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**“Knowledge, Attitude and Practices  
of Food Safety Measures among  
Urban and Rural households of  
Belagavi – A Cross-sectional Study”**

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Submitted by

(REG.NO. BD0116003)

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**KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH,  
BELAGAVI, KARNATAKA.**

**Endorsement by the HOD, Principal &  
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## LIST OF ABBREVIATIONS USED

Sl.No	ABBREVIATIONS	EXPANSION OF THE ABBREVIATIONS
1	CPI	Consumer Price Index
2	CNAA	Community Needs Assessment Approach
3	C	Celsius
4	DALY	Disability Adjusted Life Years
5	FAO	Food and Agriculture Organization
6	GCI	Galvanized Corrugated Iron
7	ITI	Industrial Training Institute
8	JEMRA	Joint Expert Committee on Microbiological Risk Assessment
9	KAP	Knowledge, Attitude and Practices
10	LPG	Liquid Petroleum Gas
11	MF	Multiplication factor
12	No	Number
13	PUC	Pre-University College
14	PHC	Primary Health Centre
15	RCC	Reinforced Cement Concrete
16	RBC	Reinforced Brick Concrete
17	SES	Socio Economic Status
18	SPSS	Statistical Package for Social Sciences

<b>19</b>	<b>SD</b>	Standard Deviation
<b>20</b>	<b>UHC</b>	Urban Health Centre
<b>21</b>	<b>WHO</b>	World Health Organization
<b>22</b>	<sup>2</sup>	Chi Square

## ABSTRACT

**Introduction:** Each day millions of people become ill and thousands die from preventable foodborne diseases. Food stored, prepared, cooked and eaten at home contributes to foodborne disease which, globally, presents a significant public health burden. This study aims to assess knowledge, attitude and practices of food safety measures among food handlers at household level in urban and rural areas of Belagavi.

**Methodology:** A community based cross-sectional study was conducted from 1<sup>st</sup> January 2017 to 31<sup>st</sup> December 2017 among 400 urban and 400 rural households in Belagavi district of Karnataka state. Women aged above 18 years who were involved in food preparation at urban and rural households in the urban and rural field practice areas of Belagavi were interviewed using pretested and predesigned questionnaire based on WHO's 'Five keys for Food safety'. Population Proportional sampling was done in three selected villages of sub-centre. Households were selected based on systematic random sampling. Statistical analysis was done by percentages, Mean and SD, chi square, ANOVA, and Mann Whitney U test using SPSS version 20.

**Results:** Mean age of the participants was  $37.97 \pm 13.5$  years and  $33.48 \pm 14.9$  years in urban and rural areas respectively. The mean knowledge score for urban participants was  $7.1 \pm 1.47$  and rural participants  $6.57 \pm 1.58$ , out of the total score of eleven. The mean attitude score for urban participants was  $15.45 \pm 1.65$  and rural participants was  $15.12 \pm 2$ , out of total score of eighteen and the mean practice score for urban participants was  $30.18 \pm 4.21$  and rural participants was  $25.12 \pm 4.55$ , out of ten questions. Among the urban participants the mean knowledge scores were lower among the age group more than 35 years ( $p < 0.001$ ) and the participants who

belonged to socioeconomic status class III,IV and V ( $p < 0.05$ ) and these difference were found to be statistically significant. Among the rural participants the mean knowledge scores were higher among literates ( $p < 0.001$ ) and this difference was found to be statistically significant. Mean Attitude score were higher among younger age groups ( $p < 0.001$ ) and literates ( $p < 0.05$ ) among the rural participants and this difference was found to be statistically significant. Mean practice scores were lower among the participants who belonged to class III,IV and V in both urban and rural area and this difference was found to be statistically significant ( $p < 0.05$ ).

**Conclusion:** Knowledge and Practices regarding five keys for food safety were higher in the urban households compared to the rural households. Attitude towards food safety was observed to be same in both urban and rural households. Among WHO Five keys for food safety, Knowledge, Attitude and Practices regarding ‘cook thoroughly’ and ‘keep food at safe temperature’ were observed to be lower among both the urban and the rural households. Younger Age group ( $> 35$  years), higher educational status and higher socioeconomic status were associated with better Knowledge, Attitude and Practices about food safety

**Keywords:** Food safety, Knowledge and Practice, urban and rural households

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## **INTRODUCTION**

World Health Organization (WHO) (2015) report has estimated 600 million people almost one in ten people in the world – fall ill after eating contaminated food and 4,20,000 die every year, resulting in the loss of 33 million healthy life years (DALYs). 40% of the food borne disease burden, is among under five children resulting in 1, 25,000 deaths every year. Diarrhoeal diseases are the most common illnesses resulting from the consumption of contaminated food, causing 550 million people to fall ill and 2, 30,000 deaths every year. <sup>[1]</sup>

The growing concerns of food safety have not been noticed by India. Food borne illnesses occur as frequent outbreaks in all parts of India. These outbreaks go unreported, unrecognized and un-investigated and are noticed when there is a major health or economic damage to the community. These outbreaks can be prevented by taking care of food safety. <sup>[2]</sup>

Unsafe food can contain harmful infectious agents such as bacteria, virus and parasitic agents, chemical substances, toxic substances etc. Food can be contaminated by many ways from the start of food production to the final end of food preparation and then into the plate. At the production level that is in the farm food can become unsafe because of the use of harmful fertilizers, adulteration of food at the stage of production and distribution to the consumer. During food preparation and consumption, the factors which can lead to food contamination are improper maintenance of hygiene such as practice of handwashing not keeping utensils and kitchen surface clean, inadequate cooking and improper storage. <sup>[3]</sup>

Unsafe food can lead to various food-borne illnesses. Acute and lifelong diseases ranging from diarrhoeal diseases to certain cancers can be seen due to consumption of unsafe food which can lead to serious illness and sometimes death. Food borne diseases not only adversely affect health of people, but it can also become economic burden to individuals, families, communities, and countries. The vulnerable group of individuals such as infants and elderly are most commonly affected by unsafe food.

Food handlers play an important role in making food safe for consumption especially at all levels of household. It is important to make sure that food handlers at households are maintaining certain standards for food safety. There are a number of factors which are likely to contribute to food borne illness in the home, including a raw food supply that is frequently contaminated, a lack of awareness among the general public, mistakes in food handling and food preparation at home and the deliberate consumption of raw and undercooked foods of animal origin, often described as 'risky eating behavior'.<sup>[4]</sup> There is a need for assessment of food handlers regarding the food safety measures taken at household kitchen for prevention of food borne illness.

So, food safety is important as it is about handling, storing and preparing food to prevent infection and helps to make sure that our food provides enough nutrients for us to have a healthy diet. Unsafe food and water means that it has been exposed to dirt and germs, or may even be rotten, which can cause infections or diseases such as diarrhoea, meningitis, etc.<sup>[1]</sup> In simple terms, food safety is the assurance that food will not cause harm to the consumer when it is prepared and/or eaten. Food safety is defined as an estimate of acceptable risk from consuming foods containing potential

hazards. A substance in food is considered safe if the risks are estimated as acceptable. <sup>[5]</sup>

Looking at the dismal status of food safety in the world, World Health Organization stated the theme for 'World Health Day' for the year 2015 as "From farm to plate, make food safe." The main purpose of observing this day is to help taking policy decision for food safety, for health of the population, and advocacy for food safety. <sup>[6]</sup>

The WHO 'Five keys for safer food' can be used to assess food hygiene and adequate cooking and serving food practices to know the areas of contamination and to take proper measures against the unhygienic and unsafe practices to prevent food borne illness.

The core messages of the 'Five Keys to Safer Food' are:

- 1) Keep clean;
- 2) Separate raw and cooked;
- 3) Cook thoroughly;
- 4) Keep food at safe temperatures; and
- 5) Use safe water and raw materials. <sup>[7]</sup>

Margaret Chan, Director-General of the WHO (2015) stated that sometimes very simple messages and measures can have a big impact on health protection. These 'Five Keys to Safer Food' have already contributed to the prevention of food borne illness and deserve to be communicated more widely. <sup>[8]</sup>

Proper application of these 'Five keys for Food safety' helps in combating foodborne illness. The studies done previously on food safety have mainly focused on assessing the knowledge, attitude and practices among food handlers in special groups, there are very few studies done among general population at household level. There is a need for understanding the extent of knowledge and level of practices followed by food handlers at household level during storage of raw food, food preparation and consumption as it plays an important role in prevention of food borne illness. So the present study was undertaken with an objective to assess the Knowledge, Attitude and Practices about food safety among the urban and rural households based on the WHO 'Five keys for Food safety'.

## **OBJECTIVE**

To assess the Knowledge, Attitude and Practices about food safety among urban and rural households based on the 'WHO Five keys for Food safety'.

## **REVIEW OF LITERATURE**

Food is defined as any nutritious substance that people or animals eat or drink or that plants absorb in order to maintain life and growth.<sup>[9]</sup> ‘Food-borne illness’ is defined as any disease of an infectious or toxic nature caused by consumption of food.<sup>[10]</sup> These food-borne illnesses are the major public health problems both in developing and developed nations. Contamination of food with pathogenic microorganisms can lead to food-borne illness. The smell, taste and appearance of food are not good indicators of food contamination, because most of the organisms do not change appearance of food. Most common dangerous foodborne microorganisms include bacteria such as Salmonella, Shigella, Campylobacter and E. coli; Parasites like Giardia, Trichinella and viruses such as Hepatitis A and Norovirus. These microorganisms can spread through human and animal faeces, soil and water, pests such as rats, insects etc. and fish, meat or poultry and through hands. These microorganisms multiply rapidly when the food temperature is between 5°C–60 °C, which is often known as the ‘food danger zone’.<sup>[11]</sup>

The conditions which may be responsible for foodborne illness: not cooking food thoroughly (particularly meat and meat products); not storing food that needs to be chilled at below 5°C correctly; keeping cooked food unrefrigerated for more than an hour; eating food that has been touched by someone with diarrhoea and vomiting; and cross-contamination, such as placing cooked food on a plate that had raw meat. In order to prevent the spread of microorganisms, it is important to follow the WHO’s ‘five keys for safer food’.<sup>[11]</sup>

The 'Five Keys to Safer Food' were developed by the Department of Food Safety and Zoonosis at WHO in the year 2000 to educate all food handlers, including consumers, about safe food handling practices to prevent foodborne diseases. Five keys reflect the actions and decisions consumers can take to address risks linked to microbiological hazards. There is lack of awareness all over the world that food, if not properly handled, prepared and stored can make an individual sick. In order to decrease the burden of food-borne diseases, World Health Assembly (2000) passed resolution on food safety to assist Member States to implement food safety educational programs. The WHO identified the need to develop a simple and clear global health message to educate all food handlers and consumers. In the early 1990s, WHO developed the 'Ten Golden Rules for Safe Food Preparation', which were widely translated and reproduced. The WHO ten golden rules for safer food include:<sup>[12]</sup>

**1. Choose foods processed for safety**

While many foods, such as fruits and vegetables, are best in their natural state, others simply are not safe unless they have been processed. Pasteurized milk should be used instead of raw milk and Certain foods eaten raw, such as lettuce, need thorough washing.

**2. Cook food thoroughly**

Many raw foods, most notable poultry, meats, eggs and unpasteurized milk, may be contaminated with disease-causing organisms. Thorough cooking will kill the pathogens, but the temperature of all parts of the food must reach at least 70°C. Frozen meat, fish, and poultry must be thoroughly thawed before cooking.

### **3. Eat cooked foods immediately**

When cooked foods cool to room temperature, microbes begin to proliferate. The longer the wait, the greater is the risk. Cooked foods must be eaten as soon as they come off the heat.

### **4. Store cooked foods carefully**

Left-over food must be stored under either hot (near or above 60°C) or cool (near or below 10°C) conditions. Foods for infants should preferably not be stored at all.

### **5. Reheat cooked foods thoroughly**

Stored food must be reheated thoroughly (proper storage slows down microbial growth, but does not kill the organisms).

### **6. Avoid contact between raw foods and cooked foods**

Safely cooked food can become contaminated through even the slightest contact with raw food. This cross-contamination can be direct, as when raw poultry meat comes into contact with cooked foods. Same cutting board and knife should not be used for raw and cooked food.

### **7. Wash hands repeatedly**

Hands should be washed thoroughly before preparing food and after every interruption - especially after toilet. After preparing raw foods such as fish, meat, or poultry, hands should be washed again before handling other foods.

## **8. Keep all kitchen surfaces meticulously clean**

Since foods are so easily contaminated, any surface used for food preparation must be kept absolutely clean. Clothes that come into contact with dishes and utensils should be changed frequently and boiled before re-use.

## **9. Protect foods from insects, rodents, and other animals**

Storing foods in closed containers can protect food from animals which carry pathogenic microorganisms which cause foodborne diseases.

## **10. Use safe water**

Safe water is just as important for food preparation as for drinking.

The 'Five Keys to Safer Food' message incorporates all the messages of the 'Ten Golden rules for Safe Food preparation' under simpler heading that are more easily remembered. Development of the concept included review of the existing health educational materials in food safety all over the world. Development of the messages was made in consultation with WHO experts from other groups (e.g. water and sanitation) and national and international food safety experts. This was done through a process of bridging across consultations with experts recognized by the WHO, together with experts selected for the Joint FAO / WHO Expert Committee on Microbiological Risk Assessment (JEMRA) for one year. The messages were reviewed by the WHO representatives in Regions / in Countries to evaluate if they were acceptable in their context and reviewed by risk communicators and health educators. During the process, some testing was done with consumer groups to check the clarity of the messages and the perceptions of the consumers. <sup>[13]</sup>

The Five keys to safer food are as follows: <sup>[7]</sup>

1. Keep food surfaces clean.
  - Wash all utensils, plates, platters, and cutlery as soon as used.
  - Wash hands before handling food and during food preparation.
  - Keep the kitchen surface clean.
2. Separate raw food from cooked food.
  - Use separate cutting board, knives and utensils for raw and cooked food.
  - Store raw and cooked food separately.
3. Cook food thoroughly, to the appropriate temperature.
  - Cook food thoroughly until the juices are clear.
  - Reheat cooked food until it is piping hot.
4. Keep food at safe temperatures, both for serving and storage.
  - Do not leave cooked food at room temperature more than two hours.
  - Do not thaw frozen food at room temperature.
  - Keep food piping hot before serving.
  - Refrigerate all cooked and perishable food.
5. Use safe water and raw materials.
  - Use safe water or treat it to make it safe.
  - Choose fresh and wholesome food.
  - Wash fruits and vegetables.
  - Check and throw away food beyond expiry date.

A self-administered questionnaire based study was conducted among randomly chosen household consumers in Trinidad, West Indies in, 2002 with 84 respondents. It was found that 88.1% of consumers washed their hands thoroughly with soap and water before and after preparing meals, 61.9% of consumers always checked food labels for 'expiry date' or 'use - by- date' when purchasing food products and 82.1% checked for damaged food packages, foul odours and discoloured meat prior to purchase. Cooked, ready to eat foods were always stored separately from raw food among 66.7% of the consumers. <sup>[14]</sup>

A cross-sectional study was conducted among 458 consumers at household in three districts in Konya in central Anatolia, Turkey in 2003 revealed that 87.1% responded that left over food should be kept in refrigerator in small closed containers and 66.5% reported that hands washed before food preparation should be free from microorganisms. <sup>[15]</sup>

A study conducted in 2003 - 04 among 764 food handlers in 109 food business in Ankara, Turkey stated that food safety knowledge of food handlers was poor with mean score of  $43.4 \pm 16.3$  with knowledge of personal hygiene being  $31.8 \pm 23.1$ . Separation of raw food from cooked food was agreed by 59.3% of the food handlers and 78.7% agreed that improper storage of foods may be harmful to health. The self-reported hygiene practice showed that only 5.4% and 2.2% food handlers washed their hands before and after touching unwrapped foods. <sup>[16]</sup>

A questionnaire based survey was conducted involving 73 food service staff in two governments and one university hospital in Edirne, Turkey in the year 2007 stated that 94.5% agreed washing hands before handling food reduced risk of food contamination and raw food should be kept separately from cooked food during

storage. The practice of washing hands before touching unwrapped raw foods and after handling unwrapped foods was reported always by 93.2% and 97.3% respectively.<sup>[17]</sup>

A cross sectional study was conducted regarding consumer food safety knowledge and practices among 1,000 individuals living in the area of Cassino, a town in Latium (central Italy) in 2008 revealed that 24% of cooked foods were stored in the refrigerator after cooling to room temperature, while 28% were stored in the refrigerator within 24 hours if not consumed and 64.5% reported to always cleanse hands with soap and water after handling raw meat. During food preparation and 78.7% affirmed using the same cutting board for raw and cooked foods.<sup>[18]</sup>

Another study conducted in Ankara, Turkey in the year 2009 among 250 married women with mean age group of  $37.42 \pm 0.55$  years in which 85.6% of women agreed raw and cooked food should be stored separately and the mean score of food safety attitudes of women was  $29.97 \pm 2.91$  out of 36 points. The score of food safety attitude was higher in women who had a university degree ( $30.81 \pm 2.58$ ) and who were high school graduates ( $30.37 \pm 2.48$ ) than those who were primary ( $29.42 \pm 3.29$ ) and secondary ( $29.45 \pm 3.04$ ) school graduates ( $p < 0.01$ ). 62.4% women agreed that freezing food does not kill bacteria but stops their growth.<sup>[19]</sup>

A cross-sectional study was done from in 2012 among 235 workers in Local eateries in Oralu community in South Western Nigeria, revealed that their workers had 90% knowledge about food safety and 93.2% were aware that food hygiene is necessary in food preparation and 31.5% practiced food hygiene. Among the participants, 57% had training on food hygiene and 93.6% were aware that food hygiene was important and 93.2% agreed that food hygiene was necessary during

food preparation. The food hygiene practices among food handlers were reported as 53.6% stored cooked food overnight, 46.8% used preservatives to store cereals, 39.6% washed hands before and after handling food and 37.9% prepared food in hygienic space.<sup>[20]</sup>

A cross-sectional study conducted among 200 food handlers in Jordanian military hospitals in the year 2012 revealed that means of the percentage scores for the knowledge, attitude, practice and overall knowledge, attitude and practice were  $84.82 \pm 11.71$ ,  $88.88 \pm 12.67$ ,  $89.43 \pm 9.10$ , and  $87.88 \pm 9.61$  respectively. 95.5% of food handlers correctly answered that eating raw or half cooked meat can lead to food poisoning and 91.5% answered that eating left-over cooked food left at room temperature for more than 6 hours is a high risk for food contamination. 96% responded that cooked left-over food should be thoroughly reheated and 93.5% agreed raw foods should be kept separately from cooked food. Washing hands with soap and water before food preparation was practiced by 94.5% of food handlers and 98.5% of them washed fresh fruits and vegetables in tap water before eating.<sup>[21]</sup>

A mixed method study was conducted in the year 2012 among 72 main food preparers in families with children 10 years and younger to explore food safety knowledge, perceptions/beliefs and practices in Midwest USA, which revealed that the best way to handle chilli, soups or stews is to let cool on the countertop at room temperature was the response given by 36.6% and 60.6% responded that it should be put in the refrigerator within two hours of cooking. 97.2 % of the respondents agreed that cutting board should be washed with soap and hot water or placed in a dishwasher after using it to cut raw meat and 11.3% stated that the best way to tell chicken has cooked long enough is by looking for whether the juices are clear.

Washing hands with soap and water before preparing meals reduces risk of foodborne illness was reported correctly by 95.8% of the participants. The mean score of knowledge survey was 18.2 on a scale of 0 to 25. 79.2 % reported that best way to thaw frozen hamburger is to put them in refrigerator. <sup>[22]</sup>

A study conducted among 932 students of Lebanese American University in 2013 to assess food safety and handling knowledge and practices showed that overall food handling practice score was  $44.7 \pm 14.2$  and mean food safety knowledge was  $53.6 \pm 15.7$ . 38.6% reported that different cutting board was used to cut raw meat and tomatoes in their home and 16.2% reported that raw meat was stored in the lowest shelf in the fridge. Cooked left over meal is kept in the fridge by 29.1% of the respondents and 51.7% washed fresh vegetables under running water. 35% of the respondents agreed that freezing can kill harmful germs in the food. <sup>[23]</sup>

A cross-sectional study was conducted in Singapore in the year 2013 to study knowledge, attitude and behaviour of hand and food hygiene among 240 residential units. The study revealed that 48.5% washed their hands before meals and 58.8% washed their hands before handling food or cooking. Keeping fresh fruits and vegetables separately from meat in the refrigerator and cooking the food thoroughly before consumption were reported by 96.7% and 98.3% of the participants respectively. 94.2% of the participants reported that they checked expiry date of packaged food before purchasing or cooking and 88.3% reheated the leftover food before consuming. 75.8% of the participants agreed that cooked food should not be left at room temperature for more than two hours 49.2% did not practice leaving cooked food at safe temperature and 75.4% agreed that separate cutting board for

meat and vegetables should be used to prevent diarrhoea, 56.7% used separate cutting board. <sup>[24]</sup>

A cross-sectional study done among 274 food handlers at food courts of Putrajaya, Malaysia in the year 2013 regarding hygiene at food court and knowledge, attitude and practices of food safety revealed that food handlers' knowledge, attitude and practice were high with a mean percentage score more than 79.0%. Knowledge of the food handlers about reheating food and keeping cooked food at safe temperature was 52.9% and 52.2% respectively. Knowledge regarding washing of hands before handling food was 99.6% and 98.6% practiced it. It was reported that all of the food handlers (100%) agreed improper storage of foods can cause infections and 90.9% agreed that separate utensils must be used for raw and cooked food. <sup>[25]</sup>

A questionnaire based study conducted among 85 food handlers working in a university located in Kuala Lumpur, Malaysia in the year 2015 has reported moderate overall knowledge of food safety with mean score of  $61.7 \pm 8.1\%$  and good attitude with average score of  $51.9 \pm 4.2$  out of the total score of 57 and safe food handling practice during food preparation with average score of  $53.2 \pm 5.5$  of the total score of 60. Use of different chopping board for raw meat and fresh produce (vegetables and fruit) were reported to be  $4.3 \pm 1.1$  out of total score of 5 and use of protective clothing (apron) while touching or distributing unwrapped foods were reported to be  $4.6 \pm 1.0$  out of total score of 5. All the participants (100%) responded that it is important to wash hands before preparing meals and after handling raw meat and poultry. 82% responded that same knife can be used to cut raw meat or poultry and vegetables and 82% stored left-over food in the refrigerator. <sup>[26]</sup>

A study was conducted in the year 2005 among 90 mothers of children less than five years of age residing in the slums of South Indian city of Hyderabad, quantitative and qualitative type of data collection was done. The study revealed that 90% mothers washed their hands before serving, cooking food, 60% stored leftover food at room temperature, 82% did not have refrigerator, 53% those who stored food ate it in next meal and 34% recognized food to be unsafe by appearance, smell and taste. <sup>[27]</sup>

A cross-sectional study was done among 32 anganwadi workers in Mandya district of Karnataka in the year 2015 regarding food safety. The study revealed that 80% of them had the correct knowledge regarding food safety, 90% of them had the right attitude towards food safety and 90% of them were practicing the correct methods in assuring food safety to the beneficiaries. The practices among anganwadi workers revealed that 100% practiced washing hands, cleaned food contact surface before and after preparing food, 96.9% washed vegetables / fruits before slicing them and 75% kept cooked meat /chicken at room temperature for more than four hours. <sup>[28]</sup>

A cross-sectional study was done in the year 2015 among randomly selected 300 women of Khaza bazar, Kalaburagi, in Karnataka to assess knowledge, attitude and practices of food safety found that 58.3% had knowledge about food safety, 81.7% had attitude towards food safety and 79% practiced food safety measures. Knowledge and practices of food handlers were found to be same among literates and illiterates ( $p > 0.5$ ), with mean scores of knowledge were found to be  $8.5 \pm 1.2$  among illiterates and  $8.7 \pm 1.3$  among literates and the mean score of practices were found to be  $31.1 \pm 4.2$  among literates and  $30.8 \pm 4.2$  among illiterates, whereas the attitude was found to be significantly different between literates ( $16.2 \pm 1.5$ ) and illiterates ( $15.7 \pm 2.2$ ) ( $p < 0.05$ ). <sup>[29]</sup>

## **METHODOLOGY**

A community based cross-sectional study was conducted among urban and rural households in the field practice areas of Urban Health Centre, Ashok Nagar and Primary Health Centre, Kinaye in Belagavi taluka & district in Karnataka state under the administration of Department of Community Medicine, J. N. Medical College, KAHER, Belagavi. The study was conducted for a period of one year from 1<sup>st</sup> January 2017 to 31<sup>st</sup> December 2017.

Sample size was calculated using the formula  $n = 4pq/d^2$ , assuming the prevalence (p) of knowledge about food safety among households as 50% with allowable error taken as 5 % as 400 for urban and 400 for rural households separately. The information regarding total number of households was obtained from the respective health centre.

In the urban field practice area, based on the total number of urban household in Ashok Nagar (ward no. 47) of Belagavi city corporation according to CNA 2017-18, which was 1,660; the sampling interval was calculated as  $1,660/400 = 4$ . The first household was selected randomly and then every 4<sup>th</sup> household was selected for data collection using systematic random sampling.

In the rural field practice area, Primary Health Centre Kinaye has nine sub-centers, Kinaye sub-center was selected randomly. The three villages under Kinaye sub-centre namely Kinaye, Bahadurwadi and Rankunde were chosen for data collection. The total number of households covered under Kinaye Sub-Centre was 970 for which population proportional sampling was done. The households were chosen

by calculating sampling interval which is 2.4 for all the villages, so every second household was chosen for data collection.

<b>Name of Village</b>	<b>Total no. of households</b>	<b>Calculation for proportional sampling</b>	<b>Number of households selected for study</b>	<b>Sampling interval</b>
<b>Kinaye</b>	410	$410/970*400$	169	$410/169=2.4$
<b>Bahadurwadi</b>	288	$288/970*400$	119	$288/119=2.4$
<b>Rankunde</b>	272	$272/970*400$	112	$272/112=2.4$
<b>Total</b>	<b>970</b>		<b>400</b>	

Ethical clearance was obtained from the Institutional Ethics Committee for Human Subjects' Research of the Medical College dated 17<sup>th</sup> October, 2016 vide under letter (MDC/DOME/5). Written informed consent was obtained from all the study participants before the data collection.

Data collection was done by house to house visit by the investigator. Women aged above 18 years and who were mainly involved in food preparation regularly at both urban and rural households and who was permanent residents (residing in the area at least since the preceding year) in the study area were personally interviewed. Cooks who were employed for food preparation and were not a family member of household and the households which were locked during three consecutive visits were the exclusion criteria considered in the study. The personal interview was done using predesigned and pretested WHO questionnaire on 'Five Keys for Food safety'.

Socio-demographic details, cooking methods and history of food poisoning in the past six months before the study period in any of the family members of household were asked. Knowledge and attitude regarding food safety and their practices in the daily routine was observed. Health education was given to the study subjects after the interview about the importance of the ‘five keys of food safety’ using printed pamphlets prepared and translated as per the WHO guidelines and best practices were distributed to all the households.

**Definition of study variables:**

**Age:** Age was recorded to the nearest completed years. (As on last birthday)

**Religion:** The subject’s religion was grouped as “Hindu”, “Muslim”, others (include Christians/Jew/Sikh/Jain/Buddhism).<sup>[30]</sup>

**Occupation:**

Homemaker – A woman who takes care of the household day to day duties and not gainfully employed

Farmer – A person who works in his own farm field

Labourer – A person doing unskilled manual work for wages

Others – A person who is employed in any occupation such as teacher, tailor, bank employee, factory workers, shopkeeper etc.

**Education:**<sup>[30]</sup> (as per the Census of India criteria – 2011)

Illiterate – A person who cannot read and write and has completed seven years of age

Primary – Person who has studied from 1<sup>st</sup> to 5<sup>th</sup> standard

Secondary – Person who has studied from 6<sup>th</sup> to 10<sup>th</sup> standard

PUC – Person who has studied up to pre-university 2<sup>nd</sup> year or a diploma/ITI course

Degree – A person who has completed a course of study in higher education at a college or university.

**Marital status:** Marital status was classified as “Married”, “Unmarried” and “Widowed”

**Type of family:** <sup>[33]</sup>

Nuclear – households where married couple along with their dependent children live in the same house

Joint – households where many married couples and their children who live in the same household. Males are blood relatives and females of the family are related by either marriage or blood relation.

Broken – A family where the parents have separated or where death has occurred of one or both the parents.

**Type of house:** <sup>[31]</sup> (as per the observation of the investigator)

Pucca House - A Pucca house is one, which has walls and roof made of the following material.

- Wall material: Burnt bricks, stones (packed with lime or cement), cement concrete, timber etc.

- **Roof Material:** Tiles, GCI (Galvanized Corrugated Iron) sheets, asbestos cement sheet, RBC (Reinforced Brick Concrete), RCC (Reinforced Cement Concrete) and timber etc.

**Kutchra House** -The walls and/or roof of which are made of material other than those mentioned above, such as unburnt bricks, bamboos, mud, grass, reeds, thatch, loosely packed stones, etc. are treated as kutchra house.

**Semi-Pucca house:** A house that has fixed walls made up of Pucca material, but roof is made up of the material other than those used for Pucca house.

**Place of cooking:** <sup>[31]</sup>

The place of cooking was grouped into following categories (as reported/observed):

**Kitchen:** If meals are cooked by the household in a separate room available as a within the house

**Open veranda:** If meals are cooked by the household outside the house in the open place.

**Common place:** If the meals are cooked by the household within the house in an unenclosed space (i.e., a separate room is not available for cooking)

**Cooking fuel:** The type of fuel used for cooking was grouped as coal, wood, biomass, kerosene, LPG and Induction stove. <sup>[31]</sup>

**Smoke vent:** The openings in the roof which are intended to vent the heat and smoke in the kitchen.

**Socioeconomic status:** <sup>[32]</sup>

Information regarding per capita income of the family and family size (in rupees / month) was collected and socio economic status was classified using modified B.G. Prasad’s classification for the study period (2016 – 17) and it was calculated by Multiplication factor with 1961 original Prasad’s classification values. <sup>[34]</sup>

The base of Consumer Price Index (CPI) for 1960 is 100. The scale was modified in 1982 and 2001 by introducing linking factors to convert CPI (1982 and 2001) from the new base of 100 to the old base CPI (1960). The linking factors for 1982 and 2001 were 4.93 and 4.63, respectively.

Consumer Price index for January 2017 <sup>[35]</sup> (by 2001 base) = 274.

Multiplication factor = Current index value/Base index value in 2001 = 274/100 = 2.74,

$$\begin{aligned} \text{New income value} &= \text{multiplication factor} \times \text{old income value} \times 4.63 \times 4.93 \\ &= 2.74 \times 100 \times 4.63 \times 4.93 = 6254. \end{aligned}$$

Socio-economic class (as per B.G. Prasad’s classification)	Per capita monthly income in Rupees	
	In 1961	In 2017 (January 2017 CPI)
I - Upper class	100	6254
II - Upper middle class	50 - 99	3127 - 6253
III - Middle class	30 - 49	1876 - 3126
IV - Lower middle class	15 - 29	938 - 1875
V - Lower class	< 15	< 938

**Diet: <sup>[5]</sup> (as reported by the women of the household)**

Strict vegetarian - They are true vegetarians also referred to as Vegan. They take only plant foods and do not eat animal based foods as well as foods that are made with animal based ingredients.

Ovo-vegetarian – They consume egg but do not include dairy products and animal flesh in their diet.

Semi-vegetarian – They avoid red meats (beef, pork, etc.), but consume milk and milk products, egg, chicken and fish.

Lacto–vegetarian – They eat milk, cheese and other milk products in their diets but do not eat egg as well as meat, fish, poultry and other animal flesh.

Lacto-Ovo-vegetarian – They use animal products such as milk and milk products as well as egg but exclude flesh of animals and do not eat meat, fish or poultry.

Non-vegetarian – They consume all animal products including red meat (beef, pork, etc.) and milk and plant products.

**Source of drinking water: <sup>[31]</sup>**

Piped water: A household drawing drinking water through pipes either directly from a well or bore well or after pumping the well or tube well water to an overhead water tank, or the water is supplied through pipes to individual household within the premises or to a group of households through common taps (public taps / community water points) by the Govt. departments, local bodies, panchayats, public or private estate agencies, etc.

Tube wells: Tube well denotes the ground water source from where ground water is taken out through electrical or diesel pump.

Hand pumps: Hand pump means where the ground water is taken out manually by operating a hand pump.

Open well: A well which is un-covered on sides from run-off water and from bird droppings and animals; or both.

Tanks: Drinking water supplied through tanks taken from rivers and other sources etc

Refrigerator: If the household has refrigerator was noted as “yes” or “no”.

**Food poisoning:** Food poisoning is an acute gastroenteritis caused by ingestion of food or drink contaminated with either living bacteria or their toxins or inorganic chemical substances and poisons derived from plants and animals. <sup>[33]</sup> History of food poisoning in any of the family members in the households in the preceding six months prior to the survey were asked along with details of symptoms and signs and source of food which was contaminated.

**Second part** of the questionnaire contained independent variables which dealt with main objective of the study i.e., Knowledge, Attitude and Practices of the ‘five keys for food safety’ as per the WHO guidelines, 2000.

**‘Five keys for safer food’:** <sup>[7]</sup>

**1. Keep clean:**

- Importance and practice of washing hands before handling food and often during food preparation

- Knowledge regarding spread of microorganisms through wiping cloth.
- Importance of washing and cleaning all surfaces and equipment used for food preparation as it helps in prevention of food borne illness whether it was practiced was observed.

The disease causing microorganisms found in soil, water, animals and people are transmitted through hands, wiping clothes and utensils, especially cutting boards, and the slightest contact can transfer them to food and causes foodborne diseases was explained to the participant after interview.

## **2. Separate raw and cooked food:**

- Importance and practice of separation of raw meat, poultry and sea food, from other foods and whether it can help in prevention of food borne illness was asked.
- Importance and practice of using separate equipment and utensils such as knives and cutting boards for handling raw foods and its role in food safety was asked.
- Importance and practice of storing food in container to avoid contact between raw and cooked food and its role in prevention of food contamination was asked.

Raw food especially meat, poultry, seafood and their juices contain microorganisms which can contaminate other food items during preparation and storage was explained to the participants after interview.

**3. Cook thoroughly:**

- Practice of cooking food thoroughly especially meat, poultry and sea food and its role in prevention of food borne illness - was observed.
- Practice of boiling soups and stews until they reach 70°C. For meat and poultry juices must be clear not pink - was observed.
- Importance and practice of reheating cooked food thoroughly - was observed.

Proper cooking to a temperature of 70°C can kill almost all microorganisms and are safe for consumption. In Indian settings, it is difficult to assess temperature using thermometer in domestic environment, after doing pilot study the data for knowledge, Attitude and Practices regarding proper cooking of meat up to 70°C was assessed based on the responses given by the participants such as by ensuring that juices are clear, by checking the tendency of meat and cooking food products such as meat, fish, dhal and few vegetables in pressure cooker. Attitude towards food safety question regarding meat thermometers are useful for ensuring food is cooked thoroughly was not assessed, as there was no response from the participants during the pilot study.

**4. Keep food at safe temperatures:**

- Practice of not leaving cooked food at room temperature for more than two hours and whether it is important to ensure food safety was observed.
- Importance and practice of keeping cooked food piping hot before serving to ensure food safety was asked.
- Participants were asked whether frozen food should not be thawed at room temperature and whether it is important to prevent food borne illness.

Microorganisms can multiply quickly if food is stored at room temperature, if the food stored below 5°C and above 60°C the growth of microorganism is slowed down or stopped was explained to all participants after interview.

**5. Use safe water and raw materials:**

- Participants were asked whether safe water cannot be identified by the way it looks.
- Importance and practice of selecting fresh and wholesome foods to ensure food is safe was asked.
- Importance and practice of washing fruits and vegetables especially if eaten raw was asked.
- Importance and practice of checking and throwing away food beyond its expiry date was asked.

Raw materials including water and ice can be contaminated with microorganisms and toxic chemicals. Fresh fruits and vegetables are an important source of contamination and are needed to be washed with clean and safe water before eating was explained to all participants after the interview.

**Personal hygiene** – Knowledge, Attitude and Practices regarding personal hygiene other the 5 key components were also assessed that include:

- Importance and use of apron or hair tie while cooking.
- Importance and practice of avoiding pet animals in the kitchen.
- Washing hands between raw meat, poultry and sea food.
- Washing hands after going to toilet.
- Washing hands after handling chemicals.

- Washing hands after handling animals.
- Importance of avoiding pests in kitchen and use of any chemicals to avoid pests.

**Preservatives in stored food:** An open ended questionnaire was used regarding use of any preservatives, while storing food. The respondents who used preservatives were asked about the kind of food in which they used and what kinds of preservatives were used and the duration of food storage.

**Data Analysis:**

Coding was done for each option of the questionnaire. In knowledge section there were 11 items to assess regarding food safety. Response to each item was taken as “True” or “False.” One mark each was given for each correct answer and zero mark was given for wrong answer. The total knowledge scores were obtained by summing up the marks gained for each item with a maximum score of 11.

There were 9 items to assess the respondents’ attitude toward food safety. Each item was assessed using agree, disagree, and not sure, and marks given for each response were two, one, and zero, respectively. The total attitude scores were obtained by summing up the marks gained for each item with a maximum score of 18.

Similarly, 10 items were included to assess the respondents’ practice. Each item was assessed using always, most times, sometimes, not often, and never with coding of 4, 3, 2, 1 and 0 respectively. The total practice scores were obtained by summing up the marks gained for each item with a maximum score of 40.

The data collected was entered in MS Excel-sheet to prepare the master chart. SPSS version 21.0 software was used for statistical analysis of data. Tables and graphs were prepared by using MS Word 2010 software. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Knowledge, attitude, practice scores were considered as outcome variables. The association between explanatory variables and categorical outcomes was assessed by cross-tabulation and comparison of mean and standard deviation. Chi square test was used to test statistical significance, Mann Whitney test was used to compare the differences in urban and rural Knowledge, Attitude and Practices regarding food safety. ANOVA with least significant difference test was used to test the association of socio-demographic profile with Knowledge, Attitude and Practices regarding food safety. P value < 0.05 was considered statistically significant.

## **RESULTS**

The present study was a community based cross-sectional study conducted among 400 urban households in the area of Urban Health Centre, Ashok Nagar, Belagavi and 400 rural households in the area of Kinaye Sub-Centre under the Primary Health Centre Kinaye, Belagavi, which are the urban and rural field practice areas of Department of Community Medicine, J.N. Medical College, KAHER, Belagavi during the period from 1<sup>st</sup> January 2017 to 31<sup>st</sup> December 2017.

The data collected was tabulated and analyzed under the following headings as below:

- A. Socio – demographic data
- B. Cooking practices
- C. Food poisoning details
- D. Knowledge, Attitude and Practices regarding WHO Five Keys for Food safety among urban and rural participants
- E. Hygiene and practices in the kitchen
- F. Association of Knowledge, Attitude and Practices about food safety with various socio - demographic variables

## A. SOCIO – DEMOGRAPHIC DATA

**Table I. Distribution of study participants according to the age**

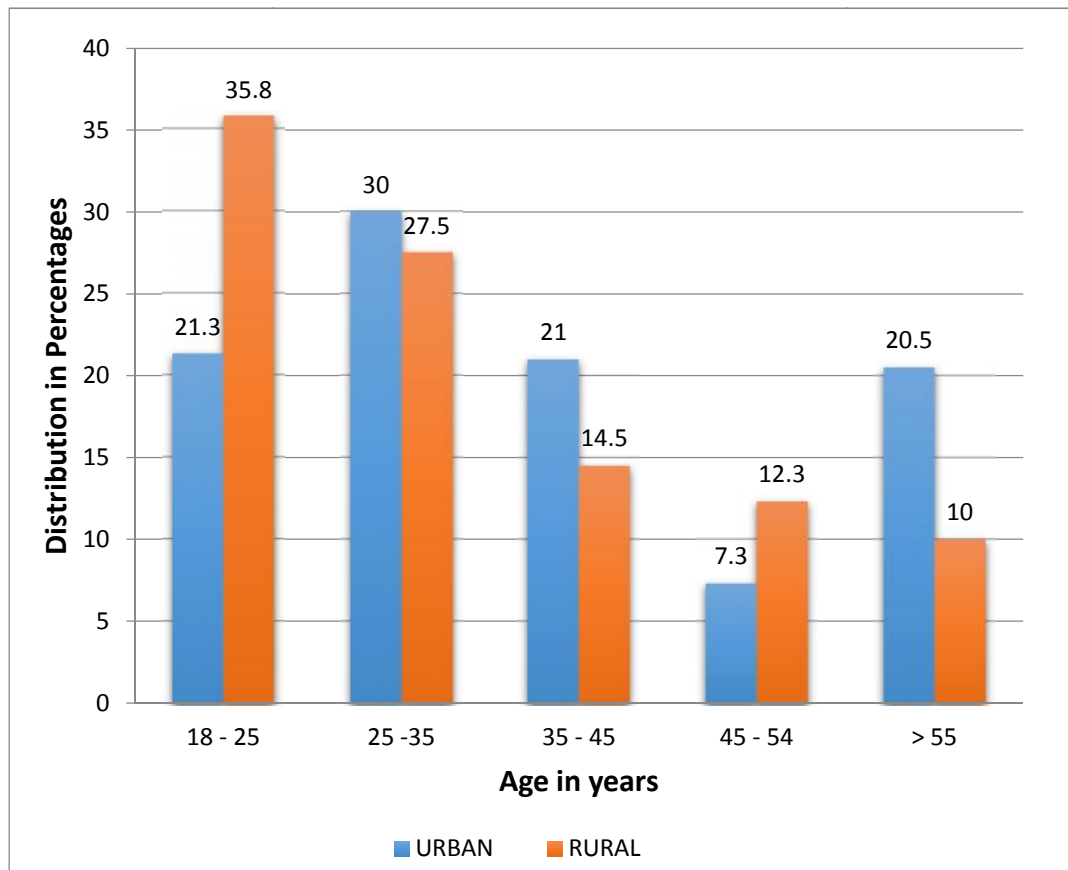
Age group (years)	Urban(n = 400)		Rural (n = 400)	
	Frequency	Percentage	Frequency	Percentage
<b>18 to 25</b>	85	21.3%	143	35.8%
<b>25 to 35</b>	120	30.0%	110	27.5%
<b>35 to 45</b>	84	21.0%	58	14.5%
<b>45 to 55</b>	29	7.3%	49	12.3%
<b>55 and above</b>	82	20.5 %	40	10.0%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, among 400 urban study participants, 120 (30.0%) were in the age group of 25 to 35 years, 85 (21.3%) were in the age group of 18 to 25 years, 84 (21.0%) were in the age group of 35 to 45 years, 82 (20.5%) were in the age group more than 55 years and 29 (7.3%) were in the age group of 45 to 55 years.

Among 400 rural study participants, 143 (35.8%) were in the age group of 18 to 25 years, 110 (27.5%) were in the age group of 25 to 35 years, 58 (14.5%) were in the age group of 35 to 45 years, 49 (12.3%) were in the age group of 45 to 55 years and 40 (10.0%) were in the age group more than 55 years.

The mean age among the urban study participants was 37.96±14.9 years and 33.48±13.5 years for rural participants. Differences in the mean ages of urban and rural participants was statistically significant ( $\chi^2 = 39.53, p < 0.001$ )

**Graph I. Distribution of study participants according to the age**



**Table II. Distribution of study participants according to the religion**

<b>Religion</b>	<b>Urban (n = 400)</b>		<b>Rural (n = 400)</b>	
	<b>Frequency</b>	<b>Percentage</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Hindu</b>	184	46.0%	315	78.8%
<b>Muslim</b>	210	52.5%	85	21.3%
<b>Others</b>	6	1.5%	0	0%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, urban households consisted of 210 (52.5%) Muslims, 184 (46%) Hindus, and 6 (1.5%) belonged to other religion such as Christians. The rural households consisted of 315 (78.8%) Hindus and 85 (21.3%) belonged to Muslim community.

**Table III. Distribution of study participants according to Educational Status**

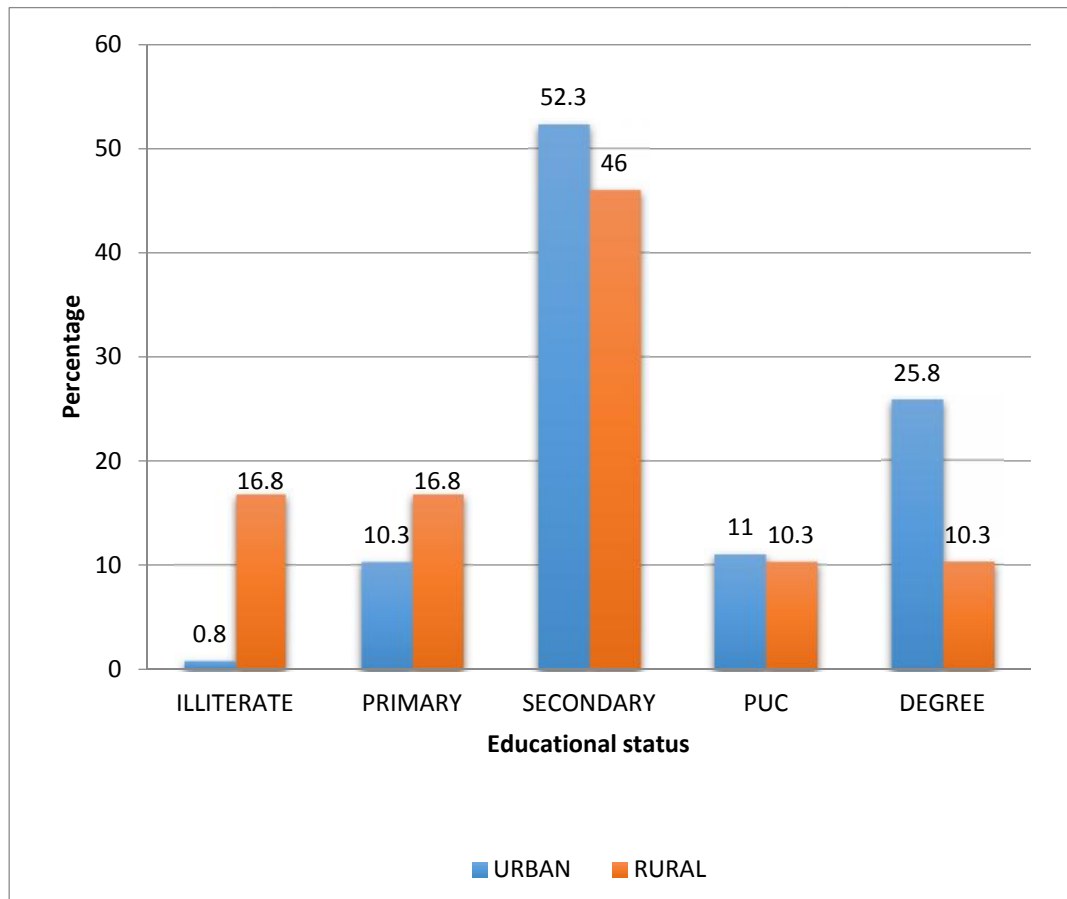
Education status	Urban (n = 400)		Rural (n = 400)	
	Frequency	Percentage	Frequency	Percentage
<b>Illiterate</b>	3	0.8%	67	16.8%
<b>Primary</b>	41	10.3%	67	16.8%
<b>Secondary</b>	209	52.3%	184	46.0%
<b>PUC/Diploma</b>	44	11.0%	41	10.3%
<b>Graduates</b>	103	25.8 %	41	10.3%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

Among the 400 study participants in urban area, 209 (52.3%) had attended secondary level of education, 103 (25.8%) were graduates, 44 (11.0%) had studied up to PUC/Diploma, 41 (10.3%) had studied up to primary level of education and 3 (0.8%) were illiterates.

Among the 400 study participants in rural area, 184 (46.0%) had attended secondary level of education, 67 (16.8%) were illiterates, 67 (16.8%) had studied up to primary level of education, 41 (10.3%) had studied up to PUC/Diploma and 41 (10.3%) were graduates.

The urban study participants were more educated compared to the rural study participants and this differences was found to be statistically significant ( $\chi^2 = 93.16, p < 0.001$ ).

**Graph II. Distribution of study participants according to Educational Status**



**Table IV: Distribution of study participants according to their occupation**

Occupation	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
<b>Home maker</b>	336	84%	228	57%
<b>Farmer</b>	5	1.3%	92	23%
<b>Labourers</b>	24	6%	40	10%
<b>Others</b>	35	8.8%	40	10%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, among 400 urban study participants 336 (84%) were homemakers, 35 (8.8%) were doing other types of occupation such as teacher, tailor etc., 24 (6%) were labourers and 5 (1.3%) were farmers.

Among 400 rural study participants, 228 (57.0%) were homemakers, 92 (23%) were farmers, 40 (10%) were labourers and 40 (10%) were doing other types of occupation such as teacher, tailor etc.

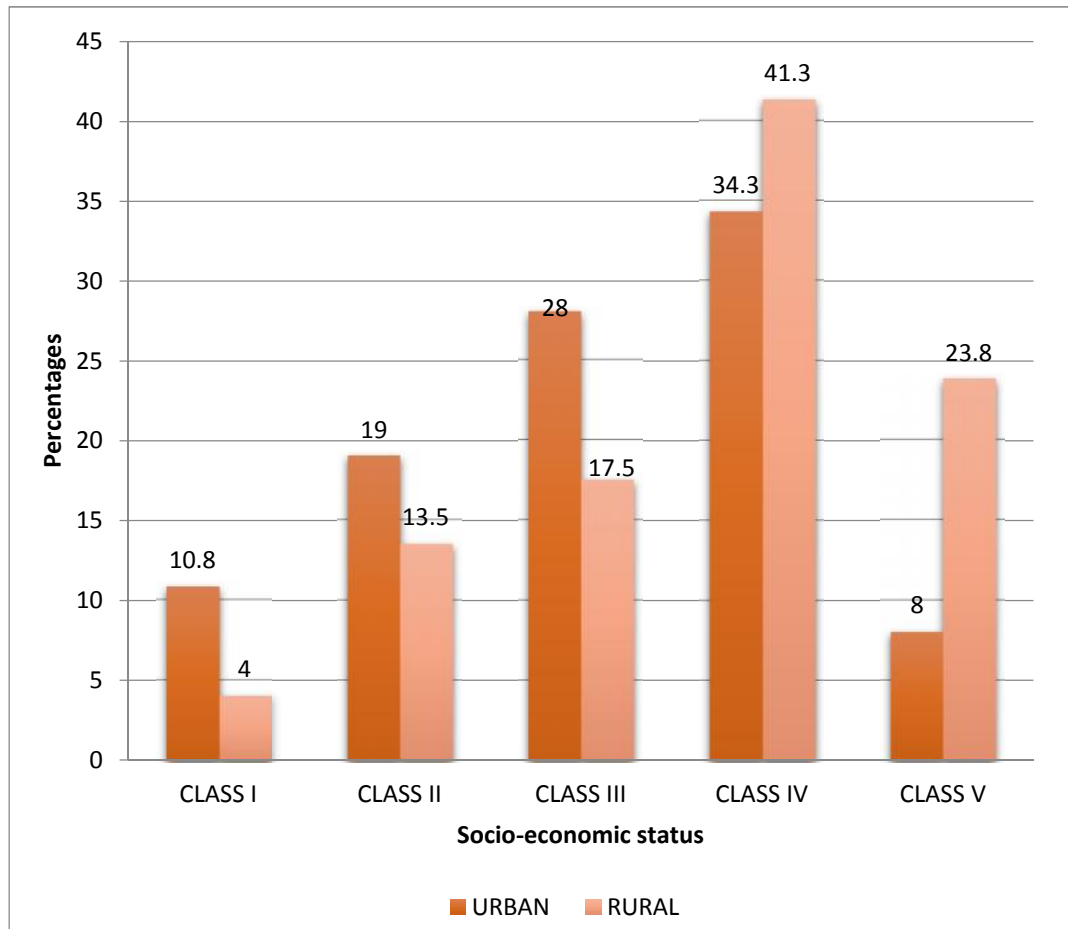
**Table V. Distribution of study participants according to Socio-Economic Status (SES) as per Modified B. G. Prasad's Classification**

Socio-economic status	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
<b>Class I</b>	43	10.8%	16	4%
<b>Class II</b>	76	19%	54	13.5%
<b>Class III</b>	112	28%	70	17.5%
<b>Class IV</b>	137	34.3%	165	41.3%
<b>Class V</b>	32	8%	95	23.8%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

According to Modified B. G. Prasad's Classification of socio-economic status, the study participants in urban area consisted of 137 (34.3%) households belonging to Class IV, 112 (28%) to Class III, 76 (19%) to Class II, 43 (10.8%) to Class I and 32 (8%) belonged to Class V.

Socio-economic status of the study participants in rural area consisted of 165 (41.3%) households belonged to Class IV, 95 (23.8%) to Class V, 70 (17.5%) to Class III, 54 (13.5%) to Class II and 16 (4%) to Class I.

Graph III. Distribution of study participants according to Socio-economic Status



**Table VI. Distribution of study participants according to marital status**

Marital status	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
<b>Married</b>	355	88.8%	379	94.8%
<b>Unmarried</b>	25	6.3%	12	3%
<b>Widow</b>	20	5%	9	2.2%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, the study participants in urban area consisted of 355 (88.8%) married women, 25 (6.3%) unmarried women and 20 (5%) widows.

The study participants in rural area consisted of 379 (94.8%) married women, 12 (3%) unmarried women and 9 (2.3%) widows.

**Table VII. Distribution of study participants according to type of family**

Type of family	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
<b>Nuclear</b>	234	58.5%	261	65.3%
<b>Joint</b>	166	41.5%	139	34.8%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In this study participants in urban area consisted of 234 (58.5%) households belonged to nuclear type of family and 166 (41.5%) belonged to joint family and the study participants in rural area consisted of 261 (65.3%) households belonged to nuclear type of family and 139 (34.8%) belonged to joint family.

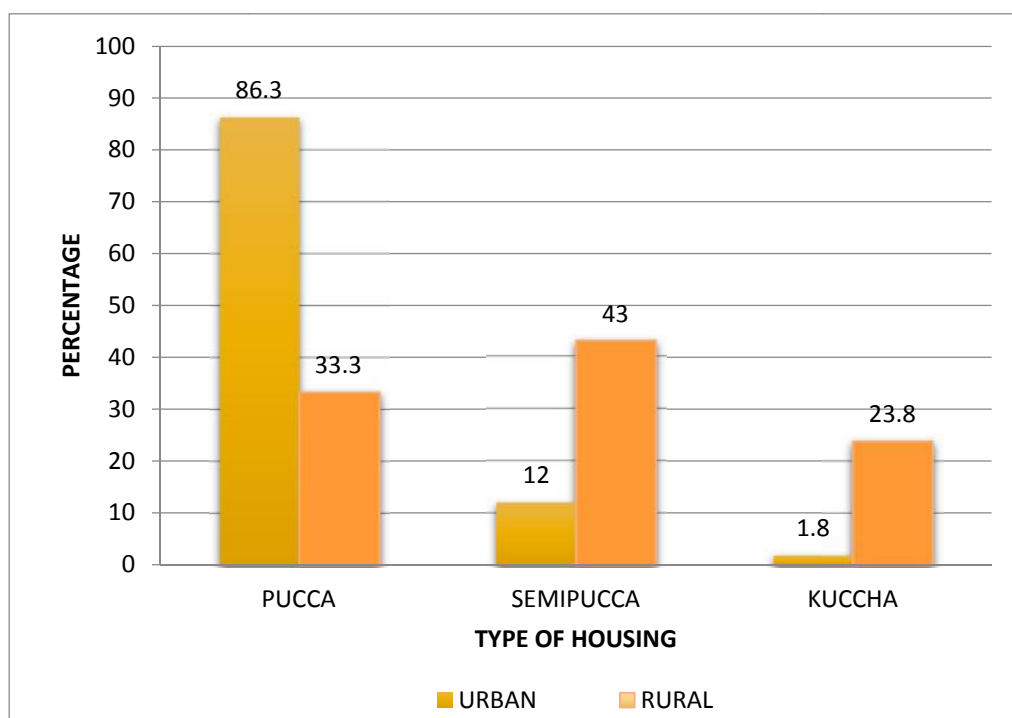
Table VIII. Distribution of study participants according to type of housing

Type of house	Urban (n = 400)		Rural (n = 400)	
	Frequency	Percentage	Frequency	Percentage
<b>Pucca</b>	345	86.3%	133	33.3%
<b>Semi Pucca</b>	48	12%	172	43%
<b>Kuccha</b>	7	1.8%	95	23.8%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, among the urban participants 345 (86.3%) households lived in pucca houses, 48 (12 %) in semi-puccahouses and 7 (1.8%) in kuccha houses.

Among the rural participants, 172 (43%) households lived in semi-pucca, 133 (33.3%) lived in pucca houses and 95 (23.8%) in kuccha houses.

Graph IV. Distribution of study participants according to type of housing



**B. COOKING PRACTICES:****Table IX. Distribution of study participants according to place of cooking**

Place of cooking	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
<b>Kitchen</b>	360	90%	237	59.3%
<b>Open veranda</b>	12	3%	40	10%
<b>Common place</b>	28	7%	123	30.8%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, the urban households had the place of cooking as kitchen in 360 (90%) households, common place in 28 (7%) households and open veranda in 12 (3%) households.

In the rural area, the place of cooking in 237 (59.3%) households was kitchen, 123 (30.8%) households it was common place and 40 (10%) households it was open veranda.

**Table X. Distribution of study participants according to cooking fuel used**

Cooking fuel	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
<b>Coal</b>	3	0.8%	8	2%
<b>Wood</b>	0	0%	48	12%
<b>Biomass</b>	0	0%	26	6.5%
<b>Kerosene</b>	0	0%	1	0.3%
<b>LPG</b>	397	99.3%	317	79.3%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, the type of cooking fuel used among urban households was LPG in 397 (99.3%) households and coal in 3 (0.8%) households. None of them used wood, biomass or kerosene as cooking fuel.

The type of cooking fuel used among rural households in 317 (79.3%) households was LPG gas, 48 (12%) households used wood, 26 (6.5%) households used biomass, 8 (2%) households used coal and only one (0.3%) household used kerosene.

**Table XI. Distribution of study participants according to use of smoke vent**

<b>Smoke vent in the kitchen/ cooking place</b>	<b>Urban (n=400)</b>		<b>Rural (n=400)</b>	
	<b>Frequency</b>	<b>Percentage</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Present</b>	22	5.5%	81	20.3%
<b>Absent</b>	378	94.5%	319	79.8%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, only 22 (5.5%) participants in urban area and only 81 (20.3%) in rural area were having smoke vent in their cooking place.

**Table XII. Distribution of study participants according to type of diet**

Diet type	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
<b>Strict vegetarian</b>	12	3%	3	0.8%
<b>Ovo-vegetarian</b>	6	1.5%	0	0%
<b>Lacto-vegetarian</b>	76	19%	59	14.8%
<b>Lacto-Ovo-vegetarian</b>	13	3.3%	50	12.5%
<b>Non-vegetarian</b>	293	73.3%	288	72%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, among the urban households, the diet of 293 (73.3 %) were non-vegetarian, 76 (19 %) were lacto-vegetarian, 13 (3.3%) were lacto-ovo-vegetarian, 12 (3%) were strict vegetarian and 6 (1.5 %) were ovo-vegetarian.

Among the rural households, the diet of 288 (72 %) were non-vegetarian, 59 (14.8 %) were lacto-vegetarian, 50 (12.5 %) were lacto-ovo-vegetarian and 3 (0.8%) were strict vegetarian.

Table XIII. Distribution of study participants according to source of water

Water source	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
<b>Piped water</b>	391	97.8%	199	49.8%
<b>Tube wells</b>	9	2.3%	107	26.8%
<b>Hand pumps</b>	0	0%	40	10%
<b>Open wells</b>	0	0%	54	13.5%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, among 400 urban households, the source of water supply used by 391 (97.8%) households was piped water and 9 (2.3%) households used tube wells.

Among the 400 rural households, 99 (49.8%) were using piped water supply, 107 (26.8%) were using tube wells, 54 (13.5%) were using open wells and 40 (10%) were using hand pumps as the source of water supply.

**Table XIV. Distribution of study participants according to availability of refrigerator in the households**

<b>Refrigerator availability</b>	<b>Urban (n=400)</b>		<b>Rural (n=400)</b>	
	<b>Frequency</b>	<b>Percentage</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Present</b>	283	70.8%	74	18.5%
<b>Absent</b>	117	29.2%	326	81.5%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

In the present study, 283 (70.8%) of urban households and only 74 (18.5%) of rural households were having refrigerator in their houses.

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**C. FOOD POISONING DETAILS**

**Table XV. Distribution of study participants according to history of food poisoning (in preceding six months prior to the study)**

Food poisoning history	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
Yes	110	27.5%	43	10.8%
No	290	72.5%	357	89.3%
<b>Total</b>	<b>400</b>	<b>100%</b>	<b>400</b>	<b>100%</b>

$$\chi^2 = 36.27 \quad p < 0.001$$

In the present study among 400 urban and 400 rural participants, history of food poisoning was reported among 110 (27.5%) in the urban area and 43 (10.8%) in the rural area. History of food poisoning in urban households was more compared to rural households and this difference was found to be statistically significant ( $p < 0.001$ ).

**Table XVI. Distribution of study participants according to source of food poisoning(in preceding six months prior to the study)**

Source of food poisoning	Urban (n=110)		Rural (n=43)	
	Frequency	Percentage	Frequency	Percentage
Home cooked food	36	32.7%	28	65.1%
Street food	45	40.9%	9	20.9%
Restaurant food	29	26.3%	6	13.9%
<b>Total</b>	<b>110</b>	<b>100%</b>	<b>43</b>	<b>100%</b>

In the present study, out of 110 study participants in the urban area, who reported to have history of food poisoning in the past six months, the sources of food consumed by 45 (40.9%) participants was street food, 36 (32.7%) participants had food cooked at home, and 29 (26.3%) participants had food from restaurant.

Out of 43 study participants in the rural area who reported to have history of food poisoning in the past six months, the sources of food consumed by 28 (65.1%) participants was food cooked at home, 9 (20.9%) participants had street food and the rest 6 (13.9%) participants had food from restaurant.

**D. Knowledge, Attitude and Practices regarding WHO Five Keys for Food safety among urban and rural participants**

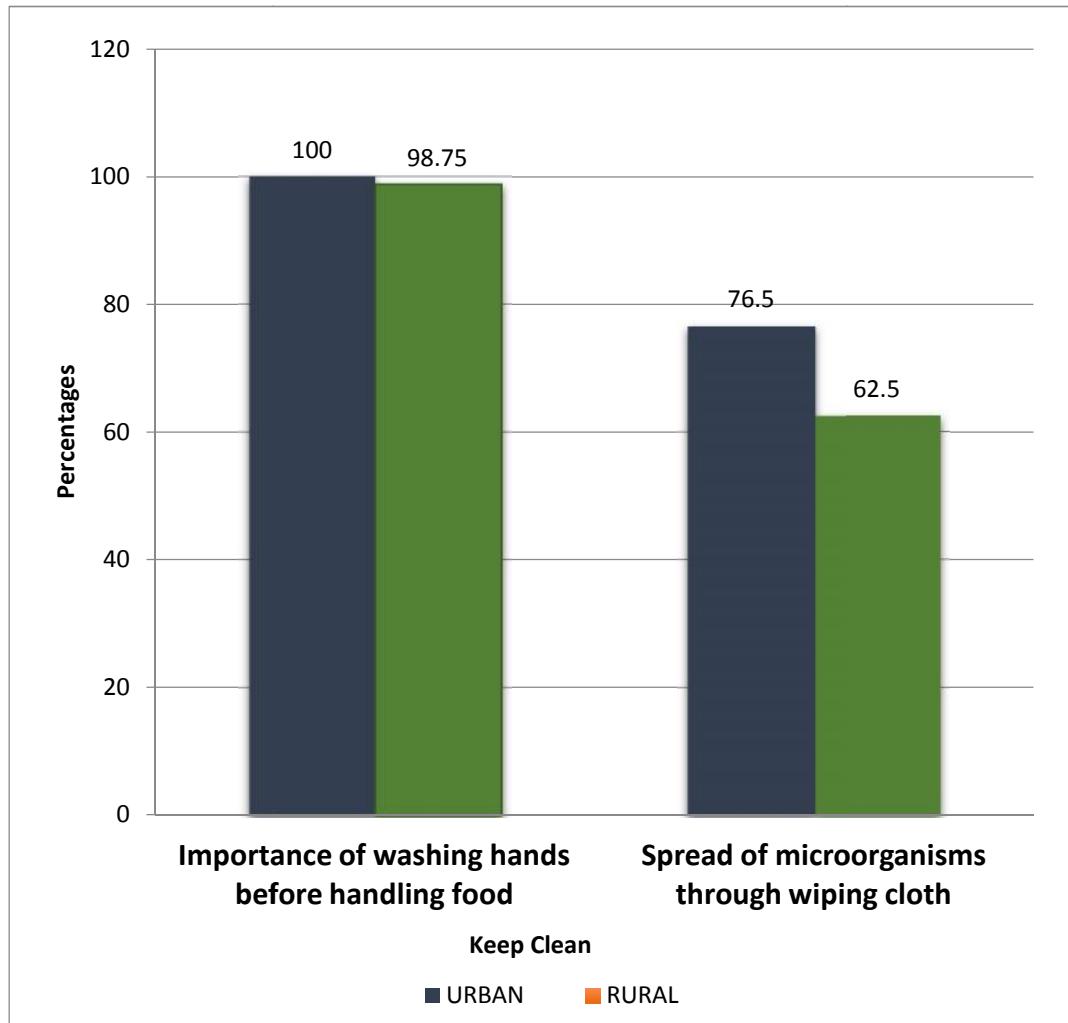
**Table XVII. Distribution of study participants according to Knowledge regarding five keys of food safety – ‘Keep Clean’**

Knowledge of food safety(Keep Clean)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
Wash hands before food handling (True)	400	100%	395	98.7%
Wiping cloth can spread microorganisms(True)	306	76.5%	250	62.5%

In the present study, knowledge regarding WHO five keys for food safety the correct responses for the first key, keep clean among urban participants regarding importance of washing hands before handling food was responded correctly as true by 400 (100%) participants and regarding the spread of microorganisms through wiping cloth was responded correctly as true by 306 (76.5%) participants.

Among rural participants, the correct responses for the first key, keep clean regarding importance of washing hands before handling food was responded correctly as true by 395 (98.7%) participants and 250 (62.5%) participants responded correctly as true regarding the spread of microorganisms through wiping cloth.

**Graph V. Distribution of study participants according to Knowledge regarding five keys of food safety – ‘Keep Clean’**



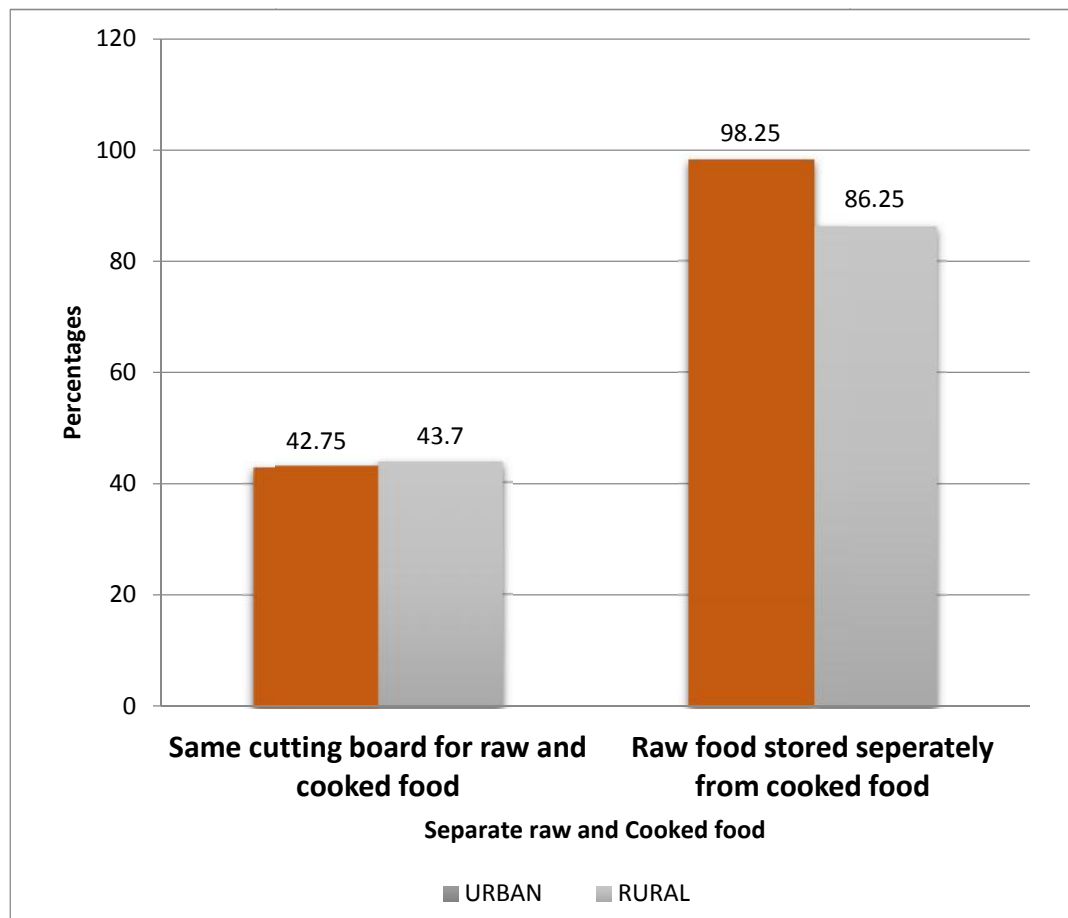
**Table XVIII. Distribution of study participants according to Knowledge regarding five keys of food safety – ‘Separate raw and cooked food’**

Knowledge of food safety(Separate raw and cooked food)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
Same cutting board used for raw and cooked food (False)	171	42.8%	175	43.7%
Raw food store separately from cooked food (True)	393	98.2%	345	86.2%

Among the urban participants, knowledge regarding the second key, separate raw and cooked food for the use of same cutting board for raw and cooked food was responded correctly as false by 171(42.8%) participants and regarding storage of raw and cooked food separately was responded correctly as true by 393 (98.2%) participants.

Among the rural participants, knowledge regarding the second key, separate raw and cooked food for use of same cuttingboard for raw and cooked food was responded correctly as false by 175 (43.7%) participants and regarding storage of raw and cooked food separately was responded correctly as true by 345 (86.2%) participants.

**Graph VI. Distribution of study participants according to Knowledge regarding five keys of food safety – ‘Separate raw and cooked food’**



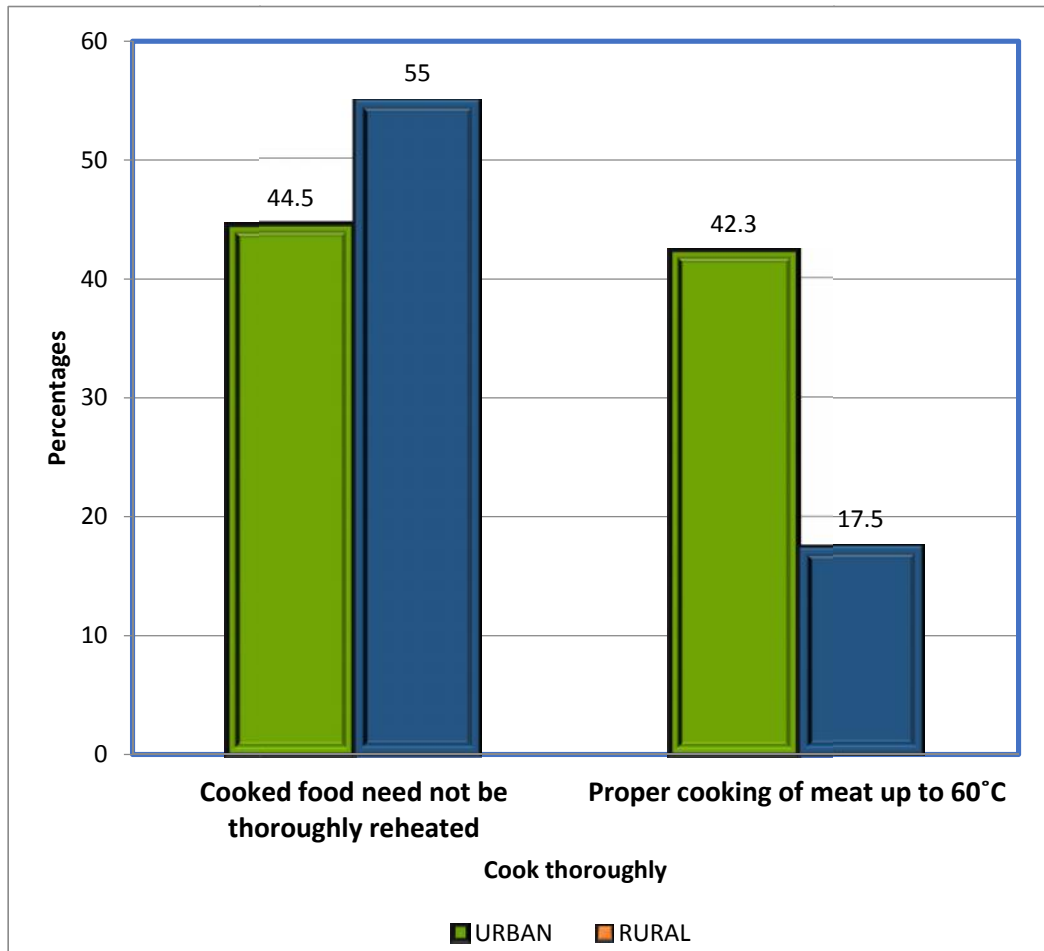
**Table XIX. Distribution of study participants according to Knowledge regarding five keys of food safety – ‘Cook thoroughly’**

Knowledge of food safety(Cook thoroughly)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Cooked food need not be thoroughly reheated(False)</b>	178	44.5%	220	55%
<b>Proper cooking up to 40°C (False)</b>	169	42.3%	70	17.5%

In the present study, knowledge regarding the third key, Cook thoroughly among the urban participants for the question cooked food need not be thoroughly reheated was answered correctly as false by 178 (44.5%) participants and for the question proper cooking of meat up to 40°C was answered correctly as false by 169 (42.3%) participants.

Among the rural participants, for the question cooked food need not be thoroughly reheated was answered correctly as false by 220(55.0%) participants and for the question proper cooking of meat up to 40°C was answered correctly as false by 70(17.5%) participants.

**Graph VII. Distribution of study participants according to Knowledge regarding fivekeys of food safety – ‘Cook thoroughly’**



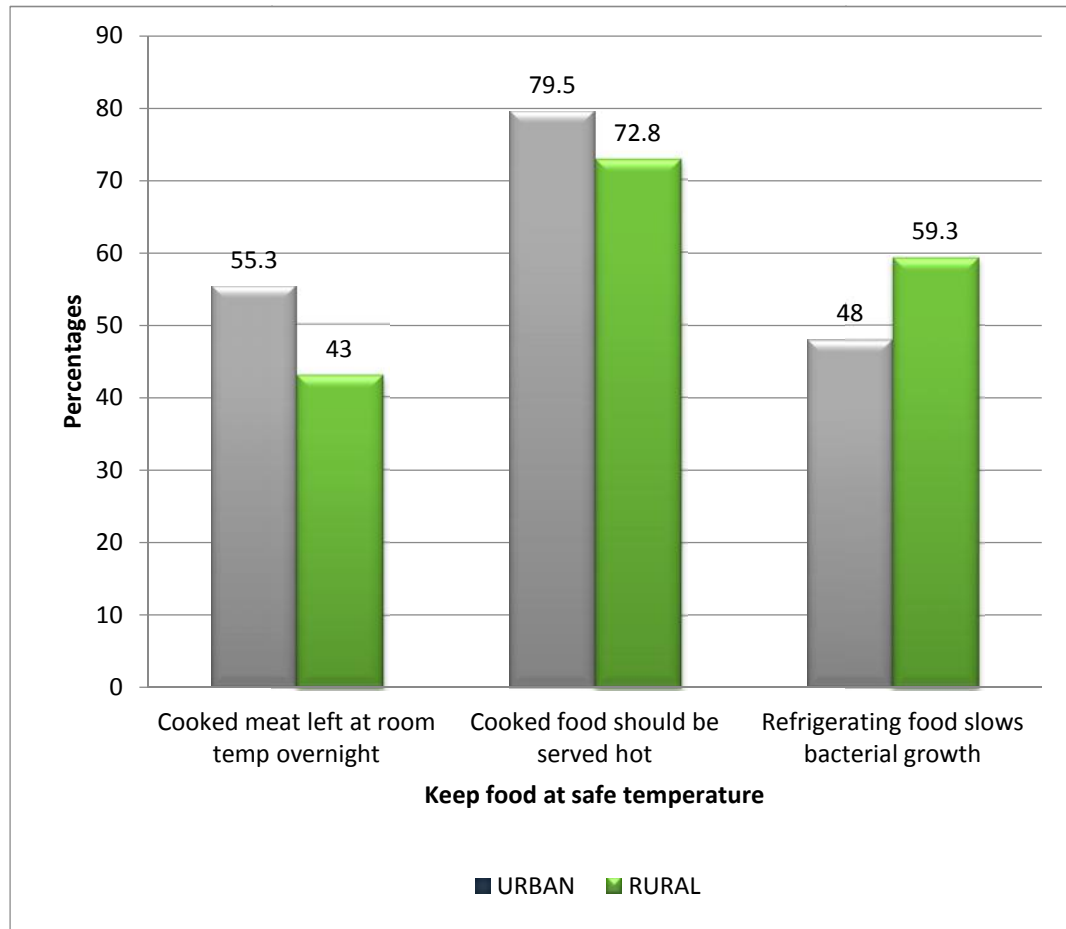
**Table XX. Distribution of study participants according to Knowledge regarding five keys of food safety – ‘Keep food at safe temperature’**

Knowledge of food safety(keep food at safe temperature)	Urban(n=400)		Rural (n=400)	
	No	%	No	%
<b>Cooked meal can be left at room temperature overnight (False)</b>	221	55.3%	172	43%
<b>Cooked food should be served hot (True)</b>	318	79.5%	291	72.8%
<b>Refrigerating food slows bacterial growth (True)</b>	192	48%	237	59.3%

In this study knowledge regarding the fourth key, keep food at safe temperature among the urban participants for the question ‘whether cooked meal can be left at room temperature overnight to cool before refrigerating’ was answered correctly as false by 221 (55.3%) participants, for the question ‘cooked food should be kept very hot before serving’ was answered correctly as true by 318 (79.5%) participants and for the question ‘refrigerating food only slows bacterial growth’ was answered correctly as true by 192 (48%) participants.

Among the rural participants, for the question ‘whether cooked meal can be left at room temperature overnight to cool before refrigerating’ was answered correctly as false by 172 (43%) participants, for the question ‘cooked food should be kept very hot before serving’ was answered correctly as true by 291(72.8%) participants and for the question ‘refrigerating food only slows bacterial growth’ was answered correctly as true by 237(59.3%) participants.

**Graph VIII. Distribution of study participants according to Knowledge regarding five keys of food safety – ‘Keep food at safe temperature’**



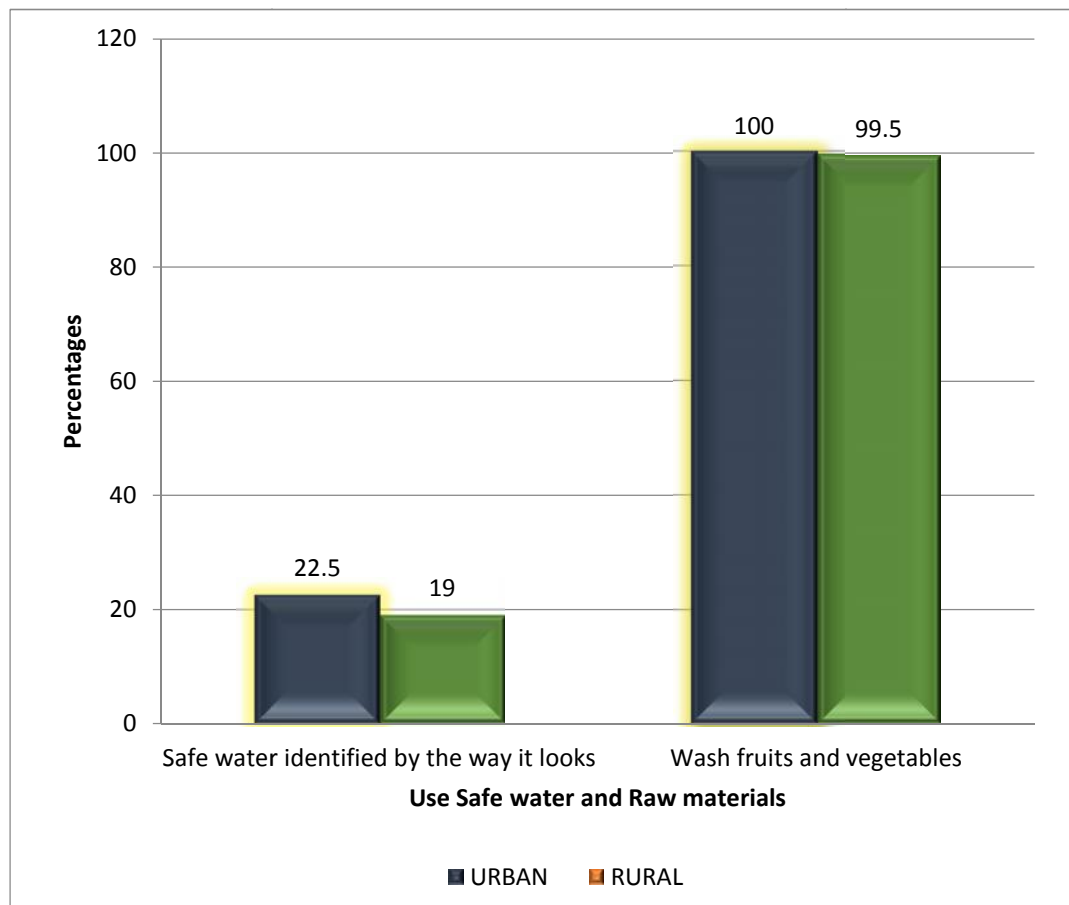
**Table XXI. Distribution of study participants according to Knowledge regarding five keys of food safety – ‘Use Safe water and Raw materials’**

Knowledge of food safety(Use Safe water and Raw materials)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
Safe water identity by the way it looks (False)	90	22.5%	76	19%
Wash fruit and vegetables (True)	400	100%	398	99.5%

In the present study, knowledge regarding fifth key use of safe water and raw materials among urban participants, for the question ‘safe water can be identified by the way it looks’ was answered correctly as false by 90(22.5%) participants and for the question ‘fruits and vegetables should be washed’ was answered correctly as true by all 400(100%) participants.

Among the rural participants, for the question ‘safe water is identified by the way it looks’ was answered correctly as false by 76(19%) participants and for the question ‘fruits and vegetables should be washed’ was answered correctly as true by 398(99.5%) participants.

**Graph IX. Distribution of study participants according to Knowledge regarding five keys of food safety – ‘Use Safe water and Raw materials’**



**Table XXII. Distribution of study participants according to Attitude regarding five keys of food safety – ‘Keep clean’**

Attitude (keep clean)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Frequent hand washing during food preparation worth</b>				
Agree	394	98.5%	392	98%
Not sure	0	0%	2	0.5%
Disagree	6	1.5%	6	1.5%
<b>Keep kitchen surface clean reduce risk of illness</b>				
Agree	394	98.5%	393	98.3%
Not sure	0	0%	4	1%
Disagree	6	1.5%	3	0.5%

In the present study, attitude regarding WHO five keys for food safety the findings for the first key ‘keep clean’ among the urban participants was agreed by 394 (98.5%) participants that ‘frequent hand washing during food preparation is worth the extra effort’ and six (1.5%) disagreed for it. 394 (98.5%) participants agreed that ‘keeping kitchen surfaces clean reduce the risk of illness’ and six (1.5%) disagreed for it.

Among the rural participants, 392 (98%) agreed that ‘frequent hand washing during food preparation is worth the extra effort’, two (0.5 %) were not sure and six (1.5%) disagreed for it. 393 (98.3%) rural participants agreed that ‘keeping kitchen surfaces clean reduce the risk of illness’, while four (1 %) were not sure and three (0.5%) disagreed for it.

**Table XXIII. Distribution of study participants according to Attitude regarding five keys of food safety – ‘separate raw and cooked food’**

Attitude (separate raw and cooked food)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Keeping raw and cooked food separate helps to prevent illness</b>				
<b>Agree</b>	330	82.5%	332	83%
<b>Not sure</b>	61	15.3%	37	9.3%
<b>Disagree</b>	9	2.3%	31	7.8%
<b>Different knives and cutting boards for raw and cooked food worth</b>				
<b>Agree</b>	305	76.3%	309	77.3%
<b>Not sure</b>	61	15.3%	46	11.5%
<b>Disagree</b>	34	8.5%	45	11.3%

In the present study, the attitude regarding the second key ‘separate raw and cooked food’, among the urban participants ‘keeping raw and cooked food separate helps to prevent illnesses was agreed by 330 (82.5%) participants, disagreed by 9 (2.3%) participants and 61 (15.3%) were not sure about it. 305(76.3%) participants agreed that ‘use of different knives and cutting board for raw and cooked food is worth’, while 61(15.3%) participants were not sure and 34(8.5%) participants disagreed to it.

Among the rural participants, ‘keeping raw and cooked food separate helps to prevent illnesses’ was agreed by 332(83%) participants, 37(9.3%) were not sure about it and it was disagreed by 31(7.8%) participants. ‘Use of different knives and cutting board for raw and cooked food is worth’ was agreed by 309(77.3%) participants, 46(11.5%) were not sure about it and it was disagreed by 45(11.3%) participants.

**Table XXIV. Distribution of study participants according to Attitude regarding five keys of food safety – ‘Cook thoroughly’**

Attitude (Cook thoroughly)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Soup and stews boiled for safety</b>				
<b>Agree</b>	244	61%	28	71.5%
<b>Not sure</b>	36	9%	44	11%
<b>Disagree</b>	120	30%	70	17.5%

Among the urban participants attitude regarding third key for food safety, ‘cook thoroughly’ on ‘soups and stews should be boiled to ensure food safety’ was agreed by 244 (61%) participants, 120 (30%) participants disagreed to it and 36(9%) participants were not sure.

Among the rural participants 286(71.5%) participants agreed that ‘soups and stews should be boiled to ensure food safety’, while 70(17.5%) disagreed to it and 44 (11%) participants were not sure about it.

**Table XXV. Distribution of study participants according to Attitude regarding five keys of food safety – ‘Keep food at safe temperature’**

Attitude (Keep food at safe temperature)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Thawing food in cool place is safe</b>				
<b>Agree</b>	311	77.8%	207	51.8%
<b>Not sure</b>	53	13.3%	129	32.3%
<b>Disagree</b>	36	9%	64	16 %
<b>Unsafe to leave cooked food out of refrigerator &gt; 2hours</b>				
<b>Agree</b>	170	42.5%	130	32.5%
<b>Not sure</b>	73	18.3%	133	33.3%
<b>Disagree</b>	157	39.3%	137	34.3%

Attitude regarding the fourth key of food safety –‘keep food at safe temperature’ among the urban participants on ‘thawing food in a cool place is safe’ was agreed by 311 (77.8%) participants, 53 (13.3%) participants were not sure and 36 (9%) participants disagreed to it.170 (42.5%) participants agreed that ‘it is unsafe to leave cooked food out of refrigerator for more than two hours’, while 157 (39.3%) participants disagreed for the same and 73 (18.3%) participants were not sure about it.

Attitude of the rural study participants on ‘thawing food in a cool place is safe’ was agreed by 207 (51.8%)participants, while 129 (32.3%) participants were not sure about it and 64 (16 %) participants disagreed for the same.‘It is unsafe to leave cooked food out of refrigerator for more than two hours’ was disagreed by 137 (34.3%) participants, while 133 (33.3%) participants were not sure about it and 130 (32.5%) participants agreed to it.

**Table XXVI. Distribution of study participants according to Attitude regarding five keys of food safety – ‘Use safe water and Raw materials’**

Attitude(Use safe water and Raw materials)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Inspecting food for freshness and wholesomeness – valuable</b>				
<b>Agree`</b>	400	100%	387	96.8%
<b>Not sure</b>	0	0%	11	2.8%
<b>Disagree</b>	0	0%	2	0.5%
<b>Important to throw food beyond expiry date</b>				
<b>Agree</b>	393	98.3%	386	96.5%
<b>Not sure</b>	7	1.7%	6	1.5%
<b>Disagree</b>	0	0%	8	2%

In the present study, attitude regarding fifth key – ‘use safe water and raw materials’ among the urban participants about ‘inspecting food for freshness and wholesomeness is valuable’ was agreed by 400 (100%) participants and 393(98.3%)participants agreed that ‘it is important to check and throw away food beyond expiry date’ while 7(1.7%) participants were not sure about it.

Among the rural participants,387(96.8%) participants agreed that ‘inspecting food for freshness and wholesomeness is valuable’, while 11(2.8%) participants were not sure about it and 2(0.5%) of them disagreed for it. 386 (96.5%) participantsagreed that ‘inspecting food for freshness and wholesomeness is valuable’, 6(1.5%) were not sure about it and 8 (2%) disagreed for it.

**Table XXVII. Distribution of study participants according to practice of washing hands before or during food preparation – Key One ‘Keep Clean’**

Practice hand wash before or during food preparation (keep clean)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Always</b>	367	91.8%	346	86.5%
<b>Most times</b>	27	6.8%	46	11.5%
<b>Sometimes</b>	6	1.5%	7	1.8%
<b>Never</b>	0	0%	1	0.3%

In the present study among 400 urban participants washing hands before or during food preparation was practiced always by 367(91.8%) participants, most of the times by 27(6.8%) participants and sometimes by 6(1.5%) participants.

Among 400 rural participants, practice of washing hands before or during food preparation was done always by 346(86.5%) participants, most of the times by 46(11.5%) participants, sometimes by seven(1.8%) participants and one(0.3%) among them never practiced it.

**Table XXVIII. Distribution of study participants according to practice of cleaning surfaces and equipment used for food preparation before re-using on other food items– Key One ‘Keep Clean’**

Practice clean surface for food preparation before reuse on other food (keep clean)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Always</b>	296	74%	329	82.3%
<b>Most times</b>	32	8%	42	10.5%
<b>Sometimes</b>	33	8.3%	16	4%
<b>Not often</b>	27	6.8%	11	2.8%
<b>Never</b>	12	3%	2	0.5%

In the present study among the urban participants the practice of cleaning kitchen surfaces for food preparation before reusing on other foods was reported as always by 296 (74%) participants, most of the times by 32 (8%) participants, sometimes by 33 (8.3%) participants, not often by 27 (6.8%) of them and never by 12 (3%) of them.

Among the rural participants, the practice of cleaning kitchen surfaces for food preparation before reusing on other foods was reported as always by 329 (82.3%) participants, most of the times by 42 (10.5%) participants, sometimes by 16 (4%) participants, not often by 11 (2.8%) of them and never by 2 (0.5%) participants.

**Table XXIX. Distribution of study participants according to practice of use of separate utensils and cutting-boards when preparing raw and cooked food – Key Two ‘Separate raw and cooked food’**

Practice of use of separate utensils and cutting board (Separate raw and cooked food)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Always</b>	291	72.8%	221	55.3%
<b>Most times</b>	40	10%	80	20%
<b>Sometimes</b>	12	3%	25	6.3%
<b>Not often</b>	32	8%	35	8.75%
<b>Never</b>	25	6.3%	39	9.75%

In the present study, urban participants reported the practice of use of separate utensils and cutting board for raw and cooked food being practiced always by 291(72.8%)participants,most of the times by 40 (10%) participants, sometimes by 12(3%)participants, not often by 32 (8%) of them and never by 25(6.3%) of them.

Among the rural participants, the practice of use of separate utensils and cutting board for raw and cooked food was reported as always by 221(55.3%)participants, most of the times by 80(20.0%)participants, sometimes by 25(6.3%)participants, not often by 35(8.75%) of them and never by 39 (9.75%) of them.

**Table XXX. Distribution of study participants according to practice of separation of raw and cooked food during storage – Key Two ‘Separate raw and cooked foods’**

Practice of separate raw and cooked food during storage (separate raw and cooked food)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Always</b>	335	83.8%	242	60.5%
<b>Most times</b>	42	10.8%	100	25%
<b>Sometimes</b>	6	1.5%	20	5%
<b>Not often</b>	9	2.3%	26	6.5%
<b>Never</b>	8	2%	12	3%

Among the urban participants, the practice of storage of raw and cooked food separately was reported as done always by 335(83.8%)participants, most of the times by 42(10.8%)participants, sometimes by 6(1.5%)participants,not often by 9(2.3%) of them and never by 8 (2%) of them.

Among the rural participants,the practice of storage of raw and cooked food separately was reported as done always by 242(60.5%)participants, most of the times by 100(25%)participants, sometimes by 20 (5%)participants, not often by 26(6.5%) of them and never by 12 (3%) of them.

**Table XXXI. Distribution of study participants according to practice of checking that meats are cooked thoroughly by ensuring that the juices are clear – Key Three ‘Cook thoroughly’**

Practice of checking meat cooked thoroughly (cook thoroughly)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
Always	71	17.8%	61	15.3%
Most times	174	43.5%	13	3.3%
Sometimes	26	6.5%	19	4.8%
Not often	42	10.5%	71	17.8%
Never	87	21.8%	236	59%

In the present study, urban participants reported the practice of checking ‘whether meats are cooked thoroughly by ensuring that juices are clear or checking tendency of meat or by cooking in pressure cooker’ was expressed as always by 71(17.8%)participants, most of the times by 174(43.5%)participants, sometimes by 26(6.5%)participants, not often by 42(10.5%) of them and never by 87(21.8%) of them.

Among the rural participants, the practice of checking ‘whether meats are cooked thoroughly by ensuring that juices are clear or by checking tendency of meat or by cooking in pressure cooker’ was expressed as always by 61(15.3%)participants, most of the times by 13(3.3%)participants, sometimes by 19(4.8%)participants, not often by 71(17.8%) of them and never by 236 (59%) of them.

**Table XXXII. Distribution of study participants according to practice of reheating cooked food until it is piping hot – Key Three ‘Cook thoroughly’**

Reheat cooked food (cook thoroughly)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
Always	184	46%	77	19.3%
Most times	57	14.3%	93	23.3%
Sometimes	72	18%	106	26.5%
Not often	68	7%	68	17%
Never	19	4.8%	56	14%

In the present study, urban participants reported the practice of ‘reheating cooked food until it is piping hot’ was expressed as always by 184 (46%) participants, most of the times by 57(14.3%) participants, sometimes by 72 (18%) participants, not often by 68 (7%) of them and never by 19(4.8%) of them.

Among the rural participants, the practice of ‘reheating cooked food until it is piping hot’ was expressed as always by 77(19.3%) participants, most of the times by 93(23.3%) participants, sometimes by 106(26.5%) participants, not often by 68(17%) of them and never by 56 (14%) of them.

**Table XXXIII. Distribution of study participants according to practice of thawing frozen food in the refrigerator or other cool place – Key Four ‘Keep Food at Safe temperature’**

Practice thaw frozen food in refrigerator or cool place (Keep Food at Safe temperature)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Always</b>	102	25.5%	86	21.5%
<b>Most times</b>	44	11%	58	14.5%
<b>Sometimes</b>	51	12.8%	71	17.8%
<b>Not often</b>	101	25.3%	84	21%
<b>Never</b>	102	25.5%	101	25.3%

In the present study, urban participants reported the practice of thawing frozen food in refrigerator or in cool place as always by 102(25.5%)participants, most of the times by 44 (11%)participants, sometimes by 51(12.8%)participants, not often by 101(25.3%)participants and never by 102(25.5%)participants.

Among the rural participants, the practice of thawing frozen food in refrigerator or in cool place was reported as always by 86(21.5%)participants, most of the times by 58(14.5%)participants, sometimes by 71(17.8%)participants, not often by 84(21%) participants and never by 101(25.3%)participants.

**Table XXXIV. Distribution of study participants according to practice of storing left-over cooked food in a cool place within two hours – Key Four ‘Keep Food at Safe temperature’**

Practice store left- over food in cool place within 2 hours (keep food at safe temperature)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Always</b>	54	13.5%	17	4.3%
<b>Most times</b>	37	9.3%	30	7.5%
<b>Sometimes</b>	42	10.5%	46	11.5%
<b>Not often</b>	103	25.8%	77	19.3%
<b>Never</b>	164	41%	230	57.5%

In the present study, urban participants reported the practice of ‘storing left-over cooked food in a cool place within two hours’ as always by 54(13.5%)participants, most of the times by 37(9.3%)participants, sometimes by 42(10.5%) participants, not often by 103(25.8%)participants and never by 164(41.0%)participants.

Among the rural participants, the practice of ‘storing left-over cooked food in a cool place within two hours’ was reported as always by 17(4.3%)participants, most of the times by 30(7.5%)participants, sometimes by 46(11.5%)participants, not often by 77(19.3%)participants and never by 230(57.5%)participants.

**Table XXXV. Distribution of study participants according to practice of checking and throwing away food beyond expiry date – Key Five ‘Use Safe water and Raw materials’**

Practice check and throw away food beyond expiry date (Use Safe water and Raw materials)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Always</b>	336	84%	92	23%
<b>Most times</b>	24	6%	72	18%
<b>Sometimes</b>	17	14.3%	14	3%
<b>Not often</b>	3	0.8%	19	4.8%
<b>Never</b>	20	5%	203	50.8%

In the present study, urban participants reported the practice of ‘checking and throwing away food beyond expiry date’ as always by 336 (84%) participants, most of the times by 24 (6%) participants, sometimes by 17 (14.3%) participants, not often by 3 (0.8%) of them and never by 20 (5%) of them.

Among the rural participants, the practice of ‘checking and throwing away food beyond expiry date’ was reported as always by 92 (23%) participants, most of the times by 72 (18%) participants, sometimes by 14 (3%) participants, not often by 19 (4.8%) of them and never by 203 (50.8%) participants.

**Table XXXVI. Distribution of study participants according to practice of washing fruit and vegetables with safe water before eating them – Key Five ‘Use Safe water and Raw materials’**

Practice wash fruits and vegetables with safe water (Use Safe water and Raw materials)	Urban (n=400)		Rural (n=400)	
	No	%	No	%
<b>Always</b>	388	97%	347	86.8%
<b>Most times</b>	6	1.5%	40	10%
<b>Sometimes</b>	6	1.5%	5	1.3%
<b>Not often</b>	0	0%	4	1%
<b>Never</b>	0	0%	4	1%

In the present study, urban participants reported the practice of ‘washing fruits and vegetables’ as always by 388 (97%) participants, most of the times by 6 (1.5%) of them and sometimes by 6 (1.5%) of them.

Among the rural participants, the practice of ‘washing fruits and vegetables’ was reported as always by 347 (86.8%) participants, most of the times by 40 (10%) participants, sometimes by 5 (1.3%) of them, not often by 4 (1%) of them and never by 4 (1%) of them.

**Table XXXVII. Distribution of study participants according to the total score of Knowledge, Attitude and Practice of food safety among urban and rural households**

Parameters	Maximum score	Mean $\pm$ SD		p value
		Urban (n= 400)	Rural (n= 400)	
Knowledge total score	11	7.1 $\pm$ 1.47	6.57 $\pm$ 1.58	< 0.001
Attitude total score	18	15.45 $\pm$ 1.65	15.14 $\pm$ 2	0.018
Practice total score	40	30.18 $\pm$ 4.21	25.12 $\pm$ 4.55	< 0.001

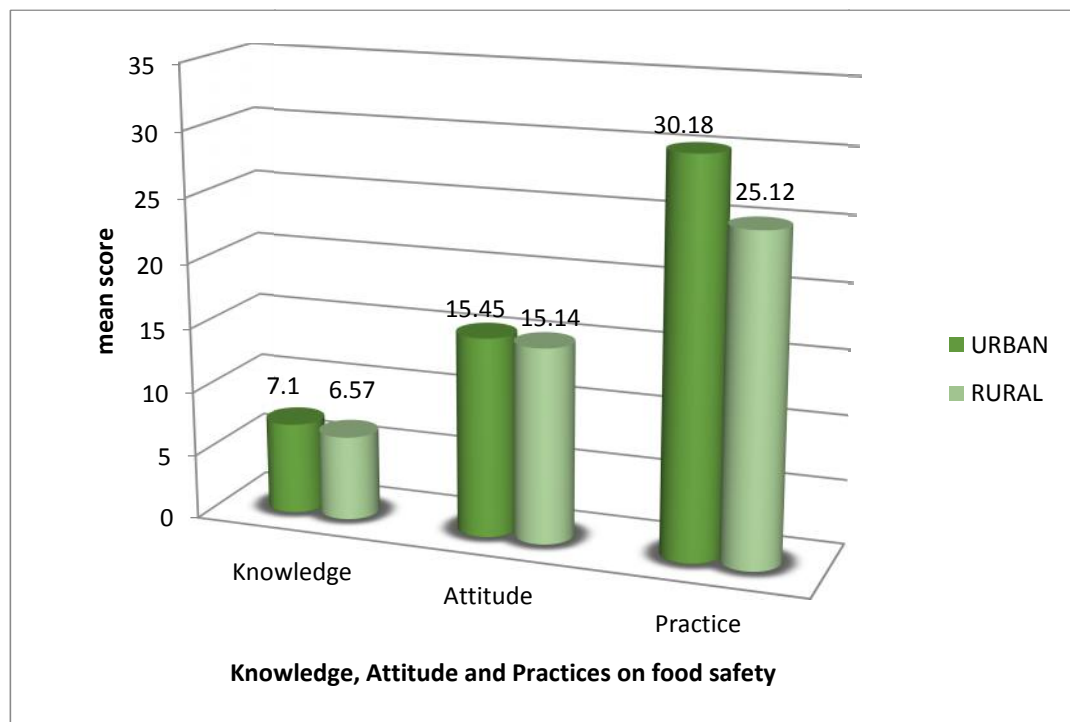
In the present study, among the urban households the mean  $\pm$  SD score of knowledge was 7.1  $\pm$  1.47 out of the total score of 11 for eleven knowledge questions asked, the mean  $\pm$  SD score of attitude was 15.45  $\pm$  1.65 out of the total score of 18 for nine attitude questions asked and the mean  $\pm$  SD score of practice regarding food safety was 30.18  $\pm$  4.21 out of the total score of 40 for ten practice questions asked.

Among the rural households, the mean  $\pm$  SD score of knowledge was 6.57  $\pm$  1.58 out of the total score of 11 for eleven knowledge questions asked, the mean  $\pm$  SD score of attitude was 15.14  $\pm$  2 out of the total score of 18 for nine attitude questions asked and the mean  $\pm$  SD score of practice regarding food safety was 25.12  $\pm$  4.55 out of the total score of 40 for ten practice questions asked.

In this study knowledge and practices of food safety was higher among urban compared to rural study participants and these differences were found to be

statistically significant ( $p < 0.001$ ). There was no difference in Attitude regarding food safety among urban and rural households but it was found to be statistically significant ( $p = 0.018$ ).

**Graph X: Distribution of study participants according to Mean and standard deviation (SD) of knowledge, attitude, and practice scores on food safety**



**Table XXXVIII. Distribution of study participants according to knowledge regarding WHO five keys for food safety**

WHO Key	Knowledge	Max. score	Mean $\pm$ SD		p value
			Urban (n= 400)	Rural ( n= 400)	
Key 1	Keep clean	2	1.77 $\pm$ 0.42	1.61 $\pm$ 0.49	<0.001
Key 2	Separate raw and cooked food	2	1.41 $\pm$ 0.52	1.30 $\pm$ 0.063	0.008
Key 3	Cook thoroughly	2	0.87 $\pm$ 0.74	0.73 $\pm$ 0.64	0.004
Key 4	Keep food at safe temperature	3	1.83 $\pm$ 0.93	1.75 $\pm$ 0.88	0.229
Key 5	Use safe water and raw materials	2	1.23 $\pm$ 0.41	1.19 $\pm$ 0.40	0.168

Among the ‘WHO Five keys for food safety’ the mean knowledge score for the first key – ‘Keep Clean’ was 1.77 $\pm$ 0.42 for urban participants and 1.61 $\pm$ 0.49 for rural participants out of the total score of 2 and the difference was statistically significant ( $p < 0.001$ ).

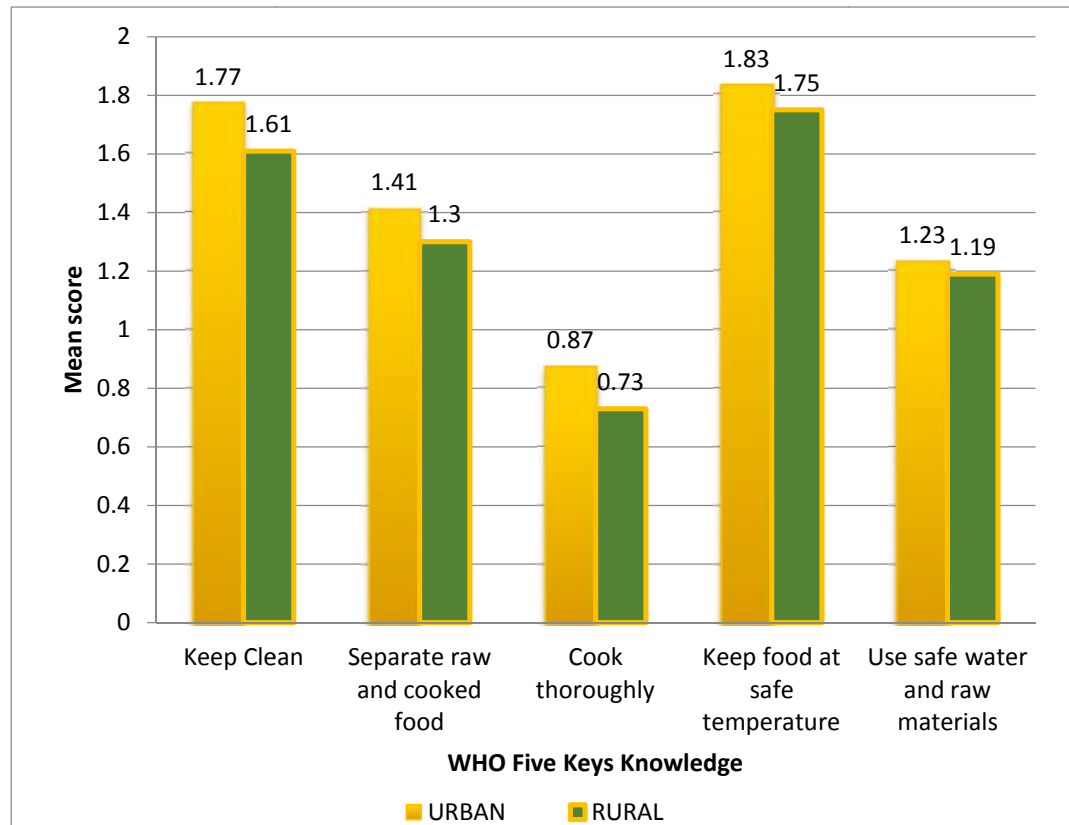
The mean knowledge score for second key – ‘Separate raw and cooked food’ was 1.41 $\pm$ 0.52 for urban participants and 1.30 $\pm$ 0.063 for rural participants out of the total score of 2 and the difference was statistically significant ( $p = 0.008$ ).

The mean knowledge score for third key – ‘Cook thoroughly’ was  $0.87 \pm 0.74$  for urban participants and  $0.73 \pm 0.64$  for rural participants out of the total score of 2 and the difference was statistically significant ( $p = 0.004$ ).

The mean knowledge score for fourth key – ‘Keep food at safe temperature’ was  $1.83 \pm 0.93$  for urban participants and  $1.75 \pm 0.88$  for rural participants out of the total score of 3 and there was no statistically significant difference.

The mean knowledge score for fifth key – ‘Use safe water and raw materials’ was  $1.23 \pm 0.41$  for urban participants and  $1.19 \pm 0.40$  for rural participants out of the total score of 2 and there was no statistically significant difference.

**Graph XI Distribution of study participants according to knowledge regarding WHO five keys for food safety**



## E. HYGIENE AND OTHER PRACTICES IN THE KITCHEN

### Use of apron or hair tie while cooking

In the present study, 339 (84.7%) urban households and 268 (67%) rural households said that it is important to use apron while cooking.

**Table XXXIX. Distribution of study participants according to attitude regarding use of apron or hair tie while cooking**

Is wearing apron while cooking worth	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
<b>Agree</b>	336	84%	230	57.5%
<b>Not sure</b>	46	11.5%	107	26.7%
<b>Disagree</b>	18	4.5%	63	15.75%

Among the urban households, 50 (12.5%) participants used apron while cooking and 350 (87.5%) participants did not use apron. Among the rural households, 11(2.75%) participants used apron while cooking and 389 (97.2%) participants did not use apron while cooking.

### Avoiding pet animals in kitchen

In the present study, among 400 urban participants 239 (59.75%) answered correctly that 'it is important to avoid pet animals in the kitchen' and agreed that 'it is safer to avoid pet in the kitchen'. Out of 80 urban participants who had pet animals in

their households the practice of avoiding pet animals in kitchen was done as always by 31 (38.75%) of them, most of the times by 7 (8.75%) of them, sometimes by 4 (5%) of them, not often by 1 (1.25%) of them and never by 37 (46.25%) of them.

Among the 400 rural participants, 274 (68.5%) answered correctly that 'it is important to avoid pet animals in the kitchen' and agreed that 'it is safer to avoid pet in the kitchen'. Out of the 126 rural participants, who had pet animals in their households the practice of avoiding pet animals in kitchen was done as always by 88 (69.8%) participants, most of the times by 7 (5.5%) of them, sometimes by 8 (6.34%) of them, not often by 10 (7.93%) of them and never by 13 (10.3%) of them.

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**Best place to store raw food in refrigerator**
**Table XL. Distribution of study participants according to the best place to store raw food in refrigerator**

Best place to store raw food in fridge	Urban (n=283)		Rural (n=74)	
	Frequency	Percentage	Frequency	Percentage
On top shelf	11	3.9%	3	4.1%
On bottom shelf	218	77%	46	62.2%
Below ready to eat	25	8.8%	6	8.1%
No difference	29	10.3%	19	25.6%

In the present study, among 283 urban study participants who had refrigerator in their homes, said that ‘the best place to store raw food in refrigerator’ was on top shelf by 11 (3.9%) of them, on the bottom shelf by 218(77%) of them, below ready to eat food by 25(8.8%) of them and no difference by 29 (10.3%) of them.

Among 74 rural study participants who had refrigerator in their homes, said that ‘the best place to store raw food in refrigerator’ was on top shelf by 3 (4.1%) of them, on the bottom shelf by 46 (62.2%) of them, below ready to eat food by 6(8.1%) of them and no difference by 19(25.6%) of them.

**Hand washing practices**

In the present study hand washing was practiced between handling raw meat, poultry, fish and other raw food products by 279 (69.8%) study participants in urban households and 295 (73.8%) study participants in rural households.

The practice of washing hands after going to toilet was reported by 394 (98.5%) urban participants and 395 (98.8%) rural participants.

The practice of washing hands after handling animals and chemicals was reported by 394(98.5%) urban participants and 380(95%) rural participants.

**Avoid pests in the kitchen**

In the present study, among the urban participants, 400(100%) reported that it is important to avoid pests in the kitchen and agreed that it can prevent food borne illness. 343 (85.8%) participants used chemicals to avoid pests in the kitchen.

Among the rural participants, 400(100%) reported that it is important to avoid pests in the kitchen and 391 (97.8%) agreed that avoiding pests in the kitchen can prevent food borne illness.316(79%) participants used chemicals to avoid pests in the kitchen.

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**Use of preservatives during food storage**
**Table XLI. Distribution of study participants according to use of preservative during food storage**

Use of preservative	Urban (n=400)		Rural (n=400)	
	Frequency	Percentage	Frequency	Percentage
<b>Yes</b>	198	49.5%	158	39.5%
<b>No</b>	202	50.5%	242	60.5%

In the present study, 198(49.5%) urban participants and 158(39.5%) rural participants used preservatives during storage of food storage and 202(50.5%) urban participants and 242(60.5%) rural participants did not use any kind of preservatives for the storage of food.

**Table XLII. Distribution of study participants according to type of food stored with preservative**

Type of food	Urban (n=198)		Rural (n=158)	
	Frequency	Percentage	Frequency	Percentage
<b>Jowar</b>	11	5.5%	29	18.3%
<b>Rice</b>	65	32.8%	35	22.1%
<b>Wheat</b>	38	19.1%	12	7.5%
<b>Wheat and rice</b>	50	25.5%	45	28.4%
<b>Green peas</b>	34	17.1%	37	23.4%

In the present study, out of 198 urban participants who used preservative for food storage, 65(32.8%) of them used it for rice, 50(25.5%) of them used it for wheat and rice, 38(19.1%)of them used it for only wheat, 34(17.1%) of them used it for green peas and 11 (5.5%) of them used preservative for Jowar.

Out of 158 rural participants who used preservative for food storage,45(28.4%) of them used it for wheat and rice, 37 (23.4%)of them used it for green peas, 35(22.1%)of them used it for rice, 29 (18.3%) of them used it for jowar and 12(7.5%)of them used it forwheat.

**Table XLIII. Distribution of study participants according to type of preservative used**

Type of preservative	Urban (n=198)		Rural (n=158)	
	Frequency	Percentage	Frequency	Percentage
<b>Boric powder</b>	97	48.9%	58	36.7%
<b>Clove</b>	30	15.1%	8	5.06%
<b>Dry chillies</b>	15	7.5%	4	2.5%
<b>Eucalyptus and neem</b>	15	7.5%	7	28.4%
<b>Goli powder</b>	2	1.01%	2	0.5%
<b>Neem and boric powder</b>	21	10.6%	19	12.02%
<b>White Powder</b>	8	4.04%	50	31.6%
<b>Tablet</b>	10	5.05%	10	6.32%

Out of the 198 urban participants who used preservative during food storage reported that 97 (48.9%) of them used boric powder, 30 (15.1%) of them used clove, 21 (10.6%) of them used neem and boric powder, 15 (7.5%) of them used dry chillies, 15 (7.5%) of them used eucalyptus and neem, 8 (4.04%) of them used white Powder, 10 (5.05%) of them used tablet and 2 (1.01%) of them used goli powder as preservative.

Out of the 158 rural participants who used preservative during food storage reported that 58 (36.7%) of them used boric powder, 50 (31.6%) of them used white Powder, 19 (12.02%) of them used neem and boric powder, 10 (6.32%) of them used tablet, 8 (5.06%) of them used clove, 7 (28.4%) of them used eucalyptus and neem, 4 (2.5%) of them used dry chillies and 2 (0.5%) of them used goli powder as preservative.

**Table XLIV. Distribution of study participants according to duration of storage of food using preservative**

Duration of storage	Urban (n=198)		Rural (n=158)	
	Frequency	Percentage	Frequency	Percentage
<b>One month</b>	65	32.8%	61	38.6%
<b>Three months (1 – 3m)</b>	65	32.8%	21	13.3%
<b>Six months (3 – 6m)</b>	50	25.3%	24	15.2%
<b>One year (6m – 1 yr )</b>	12	6.1%	48	30.4%
<b>&gt; One year</b>	6	3%	4	2.5%

Out of 198 urban participants, who used preservative for food storage, 65 (32.8%) of them stored the food for one month, 65 (32.8%) of them stored for three months, 50 (25.3%) of them stored for six months, 12 (6.1%) of them stored for one year and 6 (3%) of them stored for more than one year.

Out of 158 rural participants, who used preservative for food storage 61 (38.6%) of them stored the food for one month, 48 (30.4%) of them stored for one year, 24 (15.2%) of them stored for six months, 21 (13.3%) of them stored for three months, and 4 (2.5%) of them stored for more than one year.

## F. Association of KAP about food safety with socio - demographic variables

**Table XLV. Association between age group of participants and knowledge of food safety**

Age group	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
18 to 25 years	7.64 $\pm$ 1.07		6.7 $\pm$ 1.56	
25 to 35 years	7.34 $\pm$ 1.39	0.147	6.65 $\pm$ 1.5	0.822
35 to 45 years	6.71 $\pm$ 1.64	<0.001	6.71 $\pm$ 1.83	0.975
45 to 55 years	6.48 $\pm$ 1.38	<0.001	5.9 $\pm$ 1.53	0.002
>55 years	6.78 $\pm$ 1.56	<0.001	6.52 $\pm$ 1.58	0.535

Among the urban participants, the mean knowledge score were found to be higher in the age group of 18 to 25years (7.64  $\pm$  1.07) and 25 to 35 years (7.34  $\pm$  1.39) compared to older age groups of 35 to 45 years (6.71  $\pm$  1.64), 45 to 55 years (6.48  $\pm$  1.38) and age more than 55 years (6.78 $\pm$  1.56) and the difference in knowledge score between age groups was found to be statistically significant among the age group of 35 to 45 years (p<0.001), 45 to 55 years (p<0.001) and more than 55 years (p<0.001).

In rural study participants, the mean knowledge score was found to behigher in the age group of 18 to 25 years (6.7  $\pm$  1.56), 25 to 35 years (6.65  $\pm$  1.5), 35 to 45 years (6.71  $\pm$  1.83) compared to older age groups 45 to 55 years (5.9  $\pm$  1.53) and more than 55 years (6.52 $\pm$  1.58) and the difference in knowledge score between age groups was found to be statistically significant among the age group of 45 to 55 years (p=0.002).

**Table XLVI. Association between education of participants and knowledge of food safety**

E9ducation	Urban (n = 400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
<b>Illiterate</b>	7 $\pm$ 1.0		5.55 $\pm$ 1.57	
<b>Primary</b>	6.93 $\pm$ 1.6	0.933	6.27 $\pm$ 1.35	0.005
<b>Secondary</b>	6.86 $\pm$ 1.48	0.865	6.74 $\pm$ 1.62	<0.001
<b>PUC</b>	7.48 $\pm$ 1.86	0.581	6.98 $\pm$ 1.27	<0.001
<b>Graduates</b>	7.48 $\pm$ 1.09	0.568	7.1 $\pm$ 1.12	<0.001

Among the urban participants, the mean knowledge score among illiterates (7  $\pm$  1.0) was higher, compared to those who studied up to primary school (6.93  $\pm$  1.6), who studied up to secondary school (6.86  $\pm$  1.48) and the highest score was among those who studied up to PUC were (7.48  $\pm$  1.86) and graduates (7.48  $\pm$  1.09). There was difference in knowledge with educational status, but it was not statistically significant. .

Among the rural participants, the mean knowledge score were lower among illiterate (5.55  $\pm$  1.57), compared to literates who studied up to primary school (6.27  $\pm$  1.35), who studied up to secondary school(6.74  $\pm$  1.62), who studied up to PUC/Diploma (6.98  $\pm$  1.27) and graduates (7.1  $\pm$  1.12). Knowledge score was higher with higher educational status and the difference in knowledge with educational status was found to be statistically significant among all the literates (p<0.05).

**Table XLVII. Association between occupation of participants and knowledge of food safety**

Occupation	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
House maker	7.08 $\pm$ 1.52		6.58 $\pm$ 1.58	
Farmer	6 $\pm$ 0.71	0.103	6.59 $\pm$ 1.53	0.985
Laborer	7.17 $\pm$ 0.92	0.789	5.78 $\pm$ 1.8	0.003
Others	7.31 $\pm$ 1.35	0.377	7.28 $\pm$ 1.13	0.010

Among the urban participants, the mean knowledge scores was lower among farmers (6  $\pm$  0.71) compared to housewives (7.08  $\pm$  1.52), labourers(7.17  $\pm$  0.92) and other types of occupation (7.31  $\pm$  1.35). There was a difference in knowledge with occupation, but it was not statistically significant.

Among the rural participants, the mean knowledge score was higher among other types of occupation(7.28  $\pm$  1.13), followed by housewives (6.58  $\pm$  1.58), farmers(6.59  $\pm$  1.53) and lowest among labourers(5.78  $\pm$  1.8).The differences in knowledge was found to be statistically significant among labourers (p=0.003) and other type of occupation (p=0.010).

**Table XLVIII. Association between socio-economic status of participants and knowledge of food safety**

Socio economic status	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
<b>Class I</b>	7.7 $\pm$ 1.37		6.94 $\pm$ 1.44	
<b>Class II</b>	7.22 $\pm$ 1.4	0.089	6.48 $\pm$ 1.56	0.313
<b>Class III</b>	6.95 $\pm$ 1.39	0.004	6.61 $\pm$ 1.5	0.462
<b>Class IV</b>	7.07 $\pm$ 1.54	0.013	6.65 $\pm$ 1.73	0.487
<b>Class V</b>	6.62 $\pm$ 1.53	0.002	6.4 $\pm$ 1.40	0.211

In the present study, among the urban participants based on the socio economic status the mean knowledge scores were higher among class I (7.7  $\pm$  1.37), class II (7.22  $\pm$  1.4), class IV (7.07  $\pm$  1.54) compared to class III (6.95  $\pm$  1.39) and class V (6.62  $\pm$  1.53). The differences in knowledge with socioeconomic status was found to be statistically significant among class III (p=0.004), class IV (p=0.013) and class V (p=0.002).

Among the rural participants, based on the socio-economic status, the mean knowledge scores were 6.94  $\pm$  1.44 in class I, 6.48  $\pm$  1.56 in class II, 6.61  $\pm$  1.5 in class III, 6.65  $\pm$  1.73 in class IV and 6.4  $\pm$  1.40 in class V and the differences in knowledge with socioeconomic status was not statistically significant.

**Table XLIX. Association between age group of participants and attitude towards food safety**

Age group	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
18 to 25 years	15.56 $\pm$ 2.21	0.4081*	15.69 $\pm$ 1.80	
25 to 35 years	15.69 $\pm$ 1.67		15.05 $\pm$ 2.28	0.0132
35 to 45 years	15.83 $\pm$ 1.93		14.27 $\pm$ 2.63	< 0.0001
45 to 55 years	15.86 $\pm$ 2.19		14.04 $\pm$ 2.20	< 0.0001
>55 years	15.29 $\pm$ 1.94		14.52 $\pm$ 2.65	0.0014

\*least significant difference cannot be calculated as p value not <0.05.

In the present study, among the urban participants the mean attitude scores according to age group was 15.56 $\pm$ 2.21 for 18 to 25 years, 15.69 $\pm$ 1.67 for 25 to 35 years, 15.83 $\pm$ 1.93 for 35 to 45 years, 15.86 $\pm$ 2.19 for 45 to 55 years and 15.29 $\pm$ 1.94 for more than 55 years and the differences in attitudes scores among the age group was not statistically significant.

Among the rural participants, the mean attitude score according to age group was higher among younger age groups 18 to 25 years (15.69 $\pm$ 1.80), 25 to 35 years (15.05 $\pm$  2.28) compared to 35 to 45 years (14.27 $\pm$ 2.63), 45 to 55 years (14.04 $\pm$ 2.20) and more than 55 years (14.52 $\pm$ 2.65) and the differences in attitude scores was found to be statistically significant among all the age groups (p<0.05).

**Table L. Association between education of participants and attitude towards food safety**

Education	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
<b>Illiterate</b>	16 $\pm$ 1.0		14.19 $\pm$ 2.44	
<b>Primary</b>	14.29 $\pm$ 2.00	0.1529	15.29 $\pm$ 1.71	0.0030
<b>Secondary</b>	15.70 $\pm$ 1.68	0.7584	14.99 $\pm$ 2.43	0.0220
<b>PUC / Diploma</b>	15.54 $\pm$ 2.38	0.7429	15.75 $\pm$ 1.46	0.0003
<b>Degree</b>	16.00 $\pm$ 2.05	0.2375	15.34 $\pm$ 2.36	0.0178

Among the urban participants, the mean attitude score among illiterates was  $16 \pm 1.0$ , who studied up to primary school was  $14.29 \pm 2.00$ , who studied up to secondary school was  $15.70 \pm 1.68$ , who studied up to PUC was  $15.54 \pm 2.38$  and graduates was having a score of  $16.00 \pm 2.05$  and the difference in attitude scores with educational status was not statistically significant.

Among the rural participants, the mean attitude score among illiterate was  $14.19 \pm 2.44$ , who studied up to primary school was  $15.29 \pm 1.71$ , who studied up to secondary school was  $14.99 \pm 2.43$ , who studied up to PUC / Diploma was  $15.75 \pm 1.46$  and graduates was having a score of  $15.34 \pm 2.36$  and the difference in attitude score was statistically significant between literates and illiterates ( $p < 0.05$ ).

**Table LI. Association between occupation of participants and attitude towards food safety**

Occupation	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
<b>Homemaker</b>	15.67 $\pm$ 1.86		15.08 $\pm$ 2.34	
<b>Farmer</b>	17.6 $\pm$ 0.54	0.0212	15.15 $\pm$ 2.02	0.8016
<b>Labourer</b>	15.5 $\pm$ 2.50	0.6734	14.32 $\pm$ 2.70	0.0654
<b>Others</b>	14.97 $\pm$ 2.20	0.0381	16.77 $\pm$ 6.01	0.0020

Among the urban participants, the mean attitude scores was higher among farmers (17.6 $\pm$ 0.54) compared to homemakers (15.67  $\pm$  1.86), labourers (15.5 $\pm$ 2.50) and other types of occupation (14.97 $\pm$ 2.20) and the difference in attitude score was found to be statistically significant among farmers (p=0.0212) and (p=0.038) other type of occupation such as teacher, tailors etc.

Among the rural participants, the mean attitude score was higher among other types of occupation (16.77 $\pm$  6.01) compared to homemakers (15.08 $\pm$ 2.34), farmers (15.15 $\pm$ 2.02) and labourers (14.32 $\pm$ 2.70) and the difference in attitude score was found to be statistically significant among (p=0.002) other type of occupation such as teacher, tailors etc.

**Table LII. Association between socioeconomic status of participants and attitude towards food safety**

Socio economic status	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
<b>Class I</b>	15.72 $\pm$ 1.84	0.2176*	15.62 $\pm$ 2.12	0.1405*
<b>Class II</b>	15.76 $\pm$ 1.91		15.05 $\pm$ 2.36	
<b>Class III</b>	15.89 $\pm$ 1.81		15.2 $\pm$ 2.06	
<b>Class IV</b>	15.34 $\pm$ 2.04		14.69 $\pm$ 2.30	
<b>Class V</b>	15.43 $\pm$ 2.15		15.34 $\pm$ 2.28	

\*least significant difference cannot be calculated as p value not  $< 0.05$ .

Among the urban participants, the mean attitude scores based on socio-economic status were 15.72 $\pm$ 1.84 for class I, 15.76 $\pm$ 1.91 for class II, 15.89 $\pm$ 1.81 for class III, 15.34 $\pm$ 2.04 for class IV and 15.43 $\pm$ 2.15 for class V respectively. There was no statistically significant difference between the socio-economic status with mean attitude score.

Among the rural participants, the mean attitude scores based on socioeconomic status were 15.62 $\pm$ 2.12 in class I, 15.05 $\pm$ 2.36 in class II, 15.2 $\pm$ 2.06 in class III, 14.69 $\pm$ 2.30 in class IV and 15.34 $\pm$ 2.28 in class V. There was no statistically significant difference between the socio-economic status with mean attitude score.

**Table LIII. Association between age group of participants and practice of food safety**

Age group	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
18 to 25 years	30.90 $\pm$ 4.02		21.87 $\pm$ 3.20	0.2345*
25 to 35 years	31.54 $\pm$ 4.51	0.2966	20.79 $\pm$ 4.90	
35 to 45 years	29.95 $\pm$ 4.48	0.1486	20.74 $\pm$ 5.88	
45 to 55 years	29.44 $\pm$ 3.30	0.0808	21.79 $\pm$ 4.64	
>55 years	27.92 $\pm$ 3.07	0.0001	21.37 $\pm$ 2.46	

\*least significant difference cannot be calculated as p value not  $< 0.05$ .

In the present study, among urban participants the mean practice scores according to age group was higher among 18 to 25 years (30.90 $\pm$ 4.02), 25 to 35 years (31.54 $\pm$ 4.51) compared to 35 to 45 years (29.95 $\pm$ 4.48), 45 to 55 years (29.44 $\pm$ 3.30) and more than 55 years (27.92 $\pm$ 3.07) and the difference in practice among the age group was found to be statistically significant among age group more than 55 years ( $p=0.0001$ ).

Among the rural participants the mean practice score according to age group was 21.87 $\pm$ 3.20 for 18 to 25 years, 20.79 $\pm$ 4.90 for 25 to 35 years, 20.74 $\pm$ 5.88 for 35 to 45 years, 21.79 $\pm$ 4.64 for 45 to 55 years and 21.37 $\pm$ 2.46 for more than 55 years of age and the differences in practices among the age group was not statistically significant.

**Table LIV. Association between education of participants and practice of food safety**

Education	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
<b>Illiterate</b>	30 $\pm$ 0		20.65 $\pm$ 5.74	0.08816*
<b>Primary</b>	28.41 $\pm$ 3.48	0.0002	22.22 $\pm$ 3.37	
<b>Secondary</b>	30.15 $\pm$ 4.46	0.9537	20.92 $\pm$ 4.20	
<b>PUC / Diploma</b>	33.13 $\pm$ 4.35	0.2243	22.19 $\pm$ 2.79	
<b>Graduates</b>	29.66 $\pm$ 3.48	0.8667	21.73 $\pm$ 4.51	

\*least significant difference cannot be calculated as p value not  $< 0.05$ .

Among the urban participants, the mean practice score among illiterates was 30 $\pm$ 0, who studied up to primary school was 28.41 $\pm$ 3.48, who studied up to secondary school was 30.15 $\pm$ 4.46, who studied up to PUC / Diploma was 33.13 $\pm$ 4.35 and graduates was having a score of 29.66 $\pm$ 3.48 and the difference in practice score with educational status was found to be statistically significant among the participants who completed primary education (p=0.0002).

Among the rural participants, the mean practice score among illiterate was 20.65 $\pm$ 5.74, who studied up to primary school was 22.22 $\pm$ 3.37, who studied up to secondary school was 20.92 $\pm$ 4.20, who studied up to PUC / Diploma was 22.19 $\pm$ 2.79 and graduates was having a score of 21.73 $\pm$ 4.51 and the difference in practice score with educational status was not statistically significant.

**Table LV. Association between occupation of participants and practice of food safety**

Occupation	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
<b>Homemaker</b>	30.18 $\pm$ 4.30	0.15854*	21.65 $\pm$ 4.39	
<b>Farmer</b>	28.6 $\pm$ 1.51		21.5 $\pm$ 3.43	0.7693
<b>Labourer</b>	28.87 $\pm$ 4.85		18.77 $\pm$ 6.01	0.0004
<b>Others</b>	31.25 $\pm$ 3.35		21.45 $\pm$ 2.73	0.7808

\*least significant difference cannot be calculated as p value not  $< 0.05$ .

Among the urban participants, the mean practice scores was higher among homemakers (30.18 $\pm$ 4.30), other types of occupation (31.25 $\pm$ 3.35) compared to farmers(28.6 $\pm$ 1.51) and labourers (28.87 $\pm$ 4.85). The mean practice score differences were not statistically significant between occupations.

Among the rural participants, the mean practice score among homemakers was 21.65 $\pm$  4.39, farmers was 21.5 $\pm$  3.43, labourers was 18.77 $\pm$ 6.01 and other types of occupation was 21.45 $\pm$ 2.73and the differences in practice score with occupation was found to be statistically significant among labourers (p=0.0004).

**Table LVI. Association between socio-economic status of participants and practice of food safety**

Socio-economic status	Urban (n=400)		Rural (n= 400)	
	Mean $\pm$ SD	p value	Mean $\pm$ SD	p value
<b>Class I</b>	31.62 $\pm$ 3.53		23.5 $\pm$ 3.59	
<b>Class II</b>	29.92 $\pm$ 4.36	0.0311	22.53 $\pm$ 4.13	0.3992
<b>Class III</b>	29.95 $\pm$ 4.54	0.0314	21.18 $\pm$ 3.41	0.017
<b>Class IV</b>	30.43 $\pm$ 4.32	0.1025	21.35 $\pm$ 4.80	0.0830
<b>Class V</b>	28.56 $\pm$ 2.80	<0.0001	20.26 $\pm$ 3.97	0.0028

In the present study, among the urban participants the mean practice score was higher among the participants who belonged to class I (31.62 $\pm$ 3.53), class IV (30.43 $\pm$ 4.32) compared to class II (29.92 $\pm$ 4.36), class III (29.95 $\pm$ 4.54) and class V (28.56 $\pm$ 2.80) and the differences in practice score with socio-economic status was found to be statistically significant among the participants who belonged to class II (p=0.0311), class III (p=0.0314) and class V (p<0.0001).

Among the rural participants, the mean practice score based on socioeconomic status was 23.5 $\pm$ 3.59 in class I, 22.53 $\pm$ 4.13 in class II, 21.18 $\pm$ 3.41 in class III, 21.35 $\pm$ 4.80 in class IV and 20.26 $\pm$ 3.97 in class V and the differences in practice score with socio-economic status was found to be statistically significant among the participants who belonged to class III (p=0.017) and class V (p=0.0028).

## **DISCUSSION**

The present study about knowledge, attitude and practices of food safety among urban and rural households was conducted in Ashok Nagar and Kinaye, Belagavi, which are the urban and rural field practice areas of Department of Community Medicine, J. N. Medical College, KAHER, Belagavi. The study population consisted of participants from 400 urban households and 400 rural households. Based on the preliminary search for literature, there was a clear gap as no study was done on KAP among the women at household level. It is difficult to compare the results of previous studies with the present study due to difference in study participants (food handlers at house, restaurants, mess of different campuses, street vendors, etc.), different sociocultural patterns in cooking practices existing in India; different criteria used in defining KAP of food handling.

### **Table I: Distribution of study participants according to the age**

In the present study, participants were in the age group of 25 to 35 years (30%) in urban area and 18 to 24 years (35.8%) in urban area.

### **Tables II and III: Distribution of study participants according to the religion and Educational status**

Half of the participants in urban area were Muslims (52.5%) followed by Hindus (46%) and in rural area majority of the participants were Hindus (78.8%) followed by Muslims (21.3%).

In the present study, half of them have completed secondary education in urban area (52.3%) and rural area (46%), while 25.8% in urban and 10.3% were graduates.

**Table IV: Distribution of study participants according to their occupation**

In the present study, majority of the participants were housewives in urban area (84%) and rural area (57%), while 23% of the participants in rural area were farmers and 8.8% of the urban participants were in other types of occupation such as teachers, tailors, shopkeepers etc.

**Tables V, VI and VII: Distribution of study participants according to Socio-Economic Status, marital status and type of family**

In the present study, one third of the participants belonged to class IV according to modified B.G. Prasad's classification in urban (34.3 %) and rural (41.3 %).

Majority of the participants i.e., 88.8 % in urban and 94.8 % in rural participants were married and only 6.3% in urban and 3% in rural were unmarried.

More than half of the participants in urban (58.5 %) and rural (65.3 %) belonged to nuclear family, others belonged to joint family in urban (41.3 %) and in rural (34.8 %).

**Table VIII. Distribution of study participants according to type of house**

In the present study, majority of the participants in urban (86.3 %) lived in pucca houses, in rural (43 %) lived in semi Pucca houses while only 12 % in urban

area lived in semi-pucca houses and one third (33.3 %) of them in rural area lived in pucca houses.

**Tables IX, X and XI: Distribution of study participants according to place of cooking, type of cooking fuel used and use of smoke vent**

In the present study, most of the participants in urban (90%) and more than half of rural (59.3 %) participants had separate kitchen as place of cooking, while only 7 % in urban and 30.8 % in rural cooked food in a common place.

Almost all participants in urban (99.3 %) and majority of rural (79.3 %) participants used LPG as cooking fuel.

Only 5.5 % in urban and 20.3 % in rural used smoke vent in their cooking area.

**Table XII: Distribution of study participants according to diet**

In the present study, diet of three fourth of the participants in urban (73.3 %) and rural (72 %) were non-vegetarians followed by lacto-vegetarians with 19 % in urban and 14.8 % in rural area.

**Tables XIII and XIV: Distribution of study participants according to water source and availability of refrigerator in the households**

In the present study, almost all participants in urban (97.8 %) and half of rural (49.8 %) participants the source of water supply was from piped water, while 26.8 % in rural area the source of water supply was tube wells.

Seven out of ten (70.8 %) in urban area and two in ten (18.5 %) in rural area were having refrigerator in their households.

**Tables XV and XVI: Distribution of study participants according to history and source of food poisoning**

In the present study, history of food poisoning was present in 27.5 % of urban households and 10.8 % of rural households.

Among the urban households, the source of food poisoning in most of the households was street food (40 %) followed by home cooked food (32.7 %) whereas in rural households the most common source of food poisoning was home cooked food (65.1 %) followed by street food (20.9 %).

**Table XVII: Distribution of study participants according to Knowledge regarding five keys of food safety – Keep Clean**

In the present study, almost all the participants in urban area (100 %) and rural area (98.7 %) knew that hands should be washed before handling food. In a study conducted on food handlers working in canteens of Malaysia revealed that 100 % of the participants knew that hands should be washed before preparing meals.<sup>[26]</sup>

In another study conducted on primary food preparers in families of united states, 95.5 % knew it is important to wash hands before preparing meals.<sup>[21]</sup> In another study conducted on food handlers at food courts in Putrajaya, Malaysia, 99.6% knew that washing hands before handling food reduces the risk of food contamination,<sup>[25]</sup> which was similar to the present study.

In the present study, majority of the participants in urban area (76.5 %) and rural area (62.5 %) had the knowledge that wiping cloth can spread microorganisms.

**Table XVIII: Distribution of study participants according to Knowledge regarding five keys of food safety – Separate raw and cooked food**

In the present study, 42.7 % in urban area and 43.7 % in rural area knew that same cutting board cannot be used for raw and cooked food. In a study conducted on food handlers at canteen of Malaysia, 82% knew same cutting board cannot be used for raw and cooked food. <sup>[26]</sup> In a study conducted in a residential community of Singapore, 75.4 % had knowledge regarding use of different cutting board for raw and cooked food. <sup>[24]</sup>

In the present study, majority of the study participants in urban area (98.5 %) and rural area (86.25 %) knew that raw food needs to be stored separately from cooked food. In a study conducted on food handlers at food courts in Putrajaya, Malaysia, 100 % of the respondents knew that improper storage of food can cause health hazards. <sup>[25]</sup>

**Table XIX: Distribution of study participants according to Knowledge regarding five keys of food safety – Cook thoroughly**

In the present study, only 44 % in urban area and 55 % in rural area knew that cooked food needs to be thoroughly reheated. In a study conducted on anganwadi workers in Mandya in Karnataka state, 81.3 % knew that cooked left-over food needs to be reheated thoroughly. <sup>[28]</sup> In a study conducted on food handlers in military hospitals of Jordan, 96 % knew that cooked left-over food should be reheated thoroughly. <sup>[21]</sup>

In the present study, only 42.3 % in urban area and 17.5 % in rural area knew that proper cooking of meat includes > 60°C. In a study conducted on primary food

preparers of families in the United States, only 11.3 % knew that best way the best way to check that chicken has cooked thoroughly by looking whether juices are clear.<sup>[22]</sup>

**Table XX: Distribution of study participants according to Knowledge regarding five keys of food safety – Keep Food at Safe temperature**

In the present study, 55.3 % of urban and 43 % of rural participants had correct knowledge that cooked meat cannot be left at room temperature overnight. In a study conducted on anganwadi workers in Mandya in Karnataka state, 90.1 % knew that eating cooked left-over food kept at room temperature for more than six hours is risk to cause food poisoning.<sup>[28]</sup> In another study conducted on food handlers in military hospital of Jordan, 91.5 % knew that cooked left-over food kept at room temperature for more than six hours is a high risk for food poisoning.<sup>[21]</sup>

In the present study, 79.5 % in urban area and 72.8 % in rural area knew that cooked food should be served hot.

In the present study, 48 % in urban area and 59.3% in rural area knew that refrigerating food slows bacterial growth. In a study conducted on food handlers in Slovenia, 63.4 % knew that in cooling units the microorganisms in food stuff grow very slow,<sup>[36]</sup> which was similar to the present study.

**Table XXI: Distribution of study participants according to Knowledge regarding five keys of food safety – Use Safe water and Raw materials**

In the present study, only 22.5 % in urban area and 19% in rural area knew that safe water cannot be identified by the way it looks.

In the present study, 100 % in urban area and 99.9 % in rural area had knowledge that fruits and vegetables must be washed. In a study conducted on anganwadi workers in Mandya in Karnataka state, 90% knew that eating unwashed vegetables is risky for food poisoning.<sup>[28]</sup> In another study conducted on food handlers in military hospitals of Jordan, 96 % also knew that eating raw and unwashed vegetables is a high risk for food poisoning,<sup>[21]</sup> which was similar to the present study.

**Table XXII: Distribution of study participants according to Attitude regarding five keys of food safety – Keep Clean**

In the present study, majority of 98.5 % in urban and 98 % in rural agreed that frequent hand washing during food preparation is worth and 98.5 % in urban and 98.3 % in rural agreed that keeping kitchen surface clean reduce risk of illness. In a study conducted in residential community of Singapore, 97.9 % agreed that proper washing of food before cooking can help to prevent diarrhea,<sup>[24]</sup> which was similar to the present study.

**Table XXIII: Distribution of study participants according to Attitude regarding five keys of food safety – Separate raw and cooked food**

In the present study, 82.5 % in urban area and 83 % in rural area agreed that keeping raw and cooked food separately prevent illness. In a study conducted on women in Ankara, Turkey, 65.6 % agreed that raw and cooked food should be kept thoroughly.<sup>[19]</sup> Another study conducted on food handlers in food business in Ankara, Turkey, 59.3 % agreed that raw food should be kept separately from cooked food.<sup>[16]</sup>

In the present study, 76.3 % in urban and 77.3 % in rural agreed that use of different knives and cutting board for raw and cooked food is useful. In a study conducted in residential community of Singapore, 75.4 % agreed that using different chopping boards for meat and vegetables can help to reduce the chance of diarrheal incidence. <sup>[24]</sup> In another study conducted on food handlers in military hospitals of Jordan, 79.0 % agreed that raw vegetables and meat should not be cut on same cutting board, <sup>[21]</sup> which was similar to the present study.

**Table XXIV: Distribution of study participants according to Attitude regarding five keys of food safety – Cook thoroughly**

In the present study, 61 % in urban and 71.5 % in rural agreed that soups and stews should be boiled to ensure safety. In a study conducted in residential community of Singapore, 98.8 % agreed that well cooked food reduces risk of food poisoning to ensure food safety. <sup>[24]</sup>

**Table XXV: Distribution of study participants according to Attitude regarding five keys of food safety – Keep food at safe temperature**

In the present study, 77.8 % in urban and 51.8 % in rural agreed that thawing food in cool place is safe.

In the present study, 42.5 % in urban and 32.5 % in rural agreed that it is unsafe to leave cooked out of refrigerator for more than two hours. In a study conducted in residential community of Singapore, 75.8% agreed that leaving cooked food at room temperature for longer than two hours is a high risk for diarrhoea, <sup>[24]</sup>

**Table XXVI. Distribution of study participants according to Attitude regarding five keys of food safety – Use Safe water and Raw materials**

In the present study, almost all participants 100 % in urban area and 96.8 % in rural area agreed that inspecting food for freshness and wholesomeness is valuable.

In the present study, majority of 98.3 % in urban area and 96.5 % in rural area agreed that it is important to check and throw food beyond expiry date. In a study conducted in residential community of Singapore, 97.1 % agreed that checking the expiry date before purchasing or cooking the food can help to reduce the chance of diarrheal incidence. <sup>[24]</sup>

**Table XXVII: Distribution of study participants according to practice of washing hands before or during food preparation – Key one - Keep Clean**

In the present study, majority of the participants, 91.8 % in urban area and 86.5 % in rural area practiced washing hands always before or during food preparation, while 6.8 % in urban area and 11.5 % in rural area practiced washing hands most of the times. In a study conducted in residential community of Singapore, 58.8 % washed their hands before handling food or cooking. <sup>[24]</sup>

**Table XXVIII: Distribution of study participants according to practice of cleaning surfaces and equipment used for food preparation before re-using on other food – Key one - Keep clean**

In the present study, more than half of the participants 74 % in urban and 82.3% in rural area always cleaned surfaces for food preparation before reusing it on other food. In a study conducted on food handlers in military hospitals of Jordan, 98.5 % cleaned food contact surface before and after preparing food. <sup>[21]</sup>

**Table XXIX: Distribution of study participants according to practice of use of separate utensils and cutting-boards when preparing raw and cooked food – Key two - Separate raw and cooked food**

In the present study, 72.8 % in urban and 55.3 % in rural always practiced use of separate utensils and cutting board for raw and cooked food, while 6.3 % in urban and 9.7 % in rural never practiced separation of utensils and cutting board for raw and cooked food. In a study conducted in residential community of Singapore, 56.7 % used separate cutting board for vegetables and meat. <sup>[24]</sup>

**Table XXX: Distribution of study participants according to practice of separation of raw and cooked food during storage – Key two - Separate raw and cooked foods**

More than half of participants in urban area (83.8 %) and rural area (60.5 %) always stored raw and cooked food separately, while 2 % in urban area and 3 % in rural area never practiced it. In a study conducted on food handlers in military hospitals of Jordan, 90% separated raw meat from ready to eat foods. <sup>[21]</sup>

**Table XXXI: Distribution of study participants according to practice of checking that meats are cooked thoroughly by ensuring that the juices are clear – Key three - Cook thoroughly**

In the present study, only 17.8 % in urban area and 15.3 % in rural area always practiced meats were cooked thoroughly and 21.8 % in urban and 59 % in rural area never checked whether meats or cooked thoroughly. In a study conducted in residential community of Singapore, 98.3% made sure that food is cooked well before consumption. <sup>[24]</sup>

**Table XXXII: Distribution of study participants according to practice of reheating cooked food until it is piping hot – Key three - Cook thoroughly**

In the present study, 46 % in urban area and 19.3 % in rural area always practiced reheated left-over cooked food before consuming, while 4.8 % in urban and 14 % in rural area never reheated left-over cooked food. In a study conducted in residential community of Singapore, 88.3 % reheated left-over food before consumption.<sup>[24]</sup>

**Table XXXIII: Distribution of study participants according to practice of thawing frozen food in the refrigerator or other cool place – Key four - Keep food at safe temperature**

In the present study, 25.5 % in urban area and 21.5% in rural area always practiced thawing frozen food in refrigerator or cool place. 25.5 % in urban area and 25.3 % in rural area never practiced thawing frozen food in refrigerator or any cool place.

**Table XXXIV: Distribution of study participants according to practice of storing left-over cooked food in a cool place within two hours – Key four - Keep food at safe temperature**

In this study, only 13.5 % in urban area and 4.3 % in rural area always stored leftover cooked food in a cool place within two hours, while 41 % in urban and 57.3 % in rural area never practiced it. In a study conducted in residential community of Singapore, 49.2% left cooked food at room temperature for more than two hours.<sup>[24]</sup> In another study conducted on food handlers in military hospitals of Jordan, 89 % kept cooked meat or chicken at room temperature for more than four hours.<sup>[21]</sup>

**Table XXXV: Distribution of study participants according to practice of checking and throwing away food beyond expiry date – Key five - Use safe water and raw materials**

In the present study, 84 % in urban area and 23 % in rural area always checked and threw food beyond expiry date, while 5.9 % in urban area and 50.8 % in rural area never checked the expiry date. In a study conducted in residential community of Singapore, 94.2 % checked the expiry date on food packaging before purchasing or cooking. <sup>[24]</sup>

**Table XXXVI: Distribution of study participants according to practice of washing fruits and vegetables with safe water before eating them – Key five - Use safe water and raw materials**

In the present study, 97 % in urban area and 86.8 % in rural area participants always washed fruits and vegetables with safe water before eating them. In a study conducted on food handlers in military hospitals of Jordan, 98.5% washed fruits and vegetables before slicing them. <sup>[21]</sup>

**Table XXXVII: Distribution of study participants according to the total score of Knowledge, Attitude and Practice of food safety**

In the present study, mean knowledge score among urban participants was  $7.1 \pm 1.47$  and among rural participants was  $6.57 \pm 1.58$  out of the total score of 11. Mean attitude score among urban participants were  $15.45 \pm 1.65$  and among rural participants was  $15.14 \pm 2$  out of the total score of 18. Mean practice score among urban participants was  $30.18 \pm 4.21$  and among rural participants was  $25.12 \pm 4.55$  out of the total score of 40.

In a study conducted on women at households of Kalaburgi, Karnataka, India mean Knowledge score of food safety was  $8.65 \pm 1.25$  out of the total score of 11, mean attitude score was  $16.03 \pm 1.75$  out of the total score of 19 and mean practice score was  $30.87 \pm 4.24$  out of total score of 38.<sup>[29]</sup> In a study conducted on food handlers at canteens of Malaysia, the mean knowledge score was  $61.7 \pm 8.1$ , mean attitude score was  $51.9 \pm 4.2$  out of the total score of 57 and mean practice score were  $53.2 \pm 5.5$  of the total score of 60.<sup>[26]</sup>

**Table XXXVIII: Distribution of study participants according to knowledge regarding WHO five keys for food safety**

Among the WHO Five keys for food safety, the mean knowledge score for the first key – keep clean was  $1.77 \pm 0.42$  for urban participants and  $1.61 \pm 0.49$  for rural participants out of the total score of 2.

The mean knowledge score for second key – separate raw and cooked food was  $1.41 \pm 0.52$  for urban participants and  $1.30 \pm 0.063$  for rural participants out of the total score of 2.

The mean knowledge score for third key – cook thoroughly was  $0.87 \pm 0.74$  for urban participants and  $0.73 \pm 0.64$  for rural participants out of the total score of 2.

The mean knowledge score for fourth key – keep food at safe temperature was  $1.83 \pm 0.93$  for urban participants and  $1.75 \pm 0.88$  for rural participants out of the total score of 3.

The mean knowledge score for fifth key – use safe water and raw materials was  $1.23 \pm 0.41$  for urban participants and  $1.19 \pm 0.40$  for rural participants out of the total score of 2.

The mean knowledge score for each key was more among urban participants compared to rural participants and this difference was found to be statistically significant for the keys - keep clean ( $p < 0.001$ ), separate raw and cooked food ( $p = 0.008$ ) and cook thoroughly ( $p = 0.004$ ).

#### **Use of apron while cooking**

#### **Table XXXIX: Distribution of study participants according to attitude regarding use of apron while cooking**

In the present study, 84.7 % urban and 67 % rural participants knew the importance of using apron or hair tie while cooking and 84 % urban and 57.5 % rural participants agreed that using apron during food preparation is worth. Only 12.5 % urban and 2.75 % rural participants used apron during food preparation. In a study conducted on food handlers in food business in Ankara, Turkey, 82.9% agreed that using cap, masks, protective gloves, and adequate clothing reduces the risk of food contamination. <sup>[16]</sup>

#### **Avoiding pet animals in kitchen**

In the present study, 59.75 % urban and 68.5 % rural participants knew that it is important to avoid pet animals in kitchen. 38.75 % urban and 69.8 % rural participants always practiced avoiding pet animals in kitchen.

#### **Table XL: Distribution of study participants according to the best place to store raw food in refrigerator**

In the present study, 77 % urban and 62.1 % rural participants reported that the best place to store raw food in refrigerator was on bottom shelf.

### **Hand washing practices**

In the present study, 69.75% urban and 73.75 % rural participants washed hands between handling meat, poultry, fish and other raw food products. Majority of the participants ,98.5 % urban and 98.75 % rural participants washed hands after going to toilet and 98.5 % urban and 95 % rural participants washed hands after handling animals and chemicals.

### **Avoid pests in the kitchen**

In the present study, all the participants in urban and rural participants (100%) knew that it is important to avoid pests in the kitchen and 85.75 % urban and 79 % rural participants used chemicals to avoid pests in the kitchen.

### **Tables XLI, XLII, XLIII and XLIV: Distribution of study participants according to use of preservative during food storage, type of food preserved, type of preservative used and duration of food storage**

In the present study, 49.5 % urban and 39.5 % rural participants used preservatives during food storage and 25.5 % urban and 28.4 % rural participants used preservatives for wheat and rice. 48.9 % urban and 36.7 % rural participants used boric powder as preservative, while 32.8 % urban and 38.6 % rural participants stored food for a period of one month.

### **Tables XLV, XLVI, XLVII and XLVIII: Association between age group, education, occupation and socioeconomic status of participants and knowledge of food safety**

In the present study, good knowledge was observed in the age group of 18 to 25 years among urban participants ( $7.64 \pm 1.07$ ) and there was statistically significant difference in knowledge of food safety in the age group more than 35 years, whereas among rural participants knowledge was poor in the age group 18 to 25 years ( $6.7 \pm 1.56$ ) and knowledge was significantly lower in the age group of 45 to 55 years.

Among the urban participants there was no significant difference of educational status with knowledge of food safety while among rural participants there was significant difference of knowledge of food safety between literates and illiterates ( $p < 0.005$ ).

Among both the urban and the rural participants, there was no significant difference of knowledge of food safety between housewives and other type of occupation.

Among the urban participants there was a significant between participants who belonged to class I and class III and Class V with knowledge of food safety, whereas in the rural participants, there was no significant difference between socioeconomic status and knowledge regarding food safety among the participants.

In a study conducted on food handlers in university canteens of Malaysia, there was a significant difference in food handling knowledge with respect to education status ( $p < 0.05$ ). where the food handlers with no formal education (66.4) scored higher mean value than those with primary education (52.9) while food handlers with university education were having the highest score (74.2).<sup>[26]</sup>

In a study conducted on women at households of Kalaburgi, Karnataka, India, there was no statistically significant difference between literates and illiterates regarding food safety knowledge ( $p = 0.162$ ).<sup>[29]</sup>

**Tables XLIX, L, LI and LII: Association between Age group, Education, Occupation and Socioeconomic status of participants and Attitude towards food safety**

In the present study, there was no significant difference in attitude towards food safety with age group among the urban participants ( $p > 0.05$ ), whereas in the rural participants there was a significant difference between the age group of 18 to 24 years and age above 35 years regarding attitude towards food safety ( $p < 0.001$ ).

Among the urban participants, there was no significant difference between illiterate and literate regarding attitude towards food safety, whereas among the rural participants, there was a significant difference between illiterates and literates regarding attitude towards food safety ( $p < 0.05$ ).

Among both the urban and the rural participants, there was a significant difference between housewives and other types of occupation regarding attitude towards food safety ( $p < 0.05$ ). Among both the urban and the rural participants, there was no significant difference between socioeconomic status of the participants regarding attitude towards food safety ( $p > 0.05$ ).

In a study conducted on women at households of Kalaburgi, Karnataka, India there was a statistically significant difference between literates and illiterates regarding attitude towards food safety ( $p = 0.046$ ).<sup>[29]</sup>

**Tables LIII, LIV, LV and LVI: Association between Age group, Education, Occupation and socioeconomic status of participants and food safety Practices**

In the present study, food safety practices among the urban participants there was a statistically significant difference between age group more than 55 years ( $p = 0.0001$ ), compared to other age groups, whereas among the rural participants there was no significant difference of food safety practices with other age group of the participants.

Among the urban participants, there was a significant difference between illiterates and participants who had completed primary education regarding food safety practices, whereas among the rural participants there was no significant difference between illiterates and literates.

Among the urban participants there was no significant difference between occupation and food safety practices, whereas among the rural participants there was significant difference between homemakers and labourers regarding food safety practices. Both the urban and the rural participants had a statistically significant difference between class I and Class V regarding food safety practices ( $p < 0.05$ ).

In a study conducted on food handlers in military hospitals of Jordan, the knowledge, attitude, and practice scores were also significantly ( $p < 0.05$ ) affected with the level of education where the average scores increased with level of education.<sup>[26]</sup> In a study conducted on women at households of Kalaburgi, Karnataka, India, there was no statistically significant difference between literates and illiterates on food safety practices. ( $p = 0.468$ )<sup>[29]</sup>

## **CONCLUSION**

- Knowledge and Practices regarding five keys for food safety were higher in the urban households compared to the rural households.
- Attitude towards food safety was observed to be same in both urban and rural households.
- Among WHO Five keys for food safety, Knowledge, Attitude and Practices regarding ‘cook thoroughly’ and ‘keep food at safe temperature’ were observed to be lower among both the urban and the rural households.
- Younger Age group (> 35 years), higher educational status and higher socioeconomic status were associated with better Knowledge, Attitude and Practices about food safety.

## **RECOMMENDATIONS**

- Health workers at urban and rural health centres should create Food safety awareness programs including demonstrations to community members regarding WHO five keys for food safety during nutrition programs such as National Nutrition Week national breastfeeding week, Intensified Diarrhoea Control Fortnight etc. with special emphasis on:
  - Use of separate cutting board and utensils for raw and cooked food
  - Storage of raw and cooked food separately
  - Cook food thoroughly up to 70°C
  - Reheating of cooked food thoroughly
  - Keep frozen food in refrigerator or in a cool place
  - Check and throw away food beyond expiry date
- IEC materials like pamphlets, posters etc. displaying correct methods of storage and precautions to be taken during food preparation can be distributed by health workers during nutrition week.
- The Key messages about food safety can be conveyed through television, radio, newspapers etc. and social media like Facebook, what's up, Twitter which have wider reach, and can be used effectively to educate food handlers in domestic environment.
- Use of brochures at supermarkets with simple messages regarding food purchase, preparation, cooking, and storage, so as to reduce risk of food borne illness can be initiated.

- Government should provide subsidies to refrigerator / LPG / smoke vent to encourage food safety practices especially in rural area for better storage and cooking practices.
- Improving the socioeconomic status and literacy will increase the knowledge, attitude and practices about food safety at all levels.

## **STRENGTHS OF THE STUDY**

The present study was one of the first kinds of study conducted on knowledge, attitude and practices about food safety among food handlers at Urban and Rural household levels in Indian setting using WHO ‘five keys for food safety’.

A large sample size of 800 participants was included in the present study including 400 urban and 400 rural households separately.

A standard questionnaire on WHO Five keys for food safety was used from WHO food safety manual as data collection tool.

## **LIMITATIONS OF THE STUDY**

Food safety practices were self-reported by the participants. The investigator did not do directly observe the practices about food safety. So the chances of recall bias might be observed.

An interventional study with the present knowledge, attitude and practices of food safety measures after health education and demonstration would have been better, but lack of time and resources were the reasons for KAP study.

## **SUMMARY**

The present study was a community based cross sectional study undertaken to know the knowledge, attitude and practices of food safety measures among urban and rural households.

The study population consisted of 400 women from urban households at Ashok Nagar, Belagavi and 400 women from rural households at Kinaye, Belagavi, which are the urban and rural field practice areas of Department of Community Medicine, J.N. Medical College, KAHER, Belagavi. The duration of the study was one year from 1<sup>st</sup> January 2017 to 31<sup>st</sup> December 2017.

Out of the 400 urban and 400 rural participants the mean age of the participants was  $37.96 \pm 14.9$  years in urban area and  $33.48 \pm 13.5$  years in rural area. The socio-demographic characteristics of the study participants showed that 52.5% in urban area belonged to Muslim community, while 78.8% in rural area were Hindus. 52.3% of urban participants studied up to secondary school, whereas 46% of rural participants completed their secondary education. 84% of the participants in urban area and 57% of the participants in rural area were housewives. According to modified B.G Prasad's classification, 62.3% of urban participants belonged to class III and IV, while 65.1% of rural participants belonged to class IV and V. Majority of the urban (88.8%) and rural (94.8%) participants were married and 58.5% of the urban and 65.3% of the rural participants belonged to nuclear family. 86.3% of the urban participants lived in pucca type of house, whereas 33.3% of rural participants lived in semi-pucca type of house.

90% of the urban participants and 59.3% of the rural participants cooked food in a separate kitchen. 99.3% of the urban participants and 79.3% of the rural participants used LPG as cooking fuel. 73.3% of urban and 72% of rural participants were non vegetarians. 97.8% of the urban participants used piped water as source of water, while 49.8% of the rural participants used piped water. 70.8% urban households had refrigerator, whereas only 18.5% rural households had refrigerator in their home.

27.5% of urban participants and 10.8% of rural participants had history of food poisoning in the past six months before the study. History of food poisoning was more in urban participants compared to rural participants and this difference was found to be statistically significant ( $p < 0.001$ ). The source of food poisoning reported by 67.2% of urban participants was street food and restaurant food; whereas 65.1% of rural participants reported the source of food as home cooked food.

Almost all 100% urban and 98.7% rural participants knew that hands must be washed before handling food. 76.5% of urban and 62.5% rural participants knew that wiping cloths can spread microorganisms. 98.2% of the urban and 86.2% of rural participants knew that raw food should be stored separately from cooked food, while 42.7% of the urban and 43.7% of rural participants knew that same cutting board cannot be used for raw and cooked food. 44.5% of the urban participants and 55% of the rural participants knew that cooked food needs to be thoroughly reheated. 42.3% of urban participants knew that proper cooking of meat includes more than 60°C, while only 17.5% of rural participants knew about proper cooking of meat. 79.5% of urban and 72.5% of rural participants knew that cooked food should be served hot. 55.3% of urban participants and 43% of rural participants knew that cooked meal

cannot be left at room temperature overnight. 48% of urban participants and 59.3% rural participants knew refrigerating food slows the bacterial growth. Only 22.5% urban and 19% of rural participants knew that safe water cannot be identified by the way it looks. Almost all the participants in urban area (100%) and rural (99.5%) area knew that fruits and vegetables must be washed and eaten/before consumption.

Most of the participants in urban (98.5%) and rural (98%) area agreed that frequent hand washing during food preparation is worth and 98.5% in urban area and 98.3% in rural area also agreed that keeping kitchen surfaces clean reduces the risk of illness. 82.5% of urban participants and 83% of rural participants agreed that keeping raw and cooked food separately helps to prevent illness and 76.3% of urban and 77.3% of rural participants agreed that different knives and cutting board for raw and cooked food prevents cross contamination. 61% of urban and 71.5% of rural participants agreed that soups and stews must be boiled to ensure food safety. 77.8% of urban and 51.8% of rural participants agreed that thawing food in a cool place is safe. 42.5% of urban and 32.5% of rural participants agreed that it is unsafe to leave cooked food out of refrigerator for more than two hours. Almost all the participants in urban (100%) and rural (96.8%) agreed that inspecting food for freshness and wholesomeness is valuable. Most (98.3%) of the urban participants and 96.5% rural participants agreed that it is important to check and throw away food beyond expiry date.

Majority (91.8%) of the urban and 86.5% of rural participants always washed hands before or during food preparation. 74% of urban and 82.3% of rural participants always cleaned surfaces and equipment's used for food preparation before reusing on other foods. 72.8% of urban and 55.3% of rural participants always used separate

utensils and cutting board for raw and cooked food and 83.8% of urban and 60.5% of rural participants always stored raw and cooked food separately. 43.5% of urban participants most of the times checked meats are cooked thoroughly by ensuring juices are clear or by cooking in the pressure cooker, whereas 59% of the rural participants never practiced it. 46% of urban participants always reheated cooked food until it is piping hot, whereas 26.5% of rural participants sometimes practiced it. 25.5% of urban and 25.3% of rural participants never practiced thawing of frozen food in the refrigerator or other cool place. 41% of urban and 57.5% of rural participants never practiced storage of left-over cooked food in a cool place within two hours. 84% of urban participants always checked and threw food beyond expiry date, while 50% of rural participants never checked expiry date on food. Most (97%) of the urban and 86.8% rural participants always washed fruits and vegetables with safe water before eating them.

Out of the total score of 11, the mean knowledge score for urban participants was  $7.1 \pm 1.47$  and rural participant were  $6.57 \pm 1.58$ . Knowledge about WHO Five keys for food safety was more among urban participants compared to rural participants and this difference was found to be statistically significant ( $p < 0.001$ ). Out of the total score of 18, the mean attitude score for urban participants was  $15.45 \pm 1.65$  and rural participants were  $15.12 \pm 2$ . Attitude towards WHO Five keys for food safety in both urban and rural participants was similar but it was found to be statistically significant ( $p = 0.018$ ). Out of the total score of 40, the mean practice score for urban participants was  $30.18 \pm 4.21$  and rural participants were  $25.12 \pm 4.55$ . WHO Five keys for food safety practices were higher among urban participants compared to rural participants and this difference was found to be statistically significant ( $p < 0.001$ ).

Among the WHO Five keys for food safety the mean knowledge score for the first key – keep clean was  $1.77 \pm 0.42$  for urban participants and  $1.61 \pm 0.49$  for rural participants out of the total score of 2. The mean knowledge score for second key – separate raw and cooked food was  $1.41 \pm 0.52$  for urban participants and  $1.30 \pm 0.063$  for rural participants out of the total score of 2. The mean knowledge score for third key – cook thoroughly was  $0.87 \pm 0.74$  for urban participants and  $0.73 \pm 0.64$  for rural participants out of the total score of 2. The mean knowledge score for fourth key – keep food at safe temperature was  $1.83 \pm 0.93$  for urban participants and  $1.75 \pm 0.88$  for rural participants out of the total score of 3. The mean knowledge score for fifth key – use safe water and raw materials was  $1.23 \pm 0.41$  for urban participants and  $1.19 \pm 0.40$  for rural participants out of the total score of 2. The mean knowledge score for each key was more among urban participants compared to rural participants and this difference was found to be statistically significant for the keys- keep clean ( $p < 0.001$ ). Separate raw and cooked food ( $p = 0.008$ ) and cook thoroughly ( $p = 0.004$ ).

84.7% of urban participants and 67% of rural participants knew that it is important to use apron or hair tie during food preparation, while only 12.5% of urban and 2.75% of rural participants used apron or hair tie during food preparation. 59.7% of urban and 68.5% of rural participants knew that it is important avoid pet animals in kitchen. 77% of urban and 62.1% of rural participants said that the best place to store raw food in refrigerator was on bottom shelf. 69.7% of urban participants and 73.7% of rural participants washed their hands between handling meat, poultry, fish and other raw food products. Most of the participants in urban (98.5%) and rural (98.7%) area washed their hands after going to toilet. Majority of the participants in urban (85.7%) and rural (79%) areas used chemicals to avoid pests in the kitchen.

49.5% of urban and 39.5% of rural participants used preservatives during food storage. 77.4% of urban and 58% of rural participants used preservative for storage of rice and wheat and 48.9% of urban and 36.7% of rural participants used boric powder as preservative. 32.8% urban participants stored the food for three months while 38.6% stored food for only one month.

Among the urban participants, mean knowledge score were found to be higher in the age group of 18 to 25 years ( $7.64 \pm 1.07$ ) and 25 to 35 years ( $7.34 \pm 1.39$ ) and the difference in knowledge score between age groups was found to be statistically significant among the age group of 35 to 45 years ( $p < 0.001$ ), 45 to 55 years ( $p < 0.001$ ) and more than 55 years ( $p < 0.001$ ). Among the rural participants mean knowledge score were found to be higher in the age group of 18 to 25 years ( $6.7 \pm 1.56$ ) and 35 to 45 years ( $6.71 \pm 1.83$ ) while it was lower in the age group of 45 to 55 years ( $5.9 \pm 1.53$ ) and the difference in knowledge score between age groups was found to be statistically significant among the age group of 45 to 55 years ( $p = 0.002$ )

Among the urban participants, the mean knowledge score was higher among illiterates ( $7 \pm 1.0$ ) compared to those who completed secondary education ( $6.86 \pm 1.48$ ) and there was a difference in knowledge with educational status but it was not statistically significant. Among the rural participants, the mean knowledge score was lowest among illiterates ( $5.55 \pm 1.57$ ) and knowledge score was higher with higher educational status and the difference in knowledge with educational status was found to be statistically significant among all the literates ( $p < 0.05$ ).

Among the urban participants, the mean knowledge score was higher among housewives ( $7.08 \pm 1.52$ ) compared to farmers ( $6 \pm 0.71$ ) and there was a difference in knowledge with occupation but it was not statistically significant. Among rural

participants, the mean knowledge score was lower among laborers ( $5.78 \pm 1.8$ ) compared to ( $7.28 \pm 1.13$ ) other occupations such as teachers, tailors etc. and the differences in knowledge was found to be statistically significant among laborers ( $p = 0.003$ ) and other type of occupation ( $p = 0.010$ ).

Among the urban participants, the mean knowledge score was higher among the participants who belonged to socioeconomic status class I ( $7.7 \pm 1.37$ ) and the differences in knowledge with socioeconomic status was found to be statistically significant among class III ( $p = 0.004$ ), class IV ( $p = 0.013$ ) and class V ( $p = 0.002$ ). Among the rural participants, the mean knowledge score was higher among the participants who belonged to socioeconomic status class I ( $6.94 \pm 1.44$ ) and the differences in knowledge with socioeconomic status was not statistically significant.

Among the urban participants, the mean attitude score was higher among the age group of 45 to 55 years ( $15.86 \pm 2.19$ ) and the differences in attitudes scores among the age group was not statistically significant. Among the rural participants, the mean attitude score was lowest among the age group of 45 to 55 years ( $14.04 \pm 2.20$ ) and the differences in attitude scores was found to be statistically significant among all the age groups ( $p < 0.05$ ).

Among the urban participants, the mean attitude score was higher among illiterates ( $16 \pm 1.0$ ) and the difference in attitude scores with educational status was not statistically significant. Among the rural participants, the mean attitude score was lower among illiterates ( $14.19 \pm 2.44$ ) and the difference in attitude score was statistically significant between literates and illiterates ( $p < 0.05$ ).

Among the urban participants, the mean attitude score was higher among farmers ( $17.6 \pm 0.54$ ) compared to housewives ( $15.67 \pm 1.86$ ) and the difference in attitude score was found to be statistically significant among farmers ( $p = 0.0212$ ) and ( $p = 0.038$ ) other type of occupation such as teacher, tailors etc. Among the rural participants, the mean attitude score was lowest among laborers ( $14.32 \pm 2.70$ ) and the difference in attitude score was found to be statistically significant among ( $p = 0.002$ ) other type of occupation such as teacher, tailors etc.

Among the urban participants, the mean attitude score was higher among the participants who belonged to socioeconomic status class III ( $15.89 \pm 1.81$ ) and there was no difference in attitude score with socioeconomic status and it was not statistically significant. Among the rural participants, the mean attitude score was lower among the participants who belonged to socioeconomic status class IV ( $14.69 \pm 2.30$ ) and the differences in attitude scores with socioeconomic status was not statistically significant.

Among the urban participants, the mean practice score was lower in the age group more than 55 years ( $27.92 \pm 3.07$ ) compared to other age groups and the difference in practice among the age group was found to be statistically significant among age group more than 55 years ( $p = 0.0001$ ). Among the rural participants, the mean practice score was lower in the age group of 25 to 35 years ( $20.79 \pm 4.90$ ) and 35 to 45 years ( $20.74 \pm 5.88$ ) and the differences in practices among the age group was not statistically significant.

Among the urban participants, the mean practice score was higher among the participants who completed PUC/Diploma ( $33.13 \pm 4.35$ ) and the difference in practice score with educational status was found to be statistically significant among

the participants who completed primary education ( $p = 0.0002$ ). Among the rural participants, the mean practice score was lower among illiterates ( $20.65 \pm 5.74$ ) and the difference in practice score with educational status was not statistically significant.

Among the urban participants, the mean practice score was higher among ( $31.25 \pm 3.35$ ) other type of occupation such as teachers, tailors etc and the differences was not statistically significant. Among the rural participants, the mean practice score was lower among laborers ( $18.77 \pm 6.01$ ) and the differences in practice score with occupation was found to be statistically significant among labourers ( $p = 0.0004$ ).

Among the urban participants, the mean practice score was higher among the participants who belonged to socioeconomic status class I ( $31.62 \pm 3.53$ ) and the differences in practice score with socioeconomic status was found to be statistically significant among the participants who belonged to class II ( $p = 0.0311$ ), class III ( $p = 0.0314$ ) and class V ( $p < 0.0001$ ). Among the rural participants, the mean practice score was higher among the participants who belonged to socioeconomic status class I ( $23.5 \pm 3.59$ ) and the differences in practice score with socioeconomic status was found to be statistically significant among the participants who belonged to class III ( $p = 0.017$ ) and class V ( $p = 0.0028$ ).

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ANNEXURES

ANNEXURE – I – ETHICAL CLEARANCE CERTIFICATE



K.L.E UNIVERSITY'S  
**JAWAHARLAL NEHRU MEDICAL COLLEGE,**  
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)  
(Accredited 'A' Grade by NAAC)

Website: <http://www.jnmc.edu>  
E-Mail : [dome@jnmc.edu](mailto:dome@jnmc.edu)

Phone: (+ 91-(0)831 Office : 2471350  
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Ref: MDC/DOME/05

Date: 17/10/2016


To,

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **“KNOWLEDGE, ATTITUDE AND PRACTICES OF FOOD SAFETY MEASURES AMONG URBAN AND RURAL HOUSEHOLDS OF BELAGAVI-A CROSS SECTIONAL STUDY”**, is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

  
(Dr. Arathi Darshan)  
Member Secretary

JNMC Institutional Ethics Committee  
on Human Subjects Research,  
J.N.Medical College, Belagavi.

  
(Dr. Ganga Pilli)  
Chairman,

JNMC Institutional Ethics Committee  
on Human Subjects Research,  
J.N.Medical College, Belagavi.

**ANNEXURE – II – INFORMED CONSENT FORM**

**“KNOWLEDGE, ATTITUDE AND PRACTICES OF FOOD SAFETY  
MEASURES IN URBAN AND RURA HOUSEHOLDS OF BELAGAVI –  
A CROSS SECTIONAL STUDY”**

**INVESTIGATOR:**

**GUIDE:**

**Introduction:**

India is one of the countries where there are frequent outbreaks in food borne illness specifically at the household level. Foods borne illness are one of the major hidden causes of death in India. Food safety refers to all the hazards that make food unsafe to health. Unsafe food leads to vicious cycle of diseases and malnutrition affecting all age groups. The reason behind food borne illness outbreaks are unsafe and unhygienic practices during food preparation especially at the household kitchen level.

**Objective / Purpose of the study:**

You are being invited to participate in the study to assess the knowledge, attitude and practices of food safety measures. The study will be carried out in the urban field practice area of Ashok Nagar and in the rural field practice area of Kinaye at Belagavi.

**Procedures:**

In this study you will have to answer a few prepared questions about your socio-demography dietary and cultural practices, resources available to you regarding food safety and any history of food borne illness. Knowledge, attitude and practices of five

keys of food safety details will be taken from you. The entire procedure may take 20-30 minutes. If you agree to participate, the required information will be collected.

**Benefits:**

You will be benefited by the health education given during this study. No risk is involved in this study.

**Incentives:**

You will not be eligible for any kind of monetary benefits or free services by virtue of your participation in the study at UHC/PHC or at KLE Dr. Prabhakar Kore Hospital, Belagavi.

**Cost of participation:**

You will not bear any costs attached to your participation.

**Legal rights:**

By signing this consent form, you are not waiving off any of your legal rights.

**Privacy and Confidentiality:**

The results of the study may be published for scientific purposes. However your personal identity will not be revealed. All information collected will be coded so that no one other than investigator will know your identity.

**Withdrawal from the study:**

Participation in this study is voluntary. If you don't wish to participate in this study, you will not lose benefits to which you are entitled. You can withdraw from the study anytime, if you wish to do so.

**Authorization to publish the results:**

The investigator may use the information gathered from this study for presentation in conference or publication or in scientific journals. However your personal identity will not be revealed.

**Questions:**

If you have any questions about rights as a research participant you can contact Dr. Ganga S. Pilli, Chairperson, Institutional Ethical Committee on Human Subjects Research JNMC, KAHER, Belagavi-590010 on Phone No: 0831-2471350 or Dr. N. S. Mahantshetti, Principal JNMC, KAHER, Belagavi-590010 on Phone No: 0831-2471350.

**CONSENT STATEMENT**

“I have been explained all the contents of this consent form in my local language and have understood and clarified all my queries about the study to the best of my knowledge. Furthermore I recognize that I have the complete right to withdraw this consent at any point during the study. I understand that the information given by me will be confidential and will be used for research purpose only, further I am aware that the result of this research will be presented/published without disclosing any personal identification of the participants.

I hereby give my voluntary consent for participation in the study. I do sign the informed consent form in front of an eyewitness whom I recognize.”

Name and Signature/left thumb impression of the Participant:

Name and Signature/left thumb impression of the Witness:

Name and Signature of the Researcher/Investigator:

Date:

Place:

**ANNEXURE – III – PROFORMA**

**“KNOWLEDGE, ATTITUDE AND PRACTICES OF FOOD SAFETY  
MEASURES IN URBAN AND RURAL HOUSEHOLDS OF BELAGAVI – A  
CROSS SECTIONAL STUDY”**

Date of survey:Sl. no.     Urban/Rural    

[Note: All the data collected will be kept confidential]

**Section I: Socio-demography**

- 1) What was the living environment of the participants?          Rural      Urban
- 2) Name:
- 3) Age: \_\_\_\_\_ years
- 4) Religion:    Hindu      Muslim      Others
- 5) Occupation:
- 6) Education:    Illiterate    Primary    Secondary    PUC/Diploma    Graduate
- 7) Marital Status:    Married    Unmarried    Widow
- 8) Type of family:    Nuclear    Joint    Broken
- 9) Type of house:    Pucca    Semi pucca    Kutcha
- 10) Place of cooking :    Kitchen    Open verandah    Common place
- 11) Total Monthly Income in Rs:
- 12) No. of family members:
- 13) Per Capita Income in Rs/month:
- 14) Socio-Economic Class:Class: I/II/III/IV/ V (According to modified B.G Prasad's classification)

15) Cooking fuel : – Coal Wood Biomass Kerosene stove LPG

others specify \_\_\_\_\_

16) Smoke vent in the kitchen Present Absent

17) Diet: Strict vegetarian Ova vegetarian Lacto vegetarian Lacto ova

vegetarian Semi vegetarian Non vegetarian

18) Source of drinking water available: Piped water Tube wells Hand pumps

Open wells Tanks

19) Is refrigerator available at your home? Present Absent

20) Any history of food poisoning in the past 6 months? Yes No

21) If yes, what was the food source? \_\_\_\_\_

**Section II: Knowledge*****Key 1 – Keep clean***

**K1a.** It is important to wash hands before handling food      True      False

**K1b.** Wiping cloths can spread microorganisms.      True      False

***Key 2 – Separate raw and cooked***

**K2a.** The same cutting board can be used for raw and cooked foods provided it looks clean.      True      False

**K2b.** Raw food needs to be stored separately from cooked food      True      False

***Key 3 – Cook thoroughly***

**K3a.** Cooked foods do not need to be thoroughly reheated.      True      False

**K3b.** Proper cooking includes meat cooked to 40 °C.      True      False

***Key 4 – Keep food at safe temperatures***

**K4a.** Cooked meat can be left at room temperature overnight to cool before refrigerating.      True      False

**K4b.** Cooked food should be kept very hot before serving.      True      False

**K4c.** Refrigerating food only slows bacterial growth.      True      False

***Key 5 – Use safe water and raw materials***

**K5a.** Safe water can be identified by the way it looks.      True      False

**K5b.** Wash fruit and vegetables.      True      False

**Section III: Attitude*****Key 1 – Keep clean***

A1a. Frequent hand-washing during food preparation is worth the extra time.

Agree      Not sure      Disagree

A1b. Keeping kitchen surfaces clean reduces the risk of illness.

Agree      Not sure      Disagree

***Key 2 – Separate raw and cooked***

A2a. Keeping raw and cooked food separate helps to prevent illness.

Agree                      Not sure                      Disagree

A2b. Using different knives and cutting boards for raw and cooked foods is worth the extra effort.

Agree                      Not sure                      Disagree

***Key 3 – Cook thoroughly***

A3a. Meat thermometers are useful for ensuring food is cooked thoroughly.

Agree                      Not sure                      Disagree

A3b. Soups and stews should always be boiled to ensure safety.

Agree                      Not sure                      Disagree

***Key 4 – Keep food at safe temperatures***

A4a. Thawing food in a cool place is safer.

Agree                      Not sure                      Disagree

A4b. I think it is unsafe to leave cooked food out of the refrigerator for more than two hours.

Agree                      Not sure                      Disagree

***Key 5 – Use safe water and raw materials***

A5a. Inspecting food for freshness and wholesomeness is valuable

Agree                      Not sure                      Disagree

A5b. I think it is important to throw away foods that have reached their expiry date.

Agree                      Not sure                      Disagree

**Section IV: Practices**

***Key 1 – Keep clean***

P1a. I wash my hands before and during food preparation.

Always    Most times    Sometimes    Not often    Never

P1b. I clean surfaces and equipment used for food preparation before re-using on other food.    Always    Most times    Sometimes    Not often    Never

***Key 2 – Separate raw and cooked***

P2a. I use separate utensils and cutting-boards when preparing raw and cooked food.

Always    Most times    Sometimes    Not often    Never

P2b. I separate raw and cooked food during storage.

Always    Most times    Sometimes    Not often    Never

***Key 3 – Cook thoroughly***

P3a. I check that meats are cooked thoroughly by ensuring that the juices are clear or by using a thermometer.    Always    Most times    Sometimes    Not often    Never

P3b. I reheat cooked food until it is piping hot throughout.

Always    Most times    Sometimes    Not often    Never

***Key 4 – Keep food at safe temperatures***

P4a. I thaw frozen food in the refrigerator or other cool place.

Always    Most times    Sometimes    Not often    Never

P4b. After I have cooked a meal I store any left-overs in a cool place within two hours.

Always    Most times    Sometimes    Not often    Never

***Key 5 – Use safe water and raw materials***

P5a. I check and throw away food beyond its expiry date.

Always    Most times    Sometimes    Not often    Never

P5b. I wash fruit and vegetables with safe water before eating them.

Always    Most times    Sometimes    Not often    Never

**Section V: Hygiene and other practices in kitchen**

6a. It is important to Use apron or hair tie while cooking?    True    False

6b. Use of aprons or hair tie is worth the extra effort?

Agree                      Not sure                      Disagree

6c. Do you use apron or hair tie while cooking?

Always    Most times    Sometimes    Not often    Never

7a. It is important to avoid pet animals in kitchen?    True    False

7b. Avoiding pet animals in kitchen help to prevents illness?

Agree                      Not sure                      Disagree

7c. Do you avoid pets in your kitchen?

Always    Most times    Sometimes    Not often    Never

Q8. Best place to store raw food in refrigerator is

On top shelf

On bottom shelf

Below ready to eat food

No difference

9a. Do you wash your hands between handling raw meat, poultry and sea food?

Always    Most times    Sometimes    Not often    Never

9b. Do you wash your hands after going to toilet?

Always    Most times    Sometimes    Not often    Never

9c. Do you wash your hands after handling animals?

Always    Most times    Sometimes    Not often    Never

9d. Do you wash your hands after handling chemicals?

Always      Most times      Sometimes      Not often      Never

10a. Is it important to avoid pests in the kitchen?    True      False

10b. Avoiding pests in kitchen are important to prevent food borne illness?

Agree                  Not sure                  Disagree

10c. Do you use any chemicals to avoid pests

Always      Most times      Sometimes      Not often      Never

11 Do you use any preservative to store food?      Yes      No

If yes,

11a. What type of food do you store?

11b. What is the preservative used?

11c. For how long do you store it?

**THANK YOU**

## **ANNEXURE – IV – KEY TO MASTER CHART**

### **Section I:**

- 1) Age: \_\_\_\_\_ years
- 2) Religion: 1- Hindu 2- Muslim 3- Others
- 3) Occupation: 1- Homemaker 2 - Farmer 3 - Laborers 4- Others
- 4) Education: 1- Illiterate 2 - Primary 3 - Secondary 4 – PUC/Diploma 5 - Graduate
- 5) Marital Status: 1 - Married 2 - Unmarried 3 - Widow
- 6) Type of family: 1 - Nuclear 2 - Joint 3 - Broken
- 7) Type of house: 1- Pucca 2- Semi Pucca 3 - Kutchha
- 8) Place of cooking : 1- Kitchen 2- Open verandah 3 - Common place
- 9) Total Monthly Income Rs:
- 10) No. of family members:
- 11) Per Capita Income Rs/month:
- 12) Socio-Economic Class: Class: I/II/III/IV/V (According to B.G Prasad classification)
- 13) Cooking fuel :  
1 - Coal 2 - Wood 3 - Biomass 4 - Kerosene 5 - LPG 6 - Induction
- 14) Smoke vent in the kitchen 1 - Present 2 - Absent
- 15) Diet: 1 - strict vegetarian 2 - Ova vegetarian 3 - Lacto vegetarian 4 - Lacto ova vegetarian 5 - Semi vegetarian 6 - Non vegetarian
- 16) Source of drinking water available:  
1 - Piped water 2 - Tube wells 3 - Hand pumps 4 - Open wells 5 - Tanks
- 17) Is refrigerator available at your home? 1 - Present 2 - Absent
- 18) Any history of food poisoning in the past 6 months? 1 - Yes 2 – No

19) If yes what is the food source?

1 - Home cooked food 2 - Street food 3 - Restaurant food

**Section II: Knowledge**

**Key 1 – Keep clean**

K1a. It is important to wash hands before handling food 1 - True 0 - False

K1b. Wiping cloths can spread microorganisms. 1 - True 0 - False

**Key 2 – Separate raw and cooked**

K2a. The same cutting board can be used for raw and cooked foods provided it looks clean. 0 - True 1 - False

K2b. Raw food needs to be stored separately from cooked food 1 - True 0 - False

**Key 3 – Cook thoroughly**

K3a. Cooked foods do not need to be thoroughly reheated. 0 - True 1 - False

K3b. Proper cooking includes meat cooked to 40 °C. 0 - True 1 - False

**Key 4 – Keep food at safe temperatures**

K4a. Cooked meat can be left at room temperature overnight to cool before refrigerating. 0 - True 1 - False

K4b. Cooked food should be kept very hot before serving. 1 - True 0 - False

K4c. Refrigerating food only slows bacterial growth. 1 - True 0 - False

**Key 5 – Use safe water and raw materials**

K5a. Safe water can be identified by the way it looks. 0 - True 1 - False

K5b. Wash fruit and vegetables. 1 - True 0 - False

**Section III: Attitude**

**Key 1 – Keep clean**

A1a. Frequent hand-washing during food preparation is worth the extra time.

2 - Agree 1 - Disagree 0 - Not sure

A1b. Keeping kitchen surfaces clean reduces the risk of illness.

2 - Agree 1 - Disagree 0 - Not sure

**Key 2 – Separate raw and cooked**

A2a. Keeping raw and cooked food separate helps to prevent illness.

2 - Agree 1 - Disagree 0 - Not sure

A2b. Using different knives and cutting boards for raw and cooked foods is worth the extra effort. 2 - Agree 1 - Disagree 0 - Not sure

**Key 3 – Cook thoroughly**

A3b. Soups and stews should always be boiled to ensure safety.

2 - Agree 1 - Disagree 0 - Not sure

**Key 4 – Keep food at safe temperatures**

A4a. Thawing food in a cool place is safer.

2 - Agree 1 - Disagree 0 - Not sure

A4b. I think it is unsafe to leave cooked food out of the refrigerator for more than two hours. 2 - Agree 1 - Disagree 0 - Not sure

**Key 5 – Use safe water and raw materials**

A5a. Inspecting food for freshness and wholesomeness is valuable

2 - Agree 1 - Disagree 0 - Not sure

A5b. I think it is important to throw away foods that have reached their expiry date.

2 - Agree 1 - Disagree 0 - Not sure

**Section IV: Practices**

**Key 1 – Keep clean**

P1a. I wash my hands before and during food preparation.

4 - Always 3 - Most times 2 - Sometimes 1 - Not often 0 - Never

P1b. I clean surfaces and equipment used for food preparation before re-using on other food. 4 - Always 3 - Most times 2 - Sometimes 1 - Not often 0 - Never

**Key 2 – Separate raw and cooked**

P2a. I use separate utensils and cutting-boards when preparing raw and cooked food.

4 - Always 3 - Most times 2 - Sometimes 1 - Not often 0 - Never

P2b. I separate raw and cooked food during storage.

4 - Always 3 - Most times 2 - Sometimes 1 - Not often 0 – Never

**Key 3 – Cook thoroughly**

P3a. I check that meats are cooked thoroughly by ensuring that the juices are clear or by using a thermometer.

4 - Always 3 - Most times 2 - Sometimes 1 - Not often 0 - Never

P3b. I reheat cooked food until it is piping hot throughout.

4 - Always 3 - Most times 2 - Sometimes 1 - Not often 0 - Never

**Key 4 – Keep food at safe temperatures**

P4a. I thaw frozen food in the refrigerator or other cool place.

4 - Always 3 - Most times 2 - Sometimes 1 - Not often 0 - Never

P4b. After I have cooked a meal I store any left-overs in a cool place within two hours.

4 - Always 3 - Most times 2 - Sometimes 1 - Not often 0 - Never

**Key 5 – Use safe water and raw materials**

P5a. I check and throw away food beyond its expiry date.

4 - Always 3 - Most times 2 - Sometimes 1 - Not often 0 - Never

P5b. I wash fruit and vegetables with safe water before eating them.

4 - Always 3 - Most times 2 - Sometimes 1 - Not often 0 – Never

**Section V: Hygiene and other practices in kitchen**

6a. It is important to Use apron or hair tie while cooking? 1 - True 2 - False

6b. Use of aprons or hair tie is worth the extra effort?

1 – Agree 2 - Not sure 3 - Disagree

6c. Do you use apron or hair tie while cooking?

1 - Always 2 - Most times 3 - Sometimes 4 - Not often 5 - Never

7a. It is important to avoid pet animals in kitchen? 1 - True 2 - False

7b. Avoiding pet animals in kitchen help to prevents illness?

1 – Agree 2 - Not sure 3 - Disagree

7c. Do you avoid pets in your kitchen?

1 - Always 2 - Most times 3 - Sometimes 4 - Not often 5 – Never

Q8. Best place to store raw food in refrigerator

1 - On top shelf 2 – On the bottom shelf 3 - Below ready to eat food 4 - No difference

9a. Do you wash your hands between handling raw meat, poultry and sea food?

1 - Always 2 - Most times 3 - Sometimes 4 - Not often 5 – Never

9b. Do you wash your hands after going to toilet?

1 - Always 2 - Most times 3 - Sometimes 4 - Not often 5 – Never

9c. Do you wash your hands after handling animals?

1 - Always 2 - Most times 3 - Sometimes 4 - Not often 5 – Never

9d. Do you wash your hands after handling chemicals?

1 - Always 2 - Most times 3 - Sometimes 4 - Not often 5 – Never

10a. Is it important to avoid pests in the kitchen? 1 - True 2 – False

10b. Avoiding pests in kitchen are important to prevent food borne illness?

1 – Agree 2 - Not sure 3 – Disagree

10c. Do you use any chemicals to avoid pests?

1 - Always 2 - Most times 3 - Sometimes 4 - Not often 5 - Never

11. Do you use any preservative to store food? 1 - Yes 2 - No

If yes

11a. What type of food do you store?

1 - Jowar 2 - Rice 3 - Wheat 4 - Cereals 5 - Wheat and Rice 6 - Green peas

b. What is the preservative used?

1 - Boric Powder 2 - Clove 3 - Dry chillies 4 - Eucalyptus, Neem 5 - Goli Powder

6 - Neem, Boric Powder 7 - Powder 8 - Tablet 9 - White Powder

c. For how long do you store it?

1 - 1 month 2 - 3 month 3 - 6 month 4 - 1 year 5 - >1 year

**THANK YOU**

## ANNEXURE – V IEC MATERIALS

# Five keys to safer food

## Keep clean

- ✓ Wash your hands before handling food and often during food preparation
- ✓ Wash your hands after going to the toilet
- ✓ Wash and sanitize all surfaces and equipment used for food preparation
- ✓ Protect kitchen areas and food from insects, pests and other animals

### Why?

While most microorganisms do not cause disease, dangerous microorganisms are widely found in soil, water, animals and people. These microorganisms are carried on hands, wiping cloths and utensils, especially cutting boards and the slightest contact can transfer them to food and cause foodborne diseases.

## Separate raw and cooked

- ✓ Separate raw meat, poultry and seafood from other foods
- ✓ Use separate equipment and utensils such as knives and cutting boards for handling raw foods
- ✓ Store food in containers to avoid contact between raw and prepared foods

### Why?

Raw food, especially meat, poultry and seafood, and their juices, can contain dangerous microorganisms which may be transferred onto other foods during food preparation and storage.

## Cook thoroughly

- ✓ Cook food thoroughly, especially meat, poultry, eggs and seafood
- ✓ Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink. Ideally, use a thermometer
- ✓ Reheat cooked food thoroughly

### Why?

Proper cooking kills almost all dangerous microorganisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include minced meat, rolled meats, large joints of meat and whole poultry.

## Keep food at safe temperatures

- ✓ Do not leave cooked food at room temperature for more than 2 hours
- ✓ Refrigerate promptly all cooked and perishable food (preferably below 5°C)
- ✓ Keep cooked food piping hot (more than 60°C) prior to serving
- ✓ Do not store food too long even in the refrigerator
- ✓ Do not thaw frozen food at room temperature

### Why?

Microorganisms can multiply very quickly if food is stored at room temperature. By holding at temperatures below 5°C or above 60°C, the growth of microorganisms is slowed down or stopped. Some dangerous microorganisms still grow below 5°C.

## Use safe water and raw materials

- ✓ Use safe water or treat it to make it safe
- ✓ Select fresh and wholesome foods
- ✓ Choose foods processed for safety, such as pasteurized milk
- ✓ Wash fruits and vegetables, especially if eaten raw
- ✓ Do not use food beyond its expiry date

### Why?

Raw materials, including water and ice, may be contaminated with dangerous microorganisms and chemicals. Toxic chemicals may be formed in damaged and moldy foods. Care in selection of raw materials and simple measures such as washing and peeling may reduce the risk.

Food Safety  
World Health Organization

## Knowledge = Prevention

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# सुरक्षित भोजन के पाँच मंत्र



## साफ-सफाई रखें

- खाद्य पदार्थों के संपर्क से पहले से पहले तथा भोजन पकाने समय हाथों को अच्छी तरह धोएं।
- खींच के पश्चात् खींच प्रहार से हाथ धोएं।
- भोजन पकाने से पहले से पहले हाथों को खींच तथा खान को खींच प्रहार से साफ करें।
- खोई का तथा भोजन को बोरे-पकोड़े, गन्गू एवं लडवने से सुरक्षित रखें।

क्यों ?

सूखे अतिरिक्त सुमरित बोरे-पकोड़े एवं लडवने, खाना-पान सुमरित बरतक का से प्रयोग, खाने, खाना एवं गन्गू से काया नहीं है, का सुमरित बोरे, सूखे बोरे का बोरे, सुमरित बोरे से प्रयोग से काया एवं बोरे से काया नहीं है। सूखे बोरे से सुमरित बोरे से काया नहीं है तथा सुमरित बोरे से खाना सुमरित का खाना नहीं है।



## कच्चे एवं, पके हुए भोजन को अलग रखें

- कच्चा खींच, विभिन्न तथा सुखी खाद्य पदार्थों को अलग खाद्य पदार्थों से अलग रखें।
- कच्चे खाद्य पदार्थों के लिए अलग उपकरण एवं बोरे का प्रयोग करें जैसे कि चाँदू और चारने के लिए बोरे।
- खाद्य पदार्थों को बन्द डिब्बों में रखें जिससे कच्चा एवं पका हुआ भोजन संपर्क से न आ सके।

क्यों ?

कच्चा भोजन सुखा, खींच, पिसा, सुखी भोजन और अन्य रूप में खाना-पान सुमरित से काया है जो सूखे खाद्य पदार्थों से खाना पकाने समय का खाना नहीं काया कर सके है।



## भोजन अच्छी तरह से पकाएँ

- भोजन को खींच प्रहार से खाना, सुखा, खींच, विभिन्न तथा सुखी खाद्य पदार्थों को।
- भोजन जैसे पूरा ताप उपकरणों द्वारा सफाई के रूप (सफाई) को प्रमाणित 70° सेल्सियस तक उबालें। खाद्य पदार्थों को खींच तथा विभिन्न का रूप साफ से, सुखायी नहीं। उपकरण सफाई का प्रयोग करें।
- पके हुए भोजन को खींच प्रहार से पुनः पारण करें।

क्यों ?

खींच प्रहार से भोजन को खाना से अतिरिक्त खाने खाना-पान सुमरित का से काया है, खाना-पान से खाना-पान का 70° सेल्सियस तापमान तक उबालें, का सुखी-पान से काया है कि भोजन का से खींच प्रहार से, काया नहीं है कि भोजन, पुनः पुनः खींच, विभिन्न एवं खींच से काया नहीं है तथा खाना-पान सुमरित से खाना-पान का से काया नहीं है।



## खाद्य पदार्थों को सुरक्षित तापमान में रखें

- पके हुए भोजन को सफाई तापमान से से काया से अतिरिक्त न रखें।
- पके हुए भोजन तथा काया काया बोरे काया खाद्य पदार्थों को रेफ्रिजरेटर में रखें (5° सेल्सियस तापमान से काया)।
- रेफ्रिजरेटर से पूर्व पके हुए भोजन को अतिरिक्त ताप रखें (60° सेल्सियस से अतिरिक्त तापमान)।
- खाद्य पदार्थों को काया अतिरिक्त ताप से खींच प्रहार से न रखें।
- पके हुए खाद्य पदार्थों को सफाई तापमान में न रखें।

क्यों ?

भोजन को सफाई तापमान से रखें से सुखी-पान का काया नहीं काया से काया है, खाना-पान से 5° सेल्सियस से काया तापमान का 60° सेल्सियस से अतिरिक्त तापमान में रखें से सुखी-पान से सुखी-पान का काया से काया है का से विभिन्न तापमान से काया है। पुनः खाना-पान सुमरित 5° सेल्सियस तापमान से काया से काया ताप से काया है।



## सुरक्षित जल तथा कच्चे पदार्थों का प्रयोग करें

- सुरक्षित जल का प्रयोग करें अतिरिक्त जल को सुरक्षित बोरे का प्रयोग करें।
- खाने और अतिरिक्त खाद्य पदार्थों का पारण करें।
- सुरक्षित अतिरिक्त खाद्य पदार्थों का से काया करें जैसे कि फल-फसल पुनः।
- खाने और अतिरिक्त का से काया अतिरिक्त ताप से काया करें, सुखायी और कच्चे खाद्य पदार्थों।
- खाद्य पदार्थों का प्रयोग उपकरण सफाई के पश्चात् न करें।

क्यों ?

कच्चे पदार्थों जल से काया और काया से काया है, अतिरिक्त सुमरित तथा सुमरित का सुखी से काया है। कच्चे भोजन का सुखी एवं भोजन से काया तापमान का काया है।

कच्चे भोजन का खाना नहीं काया तापमान से काया तथा तापमान से काया है काया है काया है अतिरिक्त तापमान से काया तापमान से काया है।

# ಸುರಕ್ಷಿತ ಆಹಾರಕ್ಕೆ ಐದು ಸೂತ್ರಗಳು



## ಶುದ್ಧತೆ ಕಾಪಾಡಿ

- ✓ ಆಡುಗೆ ಮಾಡಲು ಪ್ರಾರಂಭಿಸುವ ಮೊದಲು ಹಾಗೂ ಅಡುಗೆ ಕೆಲಸ ಮಾಡುತ್ತಿರುವಾಗ, ಆಡುಗೆ ಕೈ ತೊಳೆದುಕೊಳ್ಳಿ.
- ✓ ಶೌಚಾಲಯವನ್ನು ಬಳಸಿದ ನಂತರ ಕೈ ತೊಳೆಯಿರಿ.
- ✓ ಆಡುಗೆ ಮಾಡುವ ಜಾಗವನ್ನು ಹಾಗೂ ಬಳಸುವ ಎಲ್ಲಾ ಪಾತ್ರೆ-ಸಾಮಾನುಗಳನ್ನು ಚೆನ್ನಾಗಿ ತೊಳೆದು, ತುಡ್ಡಗೊಳಿಸಿ.
- ✓ ಆಡುಗೆ ಮನೆ ಮತ್ತು ಆಹಾರ ಪದಾರ್ಥಗಳನ್ನು ಕ್ರಿಮಿ, ಕೀಟಗಳು ಮತ್ತು ಇತರ ಪ್ರಾಣಿಗಳಿಂದ ರಕ್ಷಿಸಿ.

### ಕಾರಣ:

ಬಹುಪಾಲು ಸೂಕ್ಷ್ಮ ಜೀವಿಗಳು ಕಾಯಿಲೆ ಉಂಟುಮಾಡುವುದಿಲ್ಲ. ಆದರೆ ಮಣ್ಣು ನೀರು, ಪ್ರಾಣಿಗಳು ಮತ್ತು ಮನುಷ್ಯರಲ್ಲಿ ಹಾನಿಕಾರಕ ಸೂಕ್ಷ್ಮ ಜೀವಿಗಳನ್ನು ಹೊಂದಿರುತ್ತವೆ. ಇವು ಕೈಗಳು, ಒರೆಸುವ ವ್ಯಾಪಕವಾಗಿವೆ. ಇವು ಕೈಗಳು, ಒರೆಸುವ ಬಟ್ಟೆಗಳು, ಪಾತ್ರೆಗಳು, ಮುಖ್ಯವಾಗಿ ಹೆಚ್ಚು ಮನೆಯಲ್ಲಿ ಇರುತ್ತವೆ. ಸ್ವಲ್ಪ ಸೋಂಕಿನಿಂದಲೂ ಸಾಕು, ಅವು ಆಹಾರ ಪದಾರ್ಥಕ್ಕೆ ಹರಡಿ, ಇಂತಹ ಆಹಾರದ ಮೂಲಕ ಕಾಯಿಲೆ ಉಂಟಾಗುವ ಸಾಧ್ಯತೆಯಿದೆ.



## ಹಸಿ ಮತ್ತು ಬೇಯಿಸಿದ ಪದಾರ್ಥಗಳನ್ನು ಬೇರ್ಪಡಿಸಿ

- ✓ ಹಸಿ ಮಾಂಸ, ಕೋಳಿ ಮತ್ತು ಮೀನು ಮುಂತಾದವನ್ನು ಇತರ ಆಹಾರ ಪದಾರ್ಥಗಳಿಂದ ಬೇರ್ಪಡಿಸಿ.
- ✓ ಹಸಿ ಆಹಾರ ಪದಾರ್ಥಗಳನ್ನು ಉಪಯೋಗಿಸುವಾಗ ಪ್ರತ್ಯೇಕವಾದ ಪಾತ್ರೆಗಳನ್ನು ಮತ್ತು ಉಪಕರಣಗಳನ್ನು (ಉದಾಹರಣೆಗೆ ಕತ್ತಿಗಳು, ಹುಟ್ಟುವ ಮಣಿಗಳನ್ನು) ಬಳಸಿ.
- ✓ ಬೇಯಿಸಿದ ಪದಾರ್ಥಗಳೊಂದಿಗೆ ಹಸಿ ಪದಾರ್ಥ ಸೇರದಿರುವಂತೆ ಬೇರೆ-ಬೇರೆ ಪಾತ್ರೆಗಳಲ್ಲಿ ಇಟ್ಟುಕೊಳ್ಳಿರಿ.

### ಕಾರಣ:

ಹಸಿ ಆಹಾರ ಪದಾರ್ಥಗಳು, ಮುಖ್ಯವಾಗಿ ಮಾಂಸ, ಕೋಳಿ ಮತ್ತು ಮೀನು ಮುಂತಾದವುಗಳು ಹಾಗೂ ಅವುಗಳ ರಸದಲ್ಲಿ ಹಾನಿಕಾರಕ ಸೂಕ್ಷ್ಮ ಜೀವಿಗಳಿರುತ್ತವೆ. ಆಡುಗೆ ಮಾಡುವಾಗ ಮತ್ತು ಕೆಲವಿಂತಿ ಇರುವಾಗ ಇತರ ಆಹಾರ ಪದಾರ್ಥಗಳಿಗೆ ಇವು ಹರಡುವ ಸಾಧ್ಯತೆಯಿದೆ.

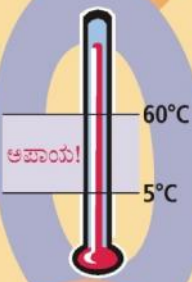


## ಸಂಪೂರ್ಣವಾಗಿ ಬೇಯಿಸಿ

- ✓ ಆಹಾರ ಪದಾರ್ಥಗಳನ್ನು ಮುಖ್ಯವಾಗಿ ಮಾಂಸ, ಕೋಳಿ ಮತ್ತು ಮೀನನ್ನು ಸಂಪೂರ್ಣವಾಗಿ ಬೇಯಿಸಿ.
- ✓ ಸೂಪ್ ಮತ್ತು ಸ್ಪೈಟ್ ಗಳಂತಹಾ ಆಹಾರಗಳನ್ನು 70°C ತಲುಪುವವರೆಗೆ ಕುದಿಸಿ.
- ✓ ಮಾಂಸ ಮತ್ತು ಕೋಳಿ ಮಾಂಸದ ರಸ, ಗುಲಾಬಿ ಬಣ್ಣದಲ್ಲಿರದೆ ಕುದ್ಡವಾಗಿರುವುದನ್ನು ಖಾತರಿ ಪಡಿಸಿಕೊಳ್ಳಿ. ಥರ್ಮಾಮೀಟರ್ ಉಪಯೋಗಿಸುವುದು ಅತ್ಯುತ್ತಮ.
- ✓ ಬೇಯಿಸಿದ ಪದಾರ್ಥವನ್ನು ಮತ್ತೊಮ್ಮೆ ಚೆನ್ನಾಗಿ ಬಿಸಿಮಾಡಿ.

### ಕಾರಣ:

ಚೆನ್ನಾಗಿ ಬೇಯಿಸಿದಾಗ ಮುಖ್ಯವಾಗಿ ಎಲ್ಲಾ ಹಾನಿಕಾರಕ ಸೂಕ್ಷ್ಮ ಜೀವಿಗಳೂ ಸಾಯುತ್ತವೆ. ಆಹಾರ ಪದಾರ್ಥಗಳನ್ನು 70°C ತಾಪಮಾನದ ವರೆಗೆ ಬೇಯಿಸುವುದರಿಂದ ಅವು ಸೇವಿಸಲು ಸುರಕ್ಷಿತ ಎಂದು ಕೋಡ್ನಲ್ಲಿ ಮೂಲಕ ರುಬಿಮಾಪನವಿಡಿಸಲಾಗಿದೆ. ಮೂಲಕ ತುಂಬಿದ ಮಾಂಸ ಸುಟ್ಟಮಾಂಸ, ಮಾಂಸದ ಕುಂಡಲಿಗಳು ಮತ್ತು ಇಡೀ ಕೋಳಿ ಮುಂತಾದವುಗಳನ್ನು ಬೇಯಿಸುವಾಗ ವಿಕಿರಣ ಕಾಲಜನಿಸಬೇಕು.



## ಆಹಾರ ಪದಾರ್ಥಗಳನ್ನು ಸುರಕ್ಷಿತ ತಾಪಮಾನದಲ್ಲಿಡಿ:

- ✓ ಬೇಯಿಸಿದ ಆಹಾರವನ್ನು ಹೊರಗಿನ ತಾಪಮಾನದಲ್ಲಿ 2 ಘಂಟೆಗಳಿಗಿಂತ ಹೆಚ್ಚು ಕಾಲ ಬಿಡಬೇಡಿ.
- ✓ ಬೇಯಿಸಿದ ಮತ್ತು ಹಳಸಿ ಹೋಗುವ ಸಾಧ್ಯತೆ ಇರುವ ಆಹಾರವನ್ನು ಮರೆಯದೆ ಫ್ರಿಜ್‌ನಲ್ಲಿಡಿ (5°C ಗಿಂತ ಕಡಿಮೆ ತಾಪಮಾನ ಸೂಕ್ತ)
- ✓ ಸೇವಿಸುವ ಮೊದಲು ಆಹಾರ ಪದಾರ್ಥವನ್ನು ಹಬೆಯಾದುವ ಹದಕ್ಕೆ ಬಿಸಿಮಾಡಿ (60°C ಗಿಂತ ಹೆಚ್ಚು)
- ✓ ಆಹಾರ ಪದಾರ್ಥವನ್ನು ಹೆಚ್ಚು ಕಾಲ ಫ್ರಿಜ್‌ನಲ್ಲಿ ಸಹ ಕೇವಲಿಸಿಡಬೇಡಿ.
- ✓ ಫ್ರೀಜರ್‌ನಿಂದ ತೆಗೆದ ಆಹಾರ ಪದಾರ್ಥವನ್ನು ಹೊರಗಿನ ತಾಪಮಾನದಲ್ಲಿ ಬಿಸಿ ಮಾಡಬೇಡಿ.

### ಕಾರಣ:

ಹೊರಗಿನ ತಾಪಮಾನದಲ್ಲಿ ಆಹಾರ ಕೇವಲಿಸಿದಾಗ ಸೂಕ್ಷ್ಮ ಜೀವಿಗಳು ತೀವ್ರವೇ ಹೆಚ್ಚಾಗುವ ಸಾಧ್ಯತೆಯಿದೆ. ತಾಪಮಾನ 5°C ಗಿಂತ ಕಡಿಮೆ ಅಥವಾ 60°C ಗಿಂತ ಹೆಚ್ಚಾದಲ್ಲಿ ಸೂಕ್ಷ್ಮ ಜೀವಿಗಳು ಹೆಚ್ಚಾಗುವ ಸ್ಪಷ್ಟತೆಯ ನಿರ್ಧಾರವಾಗುತ್ತದೆ ಅಥವಾ ನಿಲ್ಲುತ್ತದೆ. ಕೆಲವು ಹಾನಿಕಾರಕ ಕ್ರಿಮಿಗಳು 5°C ಗಿಂತ ಕಡಿಮೆ ತಾಪಮಾನದಲ್ಲೂ ಬೆಳೆಯುತ್ತವೆ.



## ಶುದ್ಧವಾದ ನೀರು ಮತ್ತು ಕಬ್ಬಾಸಾಮಿಗಳನ್ನು ಬಳಸಿ

- ✓ ಶುದ್ಧವಾದ ನೀರನ್ನು ಬಳಸಿ ಅಥವಾ ಸುರಕ್ಷಿತವಾಗುವ ರೀತಿಯಲ್ಲಿ ತುಡ್ಡಗೊಳಿಸಿ.
- ✓ ತಾಜಾ ಮತ್ತು ಪೌಷ್ಟಿಕ ಆಹಾರವನ್ನು ಆಯ್ದುಕೊಳ್ಳಿ.
- ✓ ಸುರಕ್ಷಿತ ಪ್ರಕ್ರಿಯೆಗಳ ಬಳಸಿದ ಸಲ್ಲುತ್ತ ಆಹಾರ ಪದಾರ್ಥಗಳನ್ನು ಬಳಸಿ. ಉದಾ: ಪ್ಯಾಕ್ಲೆಡ್‌ಜೆ ಮಾಡಲ್ಪಟ್ಟ ಹಾಲು.
- ✓ ಹಣ್ಣು ಮತ್ತು ತರಕಾರಿಗಳನ್ನು ಚೆನ್ನಾಗಿ ತೊಳೆಯಿರಿ, ಮುಖ್ಯವಾಗಿ ಹಸಿಯಾಗಿ ಸೇವಿಸುವಾಗ.
- ✓ ಕಾಲಾವಧಿ ಮೀರಿದ ಯಾವುದೇ ಆಹಾರ ಪದಾರ್ಥವನ್ನು ಬಳಸಬೇಡಿ.

### ಕಾರಣ:

ನೀರು ಮತ್ತು ಮಂಜುಗಡ್ಡೆ ಸೇರಿದಾಗ ಕಬ್ಬಾ ಆಹಾರ ಪದಾರ್ಥಗಳು ಹಾನಿಕಾರಕ ಕ್ರಿಮಿಗಳು ಮತ್ತು ರಾಸಾಯನಿಕ ಪದಾರ್ಥಗಳಿಂದ ಮಲಿನವಾಗಿರುವ ಸಾಧ್ಯತೆಯಿದೆ. ಹಾನಿಗೊಳಗೊಂಡ ಮತ್ತು ಅಟ್ಟಿರೂಪದ ಆಹಾರ ಪದಾರ್ಥಗಳಲ್ಲಿ ವಿಷಧರಿಸಿದ ರಾಸಾಯನಿಕ ಪದಾರ್ಥಗಳಿರುತ್ತವೆ. ಕಬ್ಬಾ ಸಾಮಿಗಳನ್ನು ಆಯ್ದುಕೊಳ್ಳುವಾಗ ಕಾಳಜಿವಹಿಸಿ ಮತ್ತು ತೊಳೆಯುವ, ಸಿಪ್ಪೆ ಸುಲಿಯುವಂತಹ ಸರಳ ಉಪಾಯಗಳಿಂದ ಆಹಾರ ಸುರಕ್ಷಿತವು.

# From farm to plate, make food safe

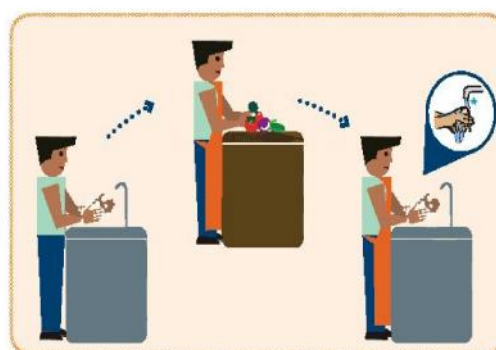


## CHECK

- ✦ Check quality of food ingredients while purchasing
- ✦ Check use-by dates and labels of packed food

## CLEAN

- ✦ Clean surfaces and wash hands
- ✦ Clean fruits and vegetables that are eaten raw



## SEPARATE

- ✦ Separate raw and ready-to-eat food
- ✦ Separate raw meat, fish and raw vegetables

## COOK

- ✦ Cook food thoroughly
- ✦ Cook/reheat leftovers thoroughly so that they are steaming



## CHILL

- ✦ Refrigerate food promptly and properly
- ✦ Refrigerate cooked food within 2 hours of preparation

**Safe food = Healthy lives**

## URBAN

sl.no	AGE	RELIGION	OCCUPATION	EDUCATION	MARITAL	FAMILY	TYPE OF HOUSE	PLACE OF COOKING	FAMILY INCOME	NO FAMILY	PER CAPITA	SOCIOECONOMIC	COOKING FUEL	SMOKE VENT	DJET	WATERSOURCE	FRIDGE	FOOD POISONING	NAUSEA	VOMITING	PAIN ABDOMEN	LOOSE STOOLS	FOOD SOURCE	K1A	K1B	K2A	K2B	K3A	K3B	K4A	K4B	K4C	K5A	K5B	a1a	a1b	a2a	a2b	a3b	a4a	a4b	a5a	a5b	p1a	p1b	p2a	p2b	p3a	p3b	p4a	p4b	p5a	p5b	q6a	q6b	q6c	q7a	q7b	q7c	q8	q9a	q9b	q9c	q9d	q10a	q10b	q10c	q11	q11a	q11b	q11c							
1	35	2	1	4	1	1	1	1	5000	3	1666.666667	4	5	2	6	1	1	2	0	0	0	0	0	1	1	0	1	1	0	1	1	0	1	1	0	1	2	2	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	1	4	1	4	4	4	1	1	5	0	1	0	2	1	1	0	1	1	1	1	1	1	4	1	3
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68	25	2	1	3	1	1	1	1	4000	2	2000	3																																																													

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143	44	2	4	3	1	1	1	1	50000	4	12500	1	5	2	6	1	1	2	0	0	0	0	0	1	1	0	1	0	0	1	1	1	0	1	2	2	2	2	1	2	2	2	4	4	4	4	4	4	4	4	4	4	4	1	1	5	1	2	0	2	1	1	0	1	1	1	1	1	4	2	3		
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191	35	1	1	5	1	2	1	2	42000	10	4200	2	5	2	6	1	1	1	2	1	1	2	1	1	1	1	1	0	0	1	0	0	1	2	2	2	0	2	1	2	2	4	2	4	2	4	4	2	0	4	2	0	4	2	0	4	2	3	5	1	2	0	2	2	1	0	3	1	1	4	1	3	3	2		
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66	60	1	2	2	1	2	2	3	5000	11	454.5454545	5	1	1	6	1	2	2	0	0</																																																						

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136	53	2	1	3	1	1	2	1	5000	4	1250	4	5	2	6	1	2	2	0	0	0	0	0	1	1	1	1	0	0	0	0	1	2	1	1	2	1	2	2	2	3	1	0	4	0	3	3	3	3	2	2	3	5	0	2	2	0	2	1	3	2	1	1	5	2	0	0	0					
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273	72	1	1	3	1	1	1	1	7000	2	3500	2	5	2	6	1	2	2	0	0	0	0	0	0	1	1	0	1	0	1	0	0	0	1	2	2	2	2	1	2	0	2	2	4	4	4	4	0	3	1	0	4	4	2	3	5	1	1	0	0	2	1	0	1	1	1	1	2	0	0	0					
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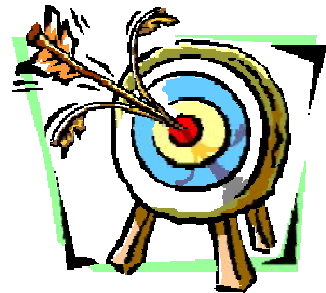
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342	21	1	1	3	1	1	1	1	25000	3	8333.333333	1	5																																																																





# *Introduction*

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# *Objectives*

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# *Review of Literature*

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# *Methodology*

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# *Results*

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# *Discussion*

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*Conclusion*

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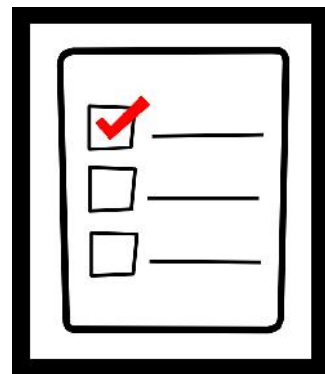
# *Recommendations*

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*Strengths*

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# *Limitations*

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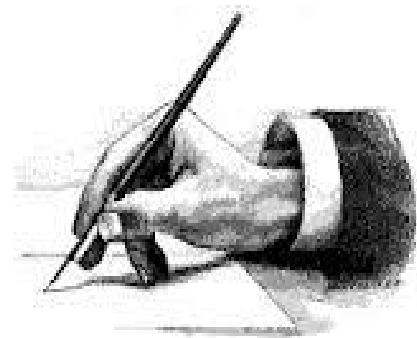
# *Summary*

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# *Bibliography*

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# *Annexures*

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