CHAPTER II

REVIEW OF LITERATURE

The research strategy used in this literature review is to locate and analyse the historical beginnings of food safety so as to understand the theoretical foundation for this study. In doing so, special attention has been given to the various techniques that appeared in the literature. This chapter identifies the relevant and related literature on the key concepts for the food safety knowledge and practices. This study includes research that have been conducted on food safety in general, and those that have been conducted with urban and rural respondents. It gives a detailed review of the published literature related to awareness and attitudes of food safety knowledge and practices of consumers. This review of literature shows that majority of consumers do not understand the crucial role of food safety regulations in healthy living. The literature review also explores rural consumers’ food safety perception, knowledge and self-reported food handling practices. It is impossible to examine all the literature and present a summary of the same in this chapter. Hence, an examination of the most important and relevant studies have been attempted.

American Meat Institute (2001)\textsuperscript{1} conducted a survey of 1,000 adults in the U.S. It concluded that lifestyle changes affect food behaviour. Women in the workforce have limited commitment to food preparation. Consumers appeared to be more interested in convenience and saving time than in proper food handling and preparation.

Anderson et al., (2004)\textsuperscript{2} concluded that cross-contamination due to badly washed hands, inappropriate procedures used for the preparation of raw and thermically

\textsuperscript{1} American Meat Institute (2001)

\textsuperscript{2} Anderson et al., (2004)
processed food stuffs and badly cleaned vegetables represented the biggest problem during the preparation of food at home.

Angelillo et al., (2001)\(^3\) conducted a survey to investigate the knowledge, attitudes and related behaviour on food borne diseases and food handling practices among consumers and pointed out that the people around the region of Italy have lack of food safety practices and knowledge. They found that both men and women needed educational programmes and counseling by physicians to adopt hygienic food handling practices.

Anne Wilcock et al., (2004)\(^4\) analysed the relationship between consumer attitudes, knowledge and behaviour regarding food safety. It indicated that different attitudes do not necessarily lead to positive behaviours that increase the safety of the food consumed. The study concluded that there exists a need for professional assistance for consumers regarding food safety issues.

Avita A. Usfer et al., (2010)\(^5\) in their study indicated that unsafe drinking water and improper food handling practices lead to diarrhoea which is the second leading cause of child mortality worldwide. Each year more than 1.5 million children under the age of 5 die of acute diarrhoea, which translates in 2000-2003 to 18% of deaths of children under the age of 5.

Avita A. Usfer et al., (2010)\(^6\) in their study stated that seventy percent of all cases of diarrhoea in children may be attributed to food contamination. The incidences of diarrhoea have increased after the introduction of complementary food due to under hygienic preparation of weaning food, especially in children aged 6 to 24 months.
Bas et al., (2004)⁷ in their study pointed out that the lack of knowledge of microbiological food hazards, temperature ranges of refrigerators, cross contamination and personal hygiene cause food-borne diseases.

Brewer et al., (2004)⁸ in their study suggested that while consumers might have relatively high levels of concern about food safety issues, they were not overly concerned about the different measures to increase food safety.

Bruhn (2002)⁹ in his study suggested that consumer education should include a comprehensive description of food borne illnesses, and prevention strategies; product labels should contain food-handling information and warnings for special populations, and food processing by newer safety-enhancing technologies should be more widely available.

Centres for Disease Control and Prevention (2006)¹⁰ reported that one in four Americans suffered from food borne illness each year, and 1 in 1000 people is hospitalized for these illnesses. Improper food handling practices in the home are believed to be responsible for approximately one fifth of food borne illnesses in United States.

Centres for Disease Control and Prevention (2007)¹¹ reported that improper hand washing practices cause a health care associated infection that accounts for 1.7 million infections and 99,000 associated deaths each year in American hospitals alone.

Centres for Disease Control and Prevention (2011)¹² reported that surveillance in the United States has reported that food borne diseases cause nearly 48 million illnesses, 128,000 hospitalizations, and 3000 deaths each year.
Chung-Tung et al., (2005)\textsuperscript{13} in their study pointed out that each year in United States, microbial pathogens cause millions of cases of food borne diseases and result in many hospitalizations and deaths. They also stated that if effective consumer education programmes are conducted to promote safer food handling practices and other averting behaviours, they may improve the consumer awareness of microbial pathogens.

Clayton et al., (2002)\textsuperscript{14} conducted a study about the food handlers’ safety practices at home and found that majority of the food handlers do not follow safe food handling practices and they lack knowledge about food safety and food borne illnesses. The study concluded that food safety education and training programmes are needed for food handlers.

Cochran-Yantis (2006)\textsuperscript{15} in his study indicated that time pressures are the major factors that influence food safety practices such as washing hands, changing gloves, cleaning cutting boards, checking temperatures, and cooling and reheating foods.

Cody and Hogue (2003)\textsuperscript{16} in their study reported that a number of studies in United States and elsewhere indicate that few respondents think that home food handling is a common cause of illness.

Collins (2001)\textsuperscript{17} in his study indicated that besides poor hand and surface hygiene, lack of personal hygiene amongst food handlers was also one of the most commonly reported practices that gave rise to food borne illness.

Curtis and Cairn Cross (2003)\textsuperscript{18} in their study explained that hand washing is considered to be the primary control measure for diseases transmission during food preparation and as one of the most effective ways to reduce the risk of diarrhoea.
Dasgupta (2005)\textsuperscript{19} in his study revealed that many food borne diseases and pathogenic microorganisms are spread by contaminated hands. If pathogens from human faeces enter a person’s mouth, it will cause diarrhoea. School-going children are exposed to greater risks of diarrhoeal disease by possibly consuming contaminated water and food.

Davila (2009)\textsuperscript{20} in his study he pointed out the reasons for diarrhoeal illness among mothers, infants and children and found that there is a lack of awareness about food safety practices like washing hands before preparing meals and infant formula, washing hands after changing diaper for children and washing hands after handling raw and cooked food. In general, mothers reported less frequent in hand washing and had lower food safety practices.

Douglas et al., (2011)\textsuperscript{21} suggested that a culture of food safety well built on a set of shared values that insists on operators and their staff follow to produce and provide food in the safest manner is essential. It also demonstrates that creating a culture of food safety requirements, application of the best science with the best management and communication systems, including compelling, rapid, relevant, reliable and repeated food safety messages using multiple media are needed.

Ehiri et al., (2001)\textsuperscript{22} stated that purchasing food from outside the home might pose considerable health risks, not only because of the lack of facilities for food protection, but also from unwashed hands of vendors and materials used for wrapping.

Ehiri and Morris, (2003)\textsuperscript{23} indicated that the unclean hands of employees of food service can spread food borne diseases due to poor personal hygiene, cross-contamination
and improper food handling practices. For instance, employees might contaminate their hands when using the toilet, or bacteria might be spread from raw meat to salad greens.

Elizabeth et al., (2004)\(^{24}\) in their study stated that multiple food safety responsibilities are required by the consumers during domestic food preparation and failure to assume personal responsibility for food safety may result in increased potential for unsafe food handling behaviours and consequential increased risk of food poisoning.

Emery (2004)\(^{25}\) stated in his study that the role of hands in the transmission of disease is well established and effective hand washing and hand drying are considered to be important control measures for preventing the transmission of food-borne diseases. Contamination of food through the hands may be through direct contact or indirectly through poor practices such as handling of contaminating equipment that is subsequently used for food preparation.

Fleury et al., (2008)\(^{26}\) stated that majority of the food borne illness cases are mild and self-limiting, whereas severe cases can occur in high risk groups resulting in high mortality and morbidity. The high risk groups for food borne diseases include infants, young children, the elderly and the immune compromised persons.

Food and Agriculture Organisation and World Health Organisation (2008)\(^{27}\) reported that food safety is an essential public health issue for all countries. Food borne diseases due to microbial pathogens, bio toxins and chemical contaminants in food represent serious threats to the health of thousands of millions of people.

Francis (2006)\(^{28}\) stated that the rigorous enforcement of the regulations by the Food and Drug Administration (FDA) and the Food Safety Council and the constant
reassurance of the safety of the food supply have reinforced the concept of absolute food safety among consumers.

Gauci and Gauci (2005)\textsuperscript{29} in their study stated that food borne illnesses cause a significant burden of disease globally. Majority of the confirmed cases of food borne illness in Malta are caused by salmonellosis. Investigation by the disease surveillance unit revealed that most of the notified cases of infectious intestinal diseases are most likely to be due to poor food safety practices at home.

Gettings and Kiernan (2001)\textsuperscript{30} identified that people in Pennysivania have lack of proper food handling practices and are not aware of the food borne illnesses which impact family health. In their study they concluded that food safety education, awareness programmes, such as videotapes, television, newspaper, radio and written pieces would create food safety awareness among the people.

Gilbert et al., (2005)\textsuperscript{31} conducted a survey to obtain information on the domestic meat handling practices and found that most of the food handlers use separate dishes for raw and cooked chicken or meat. They also use separate cutting boards for cutting the raw chicken or meat in order to avoid cross contamination.

Goodacre et al., (2002)\textsuperscript{32} concluded that based on recent surveys of public opinion, there exist diverse concerns about eating of consumer food. Studies undertaken by the Food Marketing Institute of the United States in 1996 suggested that most consumers were confident that the food they purchased was safe to eat.

Haapala and Probert (2004)\textsuperscript{33} stated that the changing demographics and lifestyle as well as emergence of resistant and exceptionally hazardous strains of food borne micro-
organisms create a situation that could lead to major outbreaks of life threatening food borne illnesses.

Harrison et al., (2001)\(^{34}\) in their study, identified that 20% - 40% of food borne illness is associated with the consumption of contaminated food. Catering establishments are found to be the most frequently cited sources of sporadic outbreak of food borne infection

Hedberg et al., (2008)\(^{35}\) concluded that most of the food borne illness outbreaks included poor personal hygiene, inadequate holding time and temperatures, cross contamination, lack of adequate heat treatment and improper food storage.

Holm and Kildevang (2005)\(^{36}\) stated that the technological and environmental changes associated with modern food production, such as genetic engineering and the use of pesticides, are also of vital importance for society and are of increasing interest to consumers.

Ibrahim Giritlioglu et al., (2011)\(^{37}\) conducted a study to assess the knowledge and practice of food safety and hygiene among students in university cookery programmes in Turkey. A questionnaire was given to cookery students in two vocational schools from two different universities. The results showed that although the students regarded the issues of food safety and personal hygiene as important, they had inadequate knowledge in this area.

Jay et al., (1998)\(^{38}\) in their study revealed that most of the consumers did not know the importance of washing their hands before preparing food and were not aware of washing their hands to an optimum extent before preparing food.
Jay et al., (2003) reported in the National Australian Food Safety Telephone Survey that most people (82.3%) reported that they washed their hands with soap or detergents and almost the same proportion felt it was very important to wash hands before and after preparing meals.

Johnson et al., (2007) conducted a study on food storage knowledge and practice of elderly people and they found that majority of the people have lack of food safety knowledge and practices at home. They concluded that food storage practices among the majority of elderly mothers do not adhere to the recommended safety standards that minimize the risk of food poisoning.

Kaferstein (2003) in their study explained that there are several studies which discussed the main causes of microbial contamination typically occurring in food service establishments. They are contaminated supplies, dirty food contact surfaces, poor personnel hygiene practices, inappropriate storage temperatures and insufficient cooking.

Klontz et al., (2005) in a study using 1,620 American telephone respondents found that the respondents reported consuming raw foods of animal origin. Twenty-five percent of the respondents said after cutting raw meat or chicken, they used the cutting board again without cleaning it.

Knight et al., (2003) conducted house interviews on 110 randomly selected householders which indicated the householders were concerned about the food they purchase for preparation at home and they displayed strong concerns about sanitation of food handling establishments, food handling practices and the quality of food purchased. It also stated that majority of the householders contacted the local health department or the ministry of health regarding food safety concerns.
Lin et al., (2003)\textsuperscript{44} stated that the Centres for Disease Control and Prevention (CDC) reported that handwashing is one of the most important hygienic procedures in preventing the transmission of infectious disease. It is the first line of defence for infectious diseases, including respiratory infection and gastrointestinal disorders among others.

Lindberg et al., (2004)\textsuperscript{45} in their study stated that diseases transmitted by contaminated food or drink, person-to person contact, or by contaminated hands lead to food borne illnesses. Human hands usually contain micro organisms, both as part of person’s normal microbial flora as well as transient microbes acquired from the environment.

Maizu Mohd Zain (2002)\textsuperscript{46} indicated that in the past few decades, the epidemiology of food borne diseases has changed with several emerging and re-emerging pathogens. Some of them may pose a low risk to most individuals, but may be life-threatening to others.

McCabe – Sellers and Beattie (2004)\textsuperscript{47} in their study indicated that most of the reported food borne illness outbreaks are due to inappropriate consumer food handling and unhygienic preparation practices in the home.

Medeiros et al., (2001)\textsuperscript{48} stated that food can be mishandled at any number of places during food preparation, handling and storage. Studies show that consumers have inadequate knowledge about measures needed to prevent food borne illnesses in the home.

Mederios et al., (2001)\textsuperscript{49} in their study noted that the common food handling mistakes, besides serving contaminated raw food, include inadequate cooking, heating, or
re-heating of foods, consumption of food from unsafe sources and allowing too much of time lapse.

Michael et al., (2001)\textsuperscript{50} in their study revealed that bacteria from unwashed raw foods, leaking packages, dirty hands and surface when introduced to domestic refrigerators may directly contaminate other stored foods.

Mitakakis et al., (2004)\textsuperscript{51} in their study stated that 70.3\% of the respondents handle food preparation surfaces poorly, 46.6\% did not wash their hands appropriately or in a timely manner, 41.7\% mishandle raw food and 70.1\% mishandle cooked food. Thus they concluded that preparing food at home increased the risk of diseases due to poor food handling practices.

Mojca Jevsnik et al., (2008)\textsuperscript{52} concluded a study with 291 pregnant women and found that the women lacked food safety knowledge and safe food handling practices, hand washing practices and hygienic practices in home kitchen. They consume meals at fast food restaurants. They do not possess adequate knowledge to check best before date, do not pay attention to hygienic conditions in stores and they do not wash their hands before and after cooking and consuming food. They concluded that to achieve global food safety, it is necessary to inform consumers, especially vulnerable groups, about fundamental principles of food safety assurance at home, since food safety begins in the home of the consumers.

Montville et al., (2001)\textsuperscript{53} in their study explained that gloves prevent bacterial cross contamination from hands to food. The results showed that a 0.01\% transfer was observed from food to hands and from hands to food when workers wore gloves and a 10\% transfer was observed without gloves.
Nam-E-Kang et al., (2010) in their study stated that the consumer's need for food safety is greatly increasing but the level of food safety education remains still low. The lack of food safety knowledge results in food safety related health problems and consumers who are undereducated, or have low incomes have limited food safety knowledge and poor food handling practices.

Nevin Sanlier (2008) in his study documented that each year millions of people worldwide suffer from food borne diseases and illnesses. Therefore, food related infection is an important health problem in many countries. They conducted the study to determine food safety and food preparation practices of young and adult consumers. They discovered that food safety knowledge of young consumers is at an insufficient level and their practices are inappropriate.

Osagbemi et al., (2010) in their study revealed that the number of reported cases of food poisoning has been increasing in recent years and many of the outbreaks can be traced to contamination caused by poor food hygiene among people.

Osagbemi et al., (2010) suggested that the annual incidence of food poisoning outbreaks continues to present a great challenge to environmental health management and a threat to the health of people globally. There is a low level of awareness concerning food poisoning or the potential dangers that lurk side by side with some food nutrients.

Patil et al., (2004) in their study indicated that the epidemiological surveillance summaries of food borne diseases clearly stated that consumer behaviours such as ingestion of raw/undercooked foods and poor hygienic practices are important contributors to outbreaks of food borne diseases.
Redmond and Griffith (2003)\textsuperscript{59} pointed out that children and adults are usually unaware of basic methods of food handling and preparation, although a substantial proportion of food borne illnesses can be attributed to improper preparation of food at home.

Santosh et al., (2008)\textsuperscript{60} in their study stated that in recent years changing lifestyle, breakdown of the joint family system and increase in the number of working women have led to consumption of ready-to-eat foods. Individuals satisfy their taste and nutrition needs, but pay little attention to hygiene and food safety.

Schlundt et al., (2004)\textsuperscript{61} pointed out that food borne diseases are increasing in both developed and developing countries. Diarrhoeal diseases are mostly caused by food borne microbial pathogens, which are a leading cause of illness and deaths in the developing countries, killing an estimated 1.9 million people annually at the global level.

Sivapalasingam et al., (2004)\textsuperscript{62} in their study stated that in the past several decades there has been an increase in the occurrence of food borne illnesses linked to fresh fruits and vegetables.

Stenberg et al., (2008)\textsuperscript{63} conducted a study to find out how effective good domestic kitchen hygiene is at reducing diarrhoeal disease. They found that normally food should be prepared at correct temperature by combining the traditional and scientific methods of food safety. Improper and unsafe handling of food leads to various food borne diseases and diarrhoeal deaths. Mothers and food handlers play a vital role in the preparation of food. Hence, they are the final line of defense against food borne disease. There is a need for the development and implementation of food safety education strategies to improve specific food safety behaviours.
Subba Rao et al., (2009)\textsuperscript{64} in their study reported that home cooked food is safer than the food purchased from outside. The common safety concerns about outside food were unclean surroundings, quality of ingredients used, personal hygiene of the food handlers, uncovered containers, cooking in re-used oils, and fly infestation.

Sudershan et al., (2008)\textsuperscript{65} conducted a study among south Indian women and found that although women have seen the content labels pasted on the packs of the food items such as, date of manufacturing and ‘best before date’, many of them are not aware of quality symbols like ISI, AGMARK and FPO.

Sudershan et al., (2008)\textsuperscript{66} in their study stated that consumers have no knowledge of basic food microbiology and have no awareness to monitor all cases of food poisoning or adulteration. Their knowledge of health or nutrition claims on food labels are almost nil and they concluded that educational programmes and orientation about food safety issues are the need of the hour.

Todd et al., (2010)\textsuperscript{67} in his study pointed that washing and drying of hands reduce microbial contamination. During various daily activities at home and work, hands quickly become contaminated. Some activities increase the risk of finger contamination by pathogens more than others, such as the use of toilet paper to clean up following a diarrhoeal episode, change of the diaper of a sick infant, blowing a nose, or touching raw food materials. Many food borne outbreaks investigation reports identified the hands of food workers as the chief source of pathogens in the implicated food.

Trepka et al., (2007)\textsuperscript{68} identified that pregnant women and infants are the two groups at the highest risk of severe effects of food borne illnesses. In general, food safety practices were most problematic among the people of Florida. Thus, they concluded that
food safety education and programmes should be conducted among the people to make them aware of food handling practices.

UNICEF (2004)\textsuperscript{69} reported that in India alone, an estimated 4,00,000 children below five years of 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, intestinal worms, eye and skin infections caused by poor hygiene and unsafe drinking water.

UNICEF (2009)\textsuperscript{70} reported that diarrhoea is the second leading killer of children under five and it is an alarming reminder of the exceptional vulnerability of children in developing countries. The main reasons of children mortality were improper sanitation, unsafe drinking water and improper food handling practices.

Water-Aid (2006)\textsuperscript{71} revealed that infectious diseases that are commonly spread through hand contact include common cold and several gastrointestinal disorders, such as diarrhoea and vomiting. Diarrhoea is a serious global public health problem. It is estimated that 2.2 million people in developing countries, most of them children, die annually due to diarrhoea linked to lack of access to safe drinking water, inadequate sanitation and poor hygiene.

WHO (2004)\textsuperscript{72} reported that inappropriate temperature, inadequate refrigeration, improper cooking and reheating were involved in most of the households. Improper food handling, insufficient hygiene, cross contamination and reusing leftover food were also reported among food handlers.

WHO (2004)\textsuperscript{73} reported that 2.16 million children die every year from diarrhoeal diseases as a result of exposure to unsafe water, food, and poor sanitation and hygiene.
WHO (2011)\textsuperscript{74} reported that the population in developing countries is more prone to suffer from food borne illnesses because of multiple reasons, including lack of access to clean water for food preparation; inappropriate transportation and storage of foods, and lack of awareness regarding safe and hygienic food practices.

WHO (2011)\textsuperscript{75} reported that food borne illness outbreaks are reported frequently at national as well as international levels, underscoring the importance of food safety. It also reported that the health of people in many countries is affected by consuming contaminated food products.

Zaglool et al., (2011)\textsuperscript{76} in their study identified that intestinal parasites and protozoan infections are among the most common infections worldwide. It is estimated that some 3.5 billion people are affected, and that 450 million are ill as a result of these infections, the majority being children.

Zain and Naing (2002)\textsuperscript{77} in their study stated that an important way to prevent food contamination is to maintain a high standard of personal hygiene and cleanliness. Mishandling of food and disregard of hygienic measures on the part of food handlers may enable pathogens to come into contact with food and in some cases, to survive and multiply in sufficient numbers to cause illnesses in the consumers.

**CONCLUSION**

In this chapter, all the earlier studies dealing with the general food safety knowledge and practices have been analysed. There is no particular study regarding awareness and attitudes of food safety knowledge and practices of consumers – A study with special reference to Tamil Nadu State. Hence, the researcher has made this attempt for the present study.
REFERENCES


