether self-propelled or not or otherwise designed to be movable from place to place, and which is used for selling food, whether on land, sea or air. It includes vehicles used for on-site food preparation (e.g. hamburgers, hot dogs and kebabs), one-step food preparation (e.g. popcorn, fairy floss, coffee and squeezing juices), and the sale of any type of food including pre-packaged food.

The Food and Agricultural Organization (FAO) of the United Nations defines street foods as ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers especially in streets and other public places.

The term 'street food' refers to a wide variety of foods and beverages prepared and/or sold by vendors and hawkers especially in streets around trading centers and other public places for immediate consumption or consumption at a later time without further processing or preparation (von Holy and Makhoane, 2006). Whereas most street foods are prepared on a
daily basis using a variety of locally available ingredients in order to suit the local tastes and preferences, others are commonly manufactured by local food processing industries, while some may be imported (Mensah et al., 2002).

In many other developing countries, street foods provide income and livelihood for many communities particularly the low-income persons. Currently, street food vending is probably the single largest employer in the informal sector providing affordable and convenient meals, drinks and snacks to the majority of people especially on journeys, those working in urban centres and a high proportion of low-income earners in their residential areas. The majority of people depending on street-vended foods are often more interested in their convenience than safety, quality and hygiene (Kumar et al., 2006).

Although street vended foods are very common in developing countries, there is paucity in data and studies regarding the incidence of foodborne diseases related to these foods. However, it has been recognized that the conditions under which street vendors operate are often unacceptable for the purposes of preparing and selling of food (Bryan et al., 1988; Mosupye and Holy, 2000). Street food vendors are very often poor, uneducated and show little concern towards the safe handling of foods, and food safety knowledge and practice (WHO, 1996). Consequently, some serious concerns do exist about the safety of street food (FAO, 2013).

The popularity of street food vending is spreading rapidly all over the world due to several reasons viz., economic and industrial developments followed by tremendous increase in urban population at an average annual growth rate of 4.2%, which is likely to continue in the years to come. Besides an increase in the number of working women over the last decades, from 76.2 to 105.7 million, employments far away from the home, modern life style compels both men and women to go to work and giving less time to cook at home (Koodagi et al., 2013).

2.2. Nutrition aspects of mobile vending foods

Vaid and Dave (2006) have reported in his study that Handwa, a fermented savory of Gujarat state served as main meal, or as a snack item. Cooked handwa was analyzed for pH, ash, iron, carbohydrates, and protein. After fermentation, pH of batter decreased from 4.79 to 3.77. Solar cooked handwa had the highest pH (3.89) while conventionally cooked had pH 3.78. Moisture content was the least in microwave-cooked handwa (39.89gm per 100gm) while highest in conventionally cooked handwa having 54.4gm per 100gm.

Vasavada and Dave (2006) in a study made different variation in ingredients for preparing dhokala and it was compared with the traditional Dhokala for its nutritive value.
Traditional dhokala (A) was prepared by using rice, black gram dal, Bengal gram dal, curd and salt. Variations were made using dry Corn (B) and Kodri (varagu) (C) instead of rice. Total amount and rest of ingredients and procedure were kept same. Carbohydrate content was highest in sample (A). Free amino acid, protein, iron, thiamine, riboflavin and fat were highest in sample (B), while calcium content was highest in sample (C). It was found that variation of corn improves free amino acid, protein, iron, and riboflavin and thiamine values. It is also moderately acceptable. Its texture was very good but the flavor and taste were found average Variation of kodri improves calcium and other nutrient comparatively traditional sample. Its acceptability was highest. Its color and flavors were found highest compared to other two samples. It is also concluded that both the modification were found highest in nutritive value and in acceptability.

Dave (2004) had reported that Vada is traditional fermented food, which is commonly prepared from fermented black gram dal and rice. Adding buttermilk or curd and warm water and allowing the mixture to stand at room temperature for at least eight to ten hours for fermentation before deep fat in frying was drained out paper. In present study, different variations were made in ingredients of vada like soybean, green gram, cheese and coconut. Carbohydrate was high in sample A compared to sample B, C and D. Free amino acids, protein, iron and calcium were found to be higher in sample B, C and D. Calcium, iron and fat content were found the deep frying was done in hot oil till golden brown.

A study done in Jakarta by Kampen (1998) compared the quality of streets food with similar home-prepared food, and food from tourist hotels. They found that even food from five star hotels were not always safe. A study done in United Kingdom by Powell and Attwell (1995) showed that there was no correlation between inspections rating and bacteriological counts of foods. However, there were no such data for Malaysia, Bangkok, Thailand, coli form bacteria were found in more than 50 percent of the food samples (Dawson, 1996).

Kamaliya (2006) in his study planned to enrich commercially available bread with wheat bran (WB) and analyzed its nutritional merit to find out its possible uses in the dietary management of people suffering from various chronic diseases. Good quality raw materials were purchased from the local market of Vallabh Vidhyanagar and Anand. One method of bread preparation was selected through market and literature survey. Both the breads (EB-Experimental Bread and CB-Control bread) were analyzed for only moisture (AOAC, 1970). However the carbohydrate and energy value were reduced in EB as compared to CB, Both the situations have beneficial effect on chronic diseases. Calcium, phosphorus and iron
content were estimated 2 to 3 times higher in EB as compared to CB, which is again beneficial in some deficiency diseases and even to healthy human beings.

Mubeen and Sarkara (2006) had carried out the nutritional composition, terrible acidity and pH of Yoghurt estimated before and after inoculation and fermentation. pH of the yoghurt samples was obtained by „Elico” pH meter model No-L1-163. (Protein was estimated by Kjeldahl method, fat by Soxhlet method, (AOAC, 1970). Sodium and potassium was estimated by ELICO” S flame photo meter. The percent change of ash value was increased by +25.58, which was significant (P<0.05), the percent change of protein level was +51.12 which was highly significant increase. Increase of fat the percent decrease after fermentation was -29.80, which was found to be highly significant.

Goswami and Mehta (2006) had reported that dahi is highly nutritive and its therapeutic value is also high as it gives protein, riboflavin and calcium in highest range. The procedure carried out included taking 100 ml of Goat’s milk in a clean container and then heating at 95°C for 5 minutes while cooling at 40°C. The suspension of homogenized 50 ml egg white was added in goat’s milk mixed well then 2ml of pasteurized Amul milk was added and again mixed well. This seeded milk 100 ml was transferred into 150 ml of big china clay pot and incubated at 34°C for about 8 hours. The pH was measured by using pH meter, which falls on 3.5. Now 100grams of Bengal gram flour is added along with approximately 5 grams of sugar and mixed well then again it was kept for incubation process for about 10 hours. The batter is mixed well with 5 grams of salt (as per taste) and 10 ml of Luke warm water and dispended in small bowl and steamed at 110°C for 10 minutes. Standard recipe was prepared using same procedure except it was not fortified with egg white. From the observations it can be concluded that the nutritive value of carbohydrate, protein, iron, calcium, riboflavin, and thiamine increased in enriched fermented food compared to standard fermented food recipe but the fat content decreases. The product acceptability of this recipe was generally good and there were remarkable increase found.

In a study conducted in Gujarat, India shown that there were different types of cakes and unsorted cakes. It provides larger share of energy, proteins, fat and carbohydrates than any other nutrients to the body. It is often called the stuff of life. The food value of shortened cake provides important amount of energy giving nutrients and also provide minerals like iron, Ca+2 etc. In present study analysis of different nutrients from commercially available shortened cake, which was collected from Rajkot City, were done by Standard Chemical methods. Finding shows that the entire samples were found good for health and nutrition (Mehta 2004).
Rathod and Rupapara (2004) carried out a study of synthetic fruit juices powder that were available in the market which were dissolved in water and served, or in the form of bottle syrup. Synthetic fruit flavors and colors were added in the powder. These juices provide some vitamins, minerals, and sugar, depending on fruit used. In the present study analysis of different nutrients from commercially available synthetic fruit juice powder, this was collected from Rajkot City.

2.3. Health effects of Food adulterant

A Substance added to food-item to reduce its quality in order to increase its quantity is called as an adulterant. Adulteration, the act of debasing a pure or genuine commodity for pecuniary profit, by adding to it and inferior or spurious article, or by taking from it one or more of its constituents. The term is derived from the Latin word *adultero*, which in its various inflections signifies to defile, to debase, and to corrupt.

Food adulteration in India includes both willful adulteration and substandard food which do not confirm to prescribe food standard. Rarely any food item is spared from malicious practice of food adulteration. According to a news article published in year 2002, The Times of India Hyderabad: “There might be iron filings in the sugar you use, including what is distributed through fair price shops all over the state.

The adulteration of food products is of primary concern for consumers, food processors, regulatory agencies, and industries. Adulteration typically involves replacing or diluting high-cost ingredients with less expensive ones. Thus, once a food product is identified as being adulterated and with what substance, rapid quantitative analysis of the adulterant is needed.

In our daily life, we come in contact with dozens of unhygienic and contaminated food products which put really bad effect on our health. Most of these food products just mix up into our daily food and contaminate our health. An adulterant is a chemical substance which should not be contained within our food, beverage, and fuels. Adulterants may be intentionally added to more expensive substances to increase visible quantities and reduce manufacturing costs, or for some other deceptive or malicious purpose. Adulterants may also be introduced into food products by accidentally or unknowingly. The substance, which lowers or degrades the quality of food material, is called an adulterant.

Fraud in food sector has been common since ancient times. Food adulteration tends to be economically motivated and is achieved through the addition, substitution or removal of food ingredients (Moore, Spink, & Lipp, 2012). It is an issue that concerns not only consumers, but producers and distributors as well. In the recent past, food fraud has become
more sophisticated due to the use of unconventional or synthetic adulterants, which has resulted in growing concern about associated health risks (Krska et al., 2012). To guarantee food safety and quality, most analytical strategies are based on the knowledge of the contaminants (Haughey, Graham, Cancouët, & Elliott, 2013). The ever-increasing ranges of analytes that can be used in food fraud together with the impossibility of covering them all make these strategies not always suitable for food adulteration problems. Otherwise, covering the widest possible range of analytes usually requires sophisticated analytical equipment such as chromatographic or mass spectrometry devices (Calvano, De Ceglie, Monopoli, & Zambonin, 2012; Di Stefano et al., 2012; Karoui & De Baerdemaeker, 2007).

There is increasing demand for the development of fast, easy-to-use and low-cost analytical methods to test for adulteration. Methods based on spectroscopic techniques offer these advantages and their combination with multivariate chemometric techniques turns into a powerful tool for adulteration testing (Ghosh & Jayas, 2009; Karoui & De Baerdemaeker, 2007). Some examples of ultra violet (UV) (López-Díez, Bianchi, & Goodacre, 2003), fluorescence (Kunz, Ottaway, Kalivas, Georgiou, & Mousdis, 2011) and Nuclear Magnetic Resonance (NMR) (Consonni, Cagliani, & Cogliati, 2012) techniques can be found in the literature. Within the field of spectroscopy, one of the most widely used techniques in the food industry is near-infra red (NIR) spectroscopy, which has shown successful results in testing food quality as well as food adulteration (Behmer, 2010; Guy, Prache, Thomas, Bauchart, & Andueza, 2011; Szigedi, Lénárt, Dernovics, Turza, & Fodor, 2012; Vitale et al., 2013).

Adulteration brings a lot of easy money for the traders, but it may spoil many lives. In these days we often hear news related to food adulteration which lead to slow poisoning and various kinds of diseases, and some time it can even result in death. Problem of Adulteration makes the food items used in our daily life unsafe and unhygienic for use. The traders use it for their economic benefit without thinking about its effect on the health of common population of our country, which consumes it.

Sudershan, R. V. et al. (2009) said that food safety in India was about 54.2% of the respondents did not know or associate diarrhoea as a symptom of food-borne disease, while about 50 to 70% did not know or associate abdominal pain, nausea and vomiting as symptoms of food-borne disease. When asked on storage of food, 75% reported to leave the cooked food at room temperature and only 29.4% of them consume the stored food after thorough heating. Only 6% of the respondents were inclined to complain about food adulteration and others were either ignorant or did not bother about it; 72% in the same study
did not take any action after an episode of food-borne disease outbreak in the village; about 50% of the respondents did not recognize food spoilage by smell. The findings of this study showed that there is a need to increase awareness pertaining to storage of food, recognition of food spoilage, symptoms of food-borne disease and action to be taken after detecting food adulteration/poisoning.

According to one survey conducted, adulteration were detected in milk to the tune of 70% with water, turmeric powder-43% with chalk powder, red chilli powder-100% with artificial colour, sugar 37% with chalk powder etc. (Kumar, Ashish. 2011). According to National Institute of Nutrition, in India some 4, 00,000 children below five years age die each year due to diarrhoea. Poor hygiene and unsafe drinking water routinely cause illnesses among the poorer classes. Danger lurks in the packaged food we find on kitchen shelves. Profiteers routinely adulterate food items like milk, dal, ghee, honey and so on. In recent years, food adulteration has evolved into a very profitable business, causing serious health hazards. Some can even cause cancer. (The Hindu, Life & Style>> Food, July 13, 2010).

A chunk of the green leafy vegetables sold in Chennai is found to contain toxic metals that have the potential to harm various organs of the body,” said D. Narasimhan, who has pursued research in floristic and plant biotechnology. Adulterations such as foreign leaves added to tea and chemicals added to powdered turmeric have the potential to cause serious health hazards. “Adulteration also happens when food grade chemicals exceed the limit. It causes cancer,” said a Corporation health official. The alleged availability of baby food products in the wholesale market for procurement and illegal packaging as branded products by unlicensed vendors in the central business district is also a cause of concern, says a retailer. “Such practices are illegal and could cause serious health problems for children,” said a health official. Label violation is considered as food adulteration, he added. (The Hindu, Tamil Nadu, July 20, 2009)

In 68.5% Households, wife (home-maker) buys the grocery. Majority of them never read the food labels. All the selected food items were adulterated ranging from 76 % to 11%. Mean percentage of purity was highest in literates (47.5 ± 22.48) than illiterates and just literates. Food borne illness was prevalent in households with low purity of food. Association was found between per capita income and percentage of purity (0.765) (Khapre, M.P., 2011). A survey conducted by the Indian Council of Medical Research (ICMR) also found high levels of pesticide residues in bovine milk and metals arsenic, cadmium and lead in infant formula canned products and turmeric (Srilakshmi, 2001)
Now a day’s several reports were accounted in various food items such as milk, spices, ghee oil. Adulteration in food is normally present in its most crude form; prohibited substances are either added or partly or wholly substituted. In India normally the contamination/adulteration in food is done either for financial gain or due to carelessness and lack in proper hygienic condition of processing, storing, transportation and marketing. This ultimately results that the consumer is either cheated or often become victim of diseases. Such types of adulteration are quite common in developing countries or backward countries. However, adequate precautions taken by the consumer at the time of purchase of such produce can make him alert to avoid procurement of such food (Agmark, India). It is equally important for the consumer to know the common adulterants and their effect on health.

2.4. Microbial quality of street foods

Food borne illnesses are a widespread public health problem globally. Developing countries bear the brunt of the problem due to the presence of a wide range of food-borne diseases (Abraham et.al., 1997). In India an estimated 4,00,000 children below five years age die each year due to diarrhoea. Several millions more suffer from multiple episodes of diarrhoea and still others fall ill on account of hepatitis A, enteric fever, etc. caused by poor hygiene and unsafe drinking water (Acharya, and Shah, 1999).

Potential hazards vary from natural and environmental contaminant to chemicals from the agriculture field, veterinary drugs growth hormones, food packaging, physical foreign bodies etc. However, microbiological hazards are considered as a greater challenge to food safety because harmful microorganisms can either proliferate in the food or in the human body once ingested (Tent, 1999). As mentioned earlier, insufficient knowledge, poor practices and operation in unsanitary environments are considered as the major risk factors leading to the production of microbiologically unsafe street foods.

According to the Centers for Disease Control and prevention (CDC) 31 pathogens are known to cause foodborne illnesses (CDC, 2013). Among the pathogens found in street vended food Bacillus cereus, Clostridium perfringens, Salmonella and Staphylococcus aureus are the most common ones (Bryan et al., 1988.; Mosupye and Holy, 2000; Umoh and Odaba, 1999).

Microbiological contamination of street foods has become a major public health concern (WHO, 2002). The majority of street food vendors are uninformed of good hygiene practices (GHP) (Mensah et al., 2002), which poses increased risk of contamination for most of the food products involved (Bhaskar et al., 2004; Tambekar et al., 2009). Epidemiological links between street foods such as ready-to-eat (RTE), viz: salad vegetables, sprouts, rice and
fish, and disease emergence have been previously reported in India, South Wales, Egypt and the Dominican Republic (Umoh and Odoba, 1999; Kumar et al., 2006).

In most parts of the world, food-borne disease incidences are more commonly associated with *Salmonella* serotype enteritidis (SE), *Vibrio cholera*, *Escherichia coli* serotype 0157:H7, *Listeria monocytogenes* and food-borne trematodes (Mensah et al., 2002; Wawa et al., 2009; Tambekar et al., 2011; Annan-Prah et al., 2011). The emergence of the above mentioned disease outbreaks is mainly linked to globalization of food supply that introduces pathogens into new geographical areas, exposure of travelers, refugees and immigrants to unfamiliar food-borne hazards, mutations in microorganisms, changes in the human population and changes in peoples’ life styles (WHO, 2002; CDC, 2008), all of which are also prevalent in many countries.

The presence in food of *E. coli* and other *Enterobacteriacae* such as *Enterococcus faecalis* is indicative of faecal contamination (Gelsomino et al., 2002) and suggests poor hygiene during preparation, handling and storage, lack of reheating and improper vending temperatures (Umoh and Odoba, 1999; Tambekar et al., 2011). Although some studies have reported the presence of *E. coli* 057:H7, *Listeria* spp. and other microorganisms in some processed dairy products sold in some parts of Uganda (Wawa et al., 2009; Mugampoza et al., 2011), limited studies have been conducted to assess the prevalence and levels of *E. coli* and *Salmonella* spp. and the factors predisposing street-vended foods to microbial contamination.

Pathogens present in street vended foods come from different sources and practices. Improper food handling can lead to transfer of pathogens such as *Salmonella*, *E.coli* and *S. aureus* from human body and environment into foods (Rane, 2011). Improper waste disposal have been associated with transmission of enteric pathogens like *Salmonella*, *Shigella* and *E.coli*. Contaminated water has been associated with pathogens such as *E. coli*, fecal streptococci, *Salmonella* and *Vibrio cholera* while vegetables and spices are associated with introduction of spore formers like *Bacilli* and *Clostridium* and pathogens like *L. monocytogenes*, *Shigella*, *Salmonella* etc (Rane, 2011). Improper storage temperature and reheating of food have been associated with production of heat stable toxins produced by pathogens like *C. perfringens* and *B. cereus* (Rane, 2011).

A study performed in the Dominican Republic showed that the aerobic mesophilic colony counts exceeded 8 logs CFU/g in beans collected from a vendor after being left overnight at ambient temperature (Bryan et al., 1988). In another study carried out in the Pakistan, aerobic mesophilic counts greater than 7 log CFU/g were observed in leftover beef
and rice collected from a vendor at a bus station (Bryan et al., 1992 b). It has been also reported in these studies that the average food holding temperatures were ranged from $26^\circ$ C to $50^\circ$ C which is ideal for the rapid growth of bacteria (Bryan et al., 1988, 1992 b). Utensils and equipment may also lead to microbial cross contamination of food with *S. aureus*, *E. coli* and *Shigella* due to contaminated water, dish cloth and handlers (WHO, 1996).

A number of observational studies have shown that street foods are sometimes held at improper temperatures, excessively handled by food vendors and sold at very dirty surroundings (WHO, 2001; Agbodaze D et al., 2005; Ghosh M et al., 2007) that make them prone to contamination. In addition, most of the vendors had either no formal education or few years of schooling. Therefore, they are unaware of in proper food handling and their role in the transmission of pathogens (Mensah P et al., 1999, Ashenafi M, 1995).

Knowing the microbiological quality of street vended foods is important factor to appreciate the safety problems related to street foods so that concerned bodies may take appropriate steps to improve safety and sanitation with respect to this economic sector (Muleta D and Ashenafi M, 2001a).

*Staphylococcus aureus* is considered the third most important cause of food-borne diseases in the world (Normanno et al., 2005). There are two major aggravations to its presence: the toxins production and antimicrobial resistance. *S. aureus* produces heat stable enterotoxins with demonstrated emetic activity (SEs; SEA to SEE, SEG to SEI, SER to SET). According to the authors SEs are a main cause of food poisoning that occurs after ingestion of foods contaminated with *S. aureus* by improper handling and subsequent storage at elevated temperatures. Symptoms are of rapid onset and include nausea and violent vomiting, with or without diarrhea. The illness is usually self-limiting and only occasionally it is severe enough to warrant hospitalization (Argudín, Mendoza, & Rodicio, 2010).

The main reservoir of staphylococci in humans is the nostrils, although staphylococci can also be found on hands. The microorganism is responsible for enormous variety of infections, such as subcutaneous and skin infections, osteomielites, pneumonias, abscesses, endocarditic and bacteremia (Gelatti, Bonamigo, Becker, & d’Azevedo, 2009). The prevalence of the bacteria in the population is so high that it is likely impossible to completely eliminate them. However, hand washing has been identified as one of the most important ways to prevent the spread of food-borne diseases.

Three factors are playing major role in the occurrence of food poisoning with regard to food handlers: knowledge, attitude and practice (Sharif & Al-Malki, 2010). Training programs are important for improving the knowledge of food handlers; however, more
knowledge of food safety practices does not always lead to positive changes in food handling behaviors (Ansari-Lari, Soodbakhsh, & Lakzadeh, 2010).

Most food borne illness is preventable if food protection principles are followed from production to consumption to ensure safety but is practically impossible to apply in developing countries. Therefore, the critical link in the chain should be home food preparation to prevent contamination during its handling, preparation, and storage. Studies showed that consumers have inadequate knowledge about measures needed to prevent food borne illness at the home level (Mederios et al., 2001; Altekruse et al., 1996; Scott, 1996; Bryan, 1988).

2.5. Food safety knowledge and attitudes towards vendors

Food safety, an increasingly important public health issue (WHO, 2004), refers to the conditions and practices that preserve the quality of food to prevent contamination microbes or toxic chemicals resulting in food borne illness. Food can be already contaminated with microbes, infected during the packaging process or mishandled, improbably cooked or stored. It can also be contaminated by potential undesirable compounds that can be natural i.e. mycotxins, environmental i.e. dioxins, agrochemicals i.e. pesticides etc (Seyfang, 2007).

Food safety is the assurance that food will not cause any harm to the consumers when taken in its current state and as it is (FAO/WHO, 2001). Food-borne diseases and zoonoses exerts a major toll on health as thousands of millions of people fall ill and many die as a result of unsafe food. Serious outbreaks of food-borne diseases and zoonoses have been documented on every continent illustrating both their public health and social significance. Due to this, WHO (2000) recognized food safety as an essential public health priority and later on adopted the WHO Global food safety strategy (WHO, 2002).

According to the WHO (2000) Global food safety strategy, traditional food safety management systems have not been effective in preventing food-borne diseases and zoonoses over the last decades. The strategy therefore, advocates food safety programmes based on a broader science based concept of risk assessment, risk management through process controls along the entire production chain and risk communication. This is a farm to table approach and involves considerations of every step in the chain, the community and all actors from raw material to consumption. The strategy also advocates sustainable agriculture production systems and redirection of some of the existing approaches to ensure they meet the challenges of global food safety (WHO, 2002).

Knowledge is defined as “a complex process of remembering, relating, or judging an idea or abstract phenomenon (cognitive abilities)” (Gotsch et al., 2012). On the other hand
attitude is defined “as a state of mind, feelings, or beliefs about a particular matter (affective abilities) (Gotsch et.al., 2012). In other words attitude is the mental state in which someone is ready and motivated to move to action. Attitude is shaped by knowledge, which itself is a product of exposure to sources of information and personal willing in obtaining information (McIntosh et al., 1994). Knowledge, attitude and practice can also be shaped by habits and other perceptions that result from social, cultural, and economic influences (Rozin and Fallon, 1980). In a nationwide study conducted in the UK in 1993 (FDF-IEHO, 1993), it was observed that 45% of consumers were discouraged from eating some types of food because they knew the possible risk of food poisoning.

Food safety is a vital issue both in developed and developing countries; given that food borne illnesses contribute to millions of illnesses and thousands of deaths annually (Pilling et.al., 2008). It is becoming a key public health priority, because a large number of people take their meals outside the home. As a result, they are exposed to food borne illnesses that originate from food stalls, restaurants and other food outlets. Food service employees are a crucial link between food and consumers. World Health Organization (WHO) has developed five main keys to safer food, which include keeping clean, separating raw and cooked food, cooking thoroughly, keeping food at safe temperatures, and using safe water and raw materials (WHO, 2007). These five keys to safer food are of immense importance in developing countries, and equipping food vendors in countries with such information could impact significantly on food safety. However, very little is known about how street food vendors themselves perceive and prioritize food safety knowledge and practice.

Many studies have been done to assess food safety knowledge and attitude of street food vendors; in comparison to developed countries, very few studies have been conducted in the third world countries on the consumer’s food safety knowledge and attitudes in general and no studies could be found regarding street food consumers. Although it was observed that an unknown proportion of foodborne diseases could be prevented by actions taken by the consumers themselves (Muzaffar, et al., 2009).

According the Food Agriculture Organization (FAO), when selecting a street food vendor, consumers attach importance to hygiene; however they are often unaware of the health hazards associated with street vended foods (FAO, 2013). Many people do not know the basic rules of food hygiene (Sockett, 1995). It has been shown in available literature that attitudes and knowledge of consumers in general differ according to their demographic and socio-economic (e.g. gender, age, sex and educational level) background (Wilcock et.al., 2004).
According to Altekruse et al. (1999), men were more likely to report risky attitudes than women and the prevalence of risky behavior also increased with increasing socioeconomic status. In their study it was observed that food handlers with college and university education had a higher score in food safety knowledge compared to those with incomplete or completed high-school education, trained workers scored significantly higher also than untrained workers.

Another study conducted in Belgium indicated as well that male consumers attached more importance to safety compared to female (Verbeke and Viaene, 1999). Unklesbay et al. (1998) in a study conducted in the US found that students enrolled in a type of program that included food safety information had higher food safety knowledge compared to others. Change in lifestyle has been also shown to have an influence on consumer’s attitudes toward safe handling of food. In a nation-wide postal survey conducted in the US, it has been shown that consumers had poor knowledge on the organisms responsible for food poisoning, which type of foods were associated with these microorganisms, the need of avoidance of cross contamination and the importance of proper cooking (Williamson et al., 1992).

Woodburn and Raab (1997) also reported that respondents could not identify which groups of people were particularly at risk of food poisoning and what a foodborne illness was. There is more interest of consumers in convenience and saving time than in proper food handling and preparation (American Meat Institute, 1996) and consumers often use their senses in their descriptions of safe food, and feel that food that looks or smells bad should not be eaten (Seward, 2003).

According to Hines et al., (1987) both declarative (knowledge of issues) and procedural knowledge (knowledge of action strategies) are essential for behaviour change. However, knowledge was not turned into safe practices, not even by those vendors who had obtained formal training in food safety. Our study did not find any statistically significant association between knowledge score and socio-demographic characteristics except for age, race and marital status (p<0.05) that is overall, young food vendors have less than optimal levels of food safety knowledge and safe food handling best practices.

### 2.6. Importance of Personal Hygiene Practices

The human body provides protection against external environment pollutants to some extent. However, skin cracks and wounds can allow pathogens to enter the body. For this reason, personal hygiene is one of the most important practices in terms of protecting the body from diseases. Hygiene is a personal matter. Hygiene practices, taught during childhood
by mothers, fathers or teachers, mostly through practicing, need to be continued by the individual after childhood. Correct adoption of these habits has a direct impact on a person’s future health (Meggitt, 2000). Hygiene behaviour includes hand hygiene, personal care, home hygiene and food hygiene. Individual hygiene behaviours can be affected by many factors, including beliefs, values, habits, socio-economic and cultural factors, level of knowledge, Personal preferences, family characteristics and physical and social characteristics of the work and living environments. Therefore, the hygiene habits of each individual differ, meaning that these habits are unique to individuals (Görgülü et al, 2000).

The most important aspect of maintaining good health is good personal hygiene. Personal hygiene which is also referred to as personal care includes all of the following: Bathing and Showering, Hair care, Nail care, Foot care, Genital care and Dental care. Personal hygiene is keeping the body clean, and helps prevent the spread of germs. Grooming is caring for fingernails and hair. Examples of these activities would be styling hair, shaving, trimming and painting fingernails. Maintaining good health also includes the following areas: Nutrition, Leisure/recreation opportunities, sleep, and exercise. As you can see, there are many factors that contribute to feeling and looking good. Feeling and looking good are important to each individual’s emotional and physical wellbeing. Maintaining personal hygiene is necessary for many reasons; these can be personal, social, for health reasons, psychological or simply as a way of life. Essentially keeping a good standard of hygiene helps to prevent the development and spread of infections, illnesses and bad odours.

Many people, women in particular, are very conscious of their hygiene needs and practices. This can be a result of being taught of the importance from an early age, from being picked-on at school for head lice or similar, or as a way of making themselves more attractive to the opposite sex. Self-esteem, confidence and motivation can all be altered by our body image, often reflected on our ability to care for ourselves and keep good hygiene practices. A bright white smile with clean and healthy teeth can endear people to us, whereas brown, unhealthy teeth can cause embarrassment and can alter our sense of well-being. Healthy hair, skin and nails are signs of a good well-balanced diet and can give us confidence in everyday life.

According to WHO (1989), food handling personnel play an important role in ensuring food safety throughout the chain of food production, processing, storage and preparation. Mishandling and disregard of hygienic measures on the part of the food vendors may enable pathogens to come into contact with food and in some cases to survive and multiply in sufficient numbers to cause illness in the consumer.
Some food handlers may introduce biological hazards by cross contamination after handling raw materials when they suffer from specific diseases (Ohiokpehai, 2003; Mensah et.al., 2002) and physical hazards by careless food handling practices. Most of the vendors pack the food in polythene bags for their customers. When packing these foods, they blow air into the polythene bags to open them, in this process a number of pathogens can be passed on to the consumer.

A study in Santa Fe de Bogota, Colombia revealed that over 30% of a group of food handlers examined were carriers of pathogenic microorganism including Salmonella typhi, Staphylococcus aureus, Salmonella enteritidis, and Shigella (Buchanan et.al., 1998).

2.7. Control Measures and Initiatives to Improve Street Food Vending

A logical step towards reducing the risks of food borne illness from street foods would be controlling the steps in food preparation and sale that may contribute to the contamination, growth and survival of the microbes responsible for food borne illness. The efforts made should focus on (a) educating the food handlers (b) improving the environmental conditions under which the trade is carried out (c) providing essential services to the vendors to ensure safety of their commodities (WHO, 1996).

To enable official recognition and control of the street food industry as an integral part of the food supply, appropriate regulations should be prepared, and incorporated into existing food regulations. FAO has implemented and supported several projects which aimed at improving various aspects of the street food sector in countries like Bolivia, Colombia, Ecuador, India, Zaire, etc.

Malaysia, Philippines and India are the three countries which have regulations for protecting street vendors. Malaysia is the only country where licensed street vendors are provided facilities for conducting their trade. An initiative has been taken in Africa, where a coalition between local and national authorities, explored the food laws associated with street vending and developed strategies that could be used to control identified food hazards (NRI, 2004). Another policy was framed in Durban, Africa, where the street vendors were allocated specific areas to operate, issued certificate of acceptability and were also given training on essential food hygiene practices (Holy and Makhone, 2004).

In India, CII Institute of Quality’s Food Safety and Quality (FSQ), has taken an initiative to create awareness among the consumers and street food vendors and it has issued a simple informative checklist of hygienic practices, called the “CII-14 point checklist on food safety for street vended food” which emphasizes on implementation of good hygiene standards by the street vendors (CII, 2008). The scheme to upgrade hygiene and quality of
street food has also been undertaken by the Ministry of Food Processing Industries, India. Under the proposed programme, 10,000 street food vendors will be identified, and the majority of stake-holders will be upgraded in terms of quality and hygiene and efforts would be made to make it mandatory for the vendors to register with the local authorities (MFPOI, 2009).