Master of Science in Public Health

Awareness and Practices on Household Food Safety among Working and Non-working Women of Islamabad

By

(DR. SIDRA MASAOOD SHAH)

Al-Shifa School of Public Health, PIO,
Al-Shifa Trust Eye Hospital
Quaid-i-Azam University
Islamabad, Pakistan

(2022)

Awareness and Practices on Household Food Safety among Working and Non-working Women of Islamabad

(DR. SIDRA MASAOOD SHAH)

(362771-PIO/MSPH-2020)

Dissertation submitted in partial fulfilment of the requirement for the degree of:

MASTER OF SCIENCE IN PUBLIC HEALTH(2020-2022)

to

Al-Shifa School of Public Health, PIO, Al-Shifa Trust Eye Hospital,
Faculty of Medicine
Quaid-i-Azam University,
Islamabad.

Word Count:
15100

Declaration

In submitting this dissertation, I certify that I have read and understood the rules and regulations of DPH and QAU regarding assessment procedures and offences and formally declare that all work contained within this document is my own apart from properly referenced quotations.

I understand that plagiarism is the use or presentation of any work by others, whether published or not, and can include the work of other candidates. I also understand that any quotation from the published or unpublished works of other persons, including other candidates, must be clearly identified as such by being placed inside quotation marks and a full reference to their source must be provided in proper form.

This dissertation is the result of an independent investigation. Where my work is indebted to others, I have made acknowledgments.

I declare that this work has not been accepted in substance for any other degree, nor is it currently being submitted in candidature for any other degree.

(Ms.Hina Sharif)
Senior LecturerPublicHealth
Al-Shifa School ofPublicHealth,
PIO, Al Shifa TrustEyeHospital
Date:17-05-2022

(Dr. Sidra Masaood Shah)
(362771-PIO/MSPH-2020)
MSPH (2022)
Date: 17-05-2022

Dedicatedtoallthosewhohavesupportedand encouraged me throughout my researchwork!

Thanks for making me see this adventure through to the end. I wouldn't be able to accomplish this task without everyone's support…….

ABSTRACT

Background: Food safety has become a universal challenge due to intrusion and escalation of food borne diseases. Foodborne diseases one of major sources of morbidity and mortality globally. Food safety is a shared responsibility; individual consumers and food handlers play a huge role in preventing foodborne diseases.

Objectives: This study aimed to determine the level of food safety awareness and practices and to assess its association with socio-demographic factors; and to comparethe food safety awareness and practices among working and non-working women of Islamabad.

Methodology: A cross-sectional study was carried out on 233 females visiting the grocery stores in sector's commercial markets (Markaz) who were randomly selected for the purpose of the study. Data was entered and analyzed using SPSS version 26.0. One-way ANOVA was carried out to investigate whether significant differences in overall level of food safety awareness and practices existed between participants with different demographic characteristics. T-test was run to investigate whether statically significant differences in awareness and practices existed, to compare between working and non-working women. A p-value of less than 0.05 was considered to indicate statistically significant results.

Results: Among the 233 respondents, 64.8% of the respondents were between the ages of 26 to 41 years, 119 were married, education level of majority (89.7%) was tertiary (university). Working and non-working women were, 135 and 64, respectively. One

hundred and twenty-one of the respondents had no children (including the singles), 44.2% lived in a joint family system, and 54.9% had a monthly household income of more than Rs. 60000. The computed score for food safety awareness and practices was 10.9±3.2, on a scale from 0-22 and 7.3±2.4,on a scale from 0-13, respectively. Statistically significant relationships were observed between the participants‘ age, education, employment status, occupational level, type of family system and monthly household income and their overall food safety awareness ($p<0.002$). Statistically significant associations were observed between the participants‘ age ($p<0.020$), number of children ($p<0.010$), type of family system ($p<0.0001$) and monthly household income ($p<0.001$) and their overall food safety practices ($p< 0.005$). The mean score of overall awareness for working women was 11.7±3.4 which was more than the non-working, 9.7±2.4.

Conclusion: In present study, the overall level of food safety awareness and practices was better in higher educated women, age group 26-41 years, who worked as middle to upper level employees and lived alone. The study concluded that the inadequate overall level of food safety awareness and practices was more prevalent among less educated, non-working women of younger and >41, years age group. There is a need for a more robust reinforcement on household food safety educational programs to prevent foodborne diseases in aimed groups.

Keywords: Food Safety, Food Safety Awareness, Food Safety Practice, Foodborne Diseases, Women, Food Hygiene

ACKNOWLEDGEMENTS

In the name of Allah, the most Merciful and Beneficent

First of all, I am thankful to Allah Almighty, the most merciful and beneficent, for making the journeyofmylifetillthispoint,includingthecompletionofmythesis,whichisablessingindeed.

My utmost gratitude to my extremely humble thesis supervisor, **Ms. Hina Sharif,** without her expertise and guidance this would not have been possible. In spite of her busiest and tiring routine, she had always provided me with her adroit guidance and worthy suggestions throughout thistime.

Iwouldliketothankall ofmyteacherswhofurtheredmyearlyandprofessionaldevelopmentduring my education life, for their guidance throughout thisjourney.

Mydeepestgratitudetothewomen at grocery storeswhohadsparedtheirprecioustimeandprovidedmerequired information for the completion of mystudy.

I owe my supreme gratitude towards my beloved parents, who have been a constant source of inspiration and gave us strength when we thought of giving up, who continually provided their moral, spiritual, emotional and financial support. Whatever I am and wherever Iam today,isjustbecauseoftheself-sacrificinglove and humblenessofmyparents towards me.Theirprayershavemademestrongenough to face every problem and difficulty of the life.

I would also like to extend my gratitude to my dearest friends, whom I owe a big time for their unconditional support throughout my research work. I humble thanks to all the persons who have supported me in this regard.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure Page

LIST OF ABBEREVIATION

DALYs	Disability-adjusted Life Years
FBD	Foodborne Diseases
FS	Food safety
IRB	Institutional Review Board
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization
YOPI	Young Old Pregnant Immunocompromised

CHAPTER I: INTRODUCTION

Food safety has become a universal challenge due to intrusion and escalation of food borne diseases. Food borne diseases arise from the consumption of contaminated food with toxins, pathogens and chemicals; and remains a great threat to global public health. More than 200 known diseases can be transmitted through food (Mead et al., 1999).

Food borne diseases are defined as diseases, either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food (Przyrembel, 2008). Food borne diseases are a major source of morbidity and mortality around the world, although their full impact is unknown and the cost of unhygienic food, particularly the cost of chemical pollutants in food, as well as parasite contaminants still remains a mystery. Detailed information on economic costs of foodborne infections in the developing world is mostly absent (World Health Organization, 2017).

One out of ten people, each year, get ill by eating unsafe food. While food safety is a shared responsibility; individual consumers and food handlers play a huge role in preventing foodborne diseases (Chellaiyan et al., 2018). World health organization stated that an estimated 600 million fall ill due to contaminated food and 420 000 die annually, resulting in the loss of 33 million healthy life years (DALYs). There is an annual loss of US$110 billion in productivity and medical expenses due to unsafe food in low- and middle-income countries. Children < 5 years of age carry almost 40% of the food borne diseases burden, with 125 000 deaths per year.Diarrheal diseases are the most common illnesses causing 550 million people to fall ill and 230 000 deaths per year (Przyrembel, 2008). FBD creates a vicious cycle of diarrhea and malnutrition; strains all health care

systems; and hits the national economy and development, and the international trade too (World Health Organization, 2009). Pakistan stand amongst the countries with highest incidence rates of typhoid infection, according to WHO, 412 per 100000 person-years (Raza et al., 2014).

The term ‗food hygiene' refers particularly to the practices that prevent microbial contamination of food at all points along the chain from farm to table. Food safety is a closely related but broader concept that means food is free from all possible contaminants and hazards. In practice both terms may be used interchangeably (Kamboj et al., 2020).

Food safety awareness (knowledge) and practice remains a major problem among both developed and the developing countries. However, developing countries are mostly affected by these due to their low living standards, poor personal hygiene and lack of access to adequate medical treatment, many cases go unreported (Mkhungo et al., 2018). From 1990 to 2018, reported FBD were caused by consumption of unhygienic foods. Including 12 bacterial infections were responsible for 46 food hazards, 5 viral infections responsible for 6 epidemics, and 3 protozoans responsible for 7 foodborne infections causing number of cases, deaths, and asymptomatic carriers in last 28 years (Munir et al., 2019).

In Asian culture, it is usually a female who is responsible to take care of the kitchen at home. Many previous studies showed that females have low food safety awareness in such developing countries (Kosi et al., 2018). A research shows unsafe domestic food safety practices which often cause contamination that are increasingly linked with food borne illnesses, since they lack hygienic food handling practices (Ahmed, 2015). Food

contamination can occur if foods are stored at the wrong temperatures or inadequately packaged. Public awareness and concern about food related risks and diseases is increasing, but there is still boom in the number of food borne illnesses which indicates that domestic food handlers still lack food safety knowledge leading to poor food handling practices (Farahat et al., 2015a). Previous studies also show that around 50 to 87% of the reported outbreaks of food borne illnesses develop from homes (Redmond, 2003). Although everyone is susceptible to food borne illness, but certain highest risk individuals are more, and thus are likely to suffer more from food borne illnesses, hospitalizations and death. These vulnerable group include young, old, pregnant, and immunosuppressed (popularly known as the YOPI). Since children have immature immune system and lower body weight, they are at higher risk than adults, to suffer from food borne illnesses and these are described as one of the main factor for morbidity and mortality in developing countries (W. O. Ayaz et al., 2018).

Mothers play a great role in food safety, as they are the last line of defense against food borne diseases (Scott, 1996). These mothers are also primarily the food handlers at home; to protect children health and wellbeing, assessing mothers‘ beliefs and behavior and collecting information on how food becomes unsafe domestically, is an essential part in Public health, in order to reduce food hazards. Furthermost preparation, handling, and storage of food at home cannot be regulated, therefore to maintain food safety at the defenseless end of the food chain, it is necessary to educate household food handlers about the possible risks of food borne illnesses and guide safe food handling practices domestically (W. O. Ayaz et al., 2018). A study carried out in South Africa concluded, despite that the consumers are concerned about the hygiene of the foods they eat, there is

a huge lack of basic food safety knowledge and proper handling practices among them (Mkhungo et al., 2018). Another survey pointed out that 255 incidences occurred in 2011 alone resulting in 2066 people falling ill, majority of whom were children; still only limited research focused on obtaining information on food safety knowledge and practices associated with improper domestic food handling in Saudi Arabia. Accordingly, no adequate efforts have been undertaken, to lessen the risks by development of effective health education programs. (W. O. Ayaz et al., 2018).

Pakistan lacks food safety monitoring and surveillance (Akhtar, 2015).Consumers should report every case of food borne illness symptom to the nearest hospital for proper treatment and record. Ongoing surveillance of incidence of food borne microbes in food should be carried out, food safety education program for food handlers is also encouraged and a national database for reporting food borne disease outbreak should be positioned in place in each country (Mkhungo et al., 2018).

1.1. Rationale

WHO identified ~~5~~ keys to safer food‘ (which are keep clean, separate raw and cooked food, cook thoroughly, keep food at safe temperatures and use safe water) measures that should be followed by everyone responsible for food handling, to prevent foodborne diseases (World Health Organization, 2009).

Around 50 to 87% of the reported outbreaks of food borne diseases developed from domestic food handling (Redmond, 2003).Another research showed that unsafe domestic food safety practices often caused contamination that was increasingly linked with food borne diseases, since they lacked hygienic food handling practices (Ahmed, 2015).

Keeping in view, this study is designed to determine the gaps in food safety awareness and practice levels among women in Islamabad, so that effective health education programs can be developed with the help of sufficient information on the knowledge and practices of the aimed group.

1.2. Objectives

- To determine the level of food safety awareness and practices among women residing in Islamabad.
- To assess the association of demographic factors with the food safety awareness and practice levels, among women residing in Islamabad.
- Tocomparethe food safety awareness and practices among working and non-working womenof Islamabad.

CHAPTER II: LITERATURE REVIEW

2.1. Global

Four hundred and twenty-three Ethiopian mothers from a town, who took part in food handling operation, were studied. Out of 423, 321 had good level of food safety knowledge/awareness while213 (50.4%) had a poor level of food safety practice. As compared with the mothers who were uneducated, the likelihood of a good level of self-reported food safety practice among mothers who had secondary educational status was 3.09 times higher and among mothers who had college and university level educational status 2.95 times higher (Dagne et al., 2019).

A population-based telephone survey was conducted in all Canadian provinces and territories among 2,474 participants of which 1516 (61%) were females. About 96% of females had correct practices for cleaning food preparation surfaces. While only 68% had correct practices to prevent cross-contamination. Only 32% reported using thermometer to know if their meat was cooked enough to consume safely. The recommended food safety practices for the clean, chill, and separate themes, with correct responses fell in between 81 to 93% range. However, there are chances that 1 in 10 Canadians may use unsafe practices putting them at risk for FBD (Murray et al., 2017).

In a province of South Africa, fifty participants were selected based on gender, age, educational level and interviewed at their homes. Most of the respondents were females (96%) with a few males (4%). The age of many of the respondents ranged between 30-59 years (46%), with educational levels from less than high school (28%) to high school (42%) followed by tertiary level (30%).There was a significant relationship between age

and educational level and the temperature range at which the meat was kept in the freezer ($p < 0.05$). Chi-square test revealed no significant relationship between age, educational level and monthly income with how the meat was kept in the freezer and the duration it was kept in the freezer for ($p > 0.05$). About 72% respondents had no idea of the temperature of their freezers. Most of the younger age range of respondents had better knowledge as to what temperature their meat should be stored in a freezer ($p < 0.05$). 72% used the same chopping board to cut both meat and vegetables. While purchasing 84% used the same grocery bags to convey meat and other fresh produce such as vegetables, fruits and other food items and only 16% of respondent used separate bags. By examining the overall data, it was concluded that there is a huge lack of basic food safety knowledge and proper handling practices (Mkhungo et al., 2018).

In Poland, women showed a slightly, though significant, higher level of knowledge than men (1.97 and 2.13, respectively). In Thailand, however, this difference was not significant (2.32 and 2.38,respectively). The ANOVA test showed that in both countries, women were more aware of the importance of adequate food hygiene practice during food preparation (Persons who come in contact with food, but not respect hygienic practices, may be the source of microbiological contamination of food) than men. Women in Poland gave correct responses regarding pathogens in food, raw eggs and meat consumption risks, food defrosting in room temperature risk and refrigerator storage of food. There were differences in the level of consumers‘ hygiene awareness between age groups in Poland and Thailand too (mean range: 1.88-2.05 and 2.15-2.51, respectively). In Thailand, younger consumers (below 25 years old) responded correctly, while in Poland a correct response was more from older (over 60) consumers.In the case of

practices, it was found that in Thailand, the difference in mean scores between age groups was lower (range: 2.28-2.58) than in Poland (range: 1.91-2.51). Depending on the country, different age groups were characterized by different responses. In Thailand, younger consumers (below 25 years old) were less likely to respond correctly, while in Poland correct responses were more frequent in the older group (over 60 years old), which was opposite than the correlation observed in the section of consumers‘ hygiene knowledge. In Poland and Thailand, consumers that had attended a higher education institution responded more correctly than those that had not (Tomaszewska et al., 2018).

A cross-sectional survey was carried out on 623 respondents, to assess the level of knowledge and self-reported practices on food safety among a group of adult consumers in a Malaysian state, 341 were female respondents. Independent sample t-test was used to compare food safety knowledge scores based on gender and employment status; females (92.1%) received a higher score, meanwhile, there was no significant difference (only a 0.9% score difference) between those employed (84.4%) and unemployed (85.3%). Female respondents reported a good level of food safety practices 40.5%. The ANOVA analysis showed significant differences in food safety knowledge based on age, 88.8% of consumers aged 30–39 received a good score, as compared to 79.3% of those aged above 50 years. While it was evaluated that educational level and the number of children in family showed great significant differences in both FS knowledge and practices. 99.0% of tertiary graduates achieved a good level of food safety knowledge than primary (mean difference=4.16, p=0.00). A total of 46.9% tertiary graduates scored „good‘ for their food safety practices, compared with 11.7% of primary graduates (mean difference = 7.85, $p < 0.05$). Around 92.3% of consumers with more than three children who gained a good

knowledge score, as compared to consumers with one child (mean difference=1.07, $p<0.02$). Of the respondents who had 3 or more children, 33.7% achieved a good practice level, compared with 14.4% of the respondents who had no children (mean difference = 3.34, $p< 0.002$). Overall the FS knowledge was considered good except that it was found the consumers to be less knowledgeable about temperature control. Only 38.8% of them knew that bacteria can multiply at a temperature of 37°C, over half of the consumers did not know about the recommended temperature of the refrigerator (57.9%) and the temperature for storing hot foods (58.1%). It was seen that overall self-reported FS practices were unsatisfactory; only 6/623 knew proper way of storing raw meat, use of thermometers in cooking 0% and temperature control in refrigerators 0% (Ruby, Abidin, et al., 2019; Ruby, Ungku Zainal Abidin, et al., 2019).

An intervention study was carried out among forty-two (42) Egyptian teachers (with mean age 34.2 ± 9.7 and 55% of them married), it showed that the knowledge about safe food handling, purchasing, storage, preparation, cooking and personal hygiene, had highly significant improvement ($p<0.01$) after intervention especially in the item of purchasing and storage in comparison to the item of personal hygiene which had the highest knowledge score before intervention but the level of practices were not changed even after the intervention ($p>0.05$). The unchanged level of practices can be recognized as that changing behavior needed longer time and more practice of the right knowledge (Awad Allah, 2017).

Another study was done on Saudi women in 2021, results showed that about 4.5%, 57.5% and 38% of the enrolled women had low, intermediate and good overall knowledge scores, respectively, however there was level of knowledge on food preparation 48% and

cooking 36%. Results showed that 41%, 52% and 7% of the surveyedwomen had, respectively, good, intermediate and low levels of overall safety practices. However, regarding food preparation and cooking, only 15% of the enrolled women revealed good safety practices. Overall the good level of practice was more as compared to the good level of food safety knowledge in purchasing and storage and in preparation and cooking (Arfaoui et al., 2021).

The total food safety and foodborne diseases mean score knowledge and practices in a study conducted on 656 females in Sharjah (United Arab Emirates) was good, though there was low level FS of awareness and practices in cooking and consuming food (28%) and only 20% knew about FBD risk factors.Employed women had significantly ($p < 0.0001$) higher score level of food safety knowledge and practices (22.4/38, 58.9%) than those unemployed (20/38; 52.6%) (Saeed et al., 2021).

2.2. Regional

One hundred and ninety-four Bangladeshi household female food handlers, including housewives, responded during the pre-test and post-test surveys. Their mean age was 38.8±12.4 years and 25% of food handlers had no education. Around17% of food handlers only, used a separate knife for cutting raw meat and for vegetables before the intervention, the percentage doubled (35%) after the intervention, and this change was statistically significant ($p <0.001$). However, hand washing after use of toilet was unchanged even after the intervention (75% vs.76%). The mean knowledge and practice scores among studied food handlers on food safety were found to increase significantly after the intervention by 1.9 and 1.6, respectively. The number of respondents with adequate knowledge showed a significant increase of 15% after the intervention and

respondents proving good practices also increased significantly by 17% (Riaz et al., 2016).

Of 640 Chinese adult respondents, 59.3% were females. Overall 28.6% indicated a poor level of knowledge. In particular, only 12.4% of respondents knew that freezing could not kill any bacteria in the food. In addition, a very low percentage of the respondents (17.4%) knew that prepared food must be put in the refrigerator and then reheated if it is not consumed within 3 hours after cooking.38.2% of the respondents knew it is the least safe method to thaw meat slowly on chopping board, 12.4% of the respondents indicated that one should use different cutting boards for raw meat and fruits. Only 27.2% knew how to wash hands correctly on the other hand, 58% did have correct knowledge on how to wash hands after handling raw meat. Knowledge on handling food to avoid cross-contamination was not good indicating that at Chinese homes, there is a high chance that food is contaminated by food handlers with food-borne illnesses. Twenty-two percent kept food refrigerated until it was time to serve them, to prevent food poisoning.Gender ($p< 0.01$) and per capita annual income ($p <0.04$) are the two most important and significant factors in determining the level of knowledge of food safety and handling, Females living in rural areas with per capita annual income of less than 4773 USD, hence were labeled as high-risk groups and deserved further attention (Gong et al., 2016).

Iran presented a study which aimed to measure the interventional role of education in changing the knowledge and outlooks of urbane mothers towards food hygiene in 2017. The subjects‘ awareness and attitudes towards food hygiene were assessed in a pre-test, and then after delivering some educational sessions, the two variables were evaluated again in a post-test using a researcher-made questionnaire. The results of study showed

that education did not promote the knowledge of married subjects, those whose use of media was average or high. However, the results showed that education had major effects on other factors. In addition, it was seen that the effects of education on promoting the attitudes of individuals aged above 60, those having academic education and the married subjects were not significant, it can be established that education plays a major role in changing the knowledge and attitudes of urban mothers towards food hygiene (Safari et al., 2018).

2.3. Local

In Lahore, a study was conducted on 1000 household female respondents from 10 towns at their residences, only 8.9% of household women had the appropriate food safety knowledge and overall practice was only 0.3% hygienic. The result of Chi-square test of association, between education and knowledge and practices of household women, were significant (p value was less than α, that is, $p< 0.05$). There was association between these variables. Negative knowledge and practices were observed in all education levels, but greater and advanced food safety knowledge and practices existed among educated household women (Naeem et al., 2018).

A cross-sectional study conducted in Karachi showed that out of 240 mothers, 198 (82.5%) mothers had adequate knowledge, while 182 (75.8%) had correct practices.Same study also showed housewives (84.3%) were more knowledgeable and had better food safety practices than working mothers (19%). Hence this reveals that there is a gap between adequate knowledge and correct practices among mothers, denoting that having adequate knowledge does not always turn into correct practices. Frequency of correct

practices were more among mothers with high education 72% ($p<0.004$) (Harani et al., 2018).

A cross-sectional study was conducted on food safety knowledge and handling practices among the students of University of Agriculture Peshawar. Based on the maternal status of participants 80.38% belonged to family having housewives and 19.61% belonged to a working women family. Participants having nonworking mothers scored considerably better, which was 58%, than those of working women which was 50% (Zeeshan et al., 2017).

A cross-sectional study was designed to access awareness among the population of Quetta city comprising 300 participants including both men and women. The respondents belonged to different professions such as street vendors, lecturers, students, and housewives. Out of 150 female respondents 26% of Quetta women, were unaware of food handling procedures, 45% were more aware of food safety to pursue proper food handling in routine than males.Preliminary food safety knowledge among uneducated man and women especially housewives are necessary. (Munir & Hafsa Ali, 2019).

The cross-sectional study carried out at The University of Lahore, 384 participants (of which 60% were females) including students, teaching and non-teaching staff members as well as lower staff were included. Females had 97% awareness about cooking techniques on food quality whereas 41% had correct knowledge about cooking protocols and 62% knew about storing food properly (Admin, 2020).

2.4. Operational definitions

2.4.1. Foodborne diseases

A general term used to describe any disease or illness caused by eating contaminated food or drink. Traditionally referred to as ―food poisoning" (World Health Organization, 2009).

2.4.2. Food Safety

WHO (1984) defined food safety as ―All measures to ensure that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use' (World Health Organization, 2009).

2.4.3. Food hygiene

―All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food-chain'(World Health Organization, 2009).

2.4.4. Working woman

A woman who is gainfully employed; often, specif., such a woman as distinct from a housewife (*Workingwoman Definition and Meaning | Collins English Dictionary*, n.d.).

2.4.5. Non-working

Not engaged in paid employment (*Nonworking Definition and Meaning | Collins English Dictionary*, n.d.).

2.4.6. Food safety awareness level

The women were scored according to their overall awareness on food safety. One point was awarded for every correct answer for the 22 variables. The wrong answers were

marked as zero. The minimum score obtained from respondents, was 4 and highest score 22. The score was 10.9±3.2, on a scale from 0-22.

2.4.7. Food safety practices level

The women were scored according to their overall practices on food safety. One point was awarded for every correct answer for the 13 variables. The wrong answers were marked as zero. The minimum score obtained from respondents, was 0 and highest score 12. The score was 7.3±2.4, on a scale from 0-13.

CHAPTER III: METHODOLOGY

3.1. Study design

The design of the study was cross-sectional and it was quantitative in nature.

3.2. Study duration

The study period for this current research was six months from December, 2021 to May, 2022.

3.3. Study setting

The study was conducted in grocery stores of commercial markets (Markaz) in sectors of Islamabad.

3.4. Study population

Working and non-working women (aged 18 and above), visiting grocerystores in sector commercial markets, were selected as study population on basis of inclusion and exclusion criteria.

3.4.1. Inclusion criteria

- Women with age of 18 years and more, who took part in food handling operations directly and not trained professionally.

3.4.2. Exclusion criteria

- Those who were related to food safety institutions or were professional food handlers.
- Those who did not agree to participate were excluded from

this study.

3.5. Sample size determination

Sample size was calculated using proportion formula for sample size calculation in OpenEpi menu, Version 3.01 software. Previous prevalence of level of food safety awareness was taken as 82.5% as reported by a study conducted in Karachi, Pakistan in 2018 (Harani et al., 2018). Calculated sample size was 222 with 95% confidence interval (C.I) and 5% margin of error. After adding 5% non-response rate, final sample size came out to be 233 women.

3.6. Sampling technique

Sampling technique was non-probability consecutive sampling in which every subject who fulfilled the inclusion criteria was selected until the required sample was achieved. Sampling unit was grocery stores of 10 sector commercial markets which were chosen by lottery method. Observational unit was female population aged 18 years and above, visiting grocery stores in sector commercial markets of Islamabad, Pakistan.

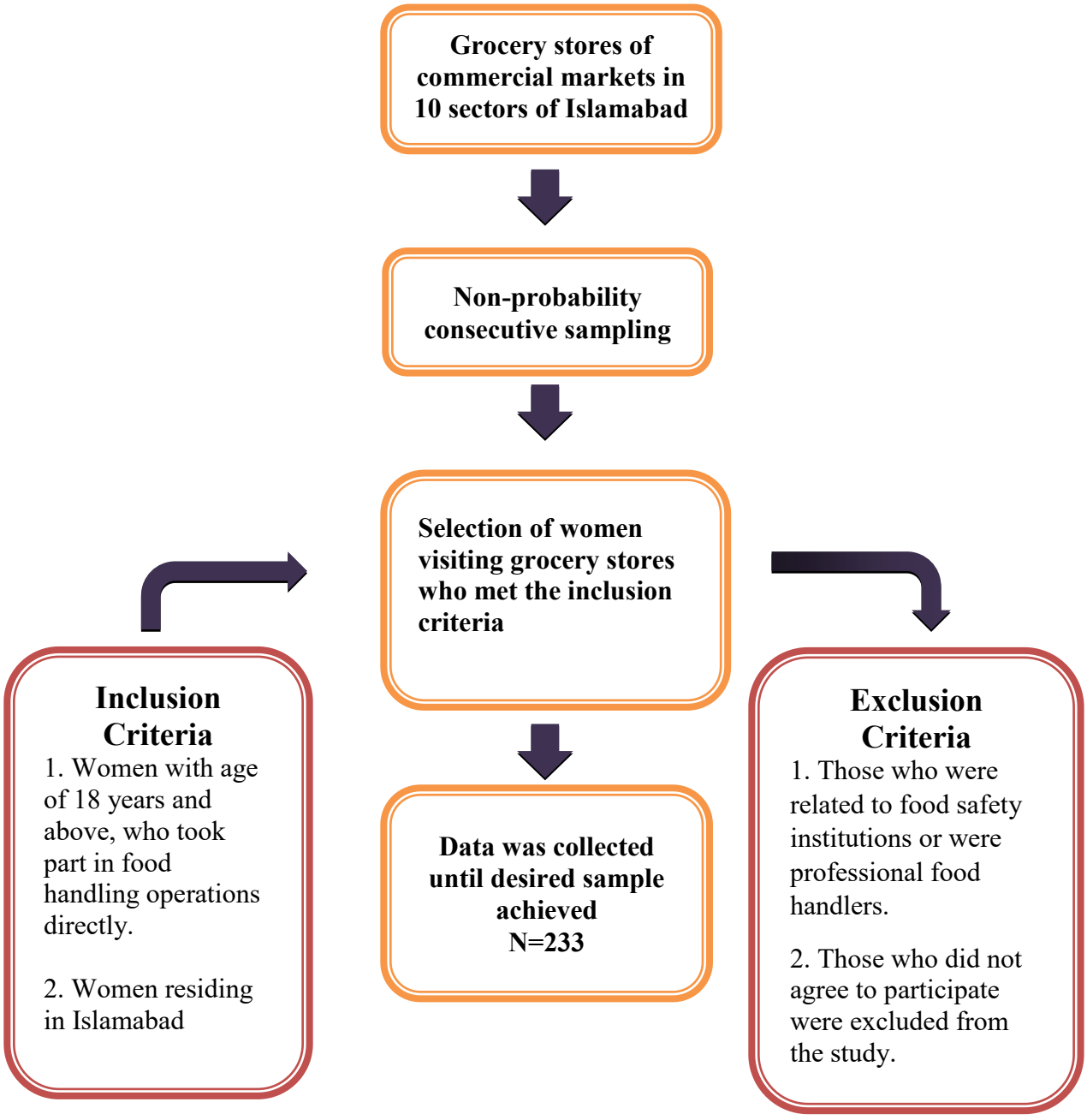

Figure 1: Non-Probability Consecutive Sampling Strategy

3.7. Data collection instrument

Data was collected using a printed questionnaire, which is attached in the Annexure-1.

3.7.1. Questionnaire design

A closed-ended questionnaire was adapted based on suitable and relevant questions from previous validated questionnaires applied in similar studies(Alqurashi et al., 2019; W. O. Ayaz et al., 2018; Harani et al., 2018; World Health Organization, 2009). It was an interviewer–administered questionnaire and due to expected language barrier, the questionnaire was translated (when needed) in Urdu to avoid misinterpretation.

3.7.2. Contents of questionnaire

The questionnaire consisted of 44 questions, comprising of three major sections.

The first section (9 questions) consisted of demographic information for each participant, such as their age, marital status, education, education of spouse, employment status, occupational level, number of children, type of family system and monthly income (household). The results were presented as frequencies and percentages. The variable occupational level had seven categories so were merged and categorized into 4 categories which are: middle to upper employment level included teachers, healthcare professionals; home businesses were included in self-employed and maids or helpers were included in laborer.

The second section of the questionnaire aimed to gather information about the participant‘s awareness of food safety in domestic kitchens. It included 22 (choose one correct answer type questions) covering four themes related to food safety, (i) food

purchasing, (ii) food handling (iii) food preparation and (iv) food storage. Food safety awareness related questions were close-ended questions. Each correct response got a score of ―1" while every wrong answer was scored as ―0". The overall food safety awareness was evaluated by summing the scores of their four themes: food purchasing, food handling, food preparation and food storage (overall score =22). Results were presented as frequencies and percentages.

In the third section of the questionnaire, self-reported information about food safety practices in domestic kitchens was collected through 13 questions; 10 taken from WHO's ―Five keys to safer food manual' covering practices relating to (i) keep clean, (ii) separate raw and cooked, (iii) cook thoroughly, (iv) keep food at safe temperatures and (v) use safe water and raw materials (World Health Organization, 2009). Food safety practices questions to evaluate their food safety practices with 5-point Likert scale (always, most times, sometimes, not often and never). Three questions were included from another validated questionnaire regarding food consumption and cross-contamination to prevent FBD (W. Ayaz et al., 2018). Each correct response got a score of ―1" while every wrong answer was scored as ―0". The overall food safety practices were evaluated by summing the scores (overall score=13). Results were presented as frequencies and percentages.

3.8. Study variables

3.8.1. Independent variables

The independent variables were ―socio-demographic variables'.

3.8.2. Dependent variables

The outcome variables of the study were ‗awareness and practices on household food safety‘.

3.9. Data collection procedure

3.9.1. Pilot testing

The validated questionnaire was pretested on 10% of the actual sample size, (23 participants) at the study site to assess acceptability, feasibility and validity before the formal data collection. On the basis of responses of pilot testing minor amendments were made to text and questions. After that the questionnaire was finally modified and ready for formal data collection. Reliability of the data waschecked after entering the data into SPSS. The value of the Cronbach‘s alpha was 0.67 for overall awareness and 0.60 for overall practices. Data from pilot testing was not included in the final analysis.

3.9.2. Formal data collection

A brief introduction of the researcher was given to the participants for the sake of rapport building. The purpose of the study and basic required information was given to the participants after the verbal consent from each participant. Questionnaire was filled by the means of interview. Data was collected from only those participants who agreed to participate.

3.10. Data management

Data was entered and recorded into statistical package for social sciences (SPSS) version

26.0. Code book was generated for all the variables in the questionnaire. Data was rechecked for any error, discrepancies or completeness by spot checking method. Data was stored in a separate storage device to avoid any loss in future.

3.11. Data analysis procedure

Data was analyzed in SPSS version 26.0. Reliability and quality of data was cross checked by using range and frequency tables to find out the missing values. After that the data was arranged according to requirement for analysis. The continuous variables were coded and were assigned to each category. All the outcome variables were computed into scores and then summarized into different categories for further analysis.

3.11.1. Descriptive statistics

Descriptive statistics were generated for socio-demographic characteristics and outcome variables. Data was summarized in the form of frequencies and percentages and presented in table form for both the socio-demographic and outcome variables, in addition the data of outcome variables of the study was also presented as histograms as can be seen in Figure. 1 and Figure. 2 in Annexure 2.

3.11.2. Inferential statistics

ANOVA one-way was carried out to investigate whether significant differences in awareness and practices existed between participants with different demographic characteristics. A p-value of less than 0.05 was considered to indicate statistically significant results. Presented in form of tables for both outcome variables separately.

Independent sample t-test was run to investigate whether statically significant differences in awareness and practices existed, to compare between working and non-working women. A p-value less than 0.005 was considered significant for the results obtained.

3.12. Ethical considerations

Before starting formal data collection, approval from Institutional Review Board (IRB) of Al-Shifa School of Public Health Rawalpindi, Pakistan has been taken (Annexure-4). Permission letter from the Head of Department of Al-Shifa School of Public Health was obtained regarding access to the participants at various grocery stores. Verbal permission was taken from the managers of the grocery stores for conducting research. Participants were explained the purpose of the research and verbal consent was taken from each participant (Annexure-3). Participants were assured for the confidentiality of their data. Data collected from the respondents was kept anonymous and was not shared with anyone. Data was entered in SPSS anonymously. After data entry, hard copies of collected were kept at a safe place.

CHAPTER IV: RESULTS

4.1. Demographic characteristics

The demographic characteristics of the sample are presented in Table 1. Most (64.8%) of the respondents were between the ages 26 to 41 years. One hundred and nineteen were married, education level of majority (89.7%) was tertiary (university). In terms of working and non-working women, 135 and 64 participants were working and non-working women, respectively. One hundred and twenty-one of the respondents had no children (including the singles), 44.2% lived in a joint family system, and 54.9% had a monthly household income of more than Rs 60000.

Table 1: Demographic characteristics of study participants (n=233)

Demographic Characteristics	Category	Respondents (n)	Percentage (%)
Age (years)	18-25	38	16.3
	26 – 41	151	64.8
	>41	44	18.9
Marital status	Single	95	40.8
	Married	119	51.1
	Divorced	19	8.2
Education	Matric	16	6.9
	Intermediate	8	3.4
	University	209	89.7
Education of spouse	Not applicable	109	46.8
	Matric	6	2.6
	Intermediate	3	1.3
	University	110	47.2
Employment status	Working	135	57.9
	Non-working	64	27.5
	Not working currently	34	14.6
Occupational level	Not applicable	74	31.8
	Middle to upper level employee	126	54.1
	Self-employed	27	11.6
	Laborer	6	2.6
Number of children	0	121	51.9
	1-3	97	41.6

	4 or more	15	6.4
Type of family system	Nuclear	79	33.9
	Joint	103	44.2
	Living alone	51	21.9
Monthly household income (Rs)	Less than 15000	32	13.7
	15000-30000	37	15.9
	31000-60000	36	15.5
	More than 60000	128	54.9

4.2. Descriptive for outcome variables

4.2.1. Food Safety Awareness

Awareness about food purchasing

The respondents were asked two questions about food purchasing presented in Table 2.

Majority of the participants (67% and 75.5%) gave the correct answer.

Table 2: Participants' awareness on food purchasing (n=233)

Questions	Category	Respondents (n)	Percentage (%)
When is the best time to purchase frozen food when shopping?	At the beginning of the shopping time	9	3.9
	At the end of the shopping time	156	67.0
	Whenever, passing the frozen food section	49	21.0
	Anytime during shopping	13	5.6
	Don't know	6	2.6
Of followings, what is important when purchasing food?	Checking expiry dates of food	44	18.9
	Checking ingredients of food packages	3	1.3
	Ensuring cleanliness of sites of purchasing food	10	4.3
	Checking for nutritional values and damaged packages	0	0
	All of above	176	75.5

–Correct answers have been highlighted in bold'.

Awareness about food handling

Table 3 presents the summary of participants‘ knowledge on food handling. Six questions were asked on the subject. The food contamination questions were answered correctly by only 9% of the participants. Washing of vegetables and fruits was correctly answered by half of the respondents. Majority (80.3%) gave correct answer for bacterial transfer. Less than half 36.9% and 38.6%, participants gave correct answers on heating leftovers and use of cutting board respectively. One hundred and fifty (64.4%) participants answered correctly about raw and cook food separation.

Table 3: Participants' awareness on food handling (n=233)

Questions	Category	Respondents (n)	Percentage (%)
How food contaminated with food poisoning bacteria can be recognized?	Tasting it	16	6.9
	Smelling it	101	43.3
	Looking at it (Change in color or texture)	88	37.8
	Reheating it	7	3.0
	None of Above	21	9.0
How should vegetables and fruit be washed?	Soak in detergent	0	0
	Wash with soap and water	6	2.6
	Wash with hot water	38	16.3
	Wash with running cold water	117	50.2
	Soak in cold water, then wash	72	30.9
How bacteria can be transferred to the food	People	9	3.9
	Insects	12	5.2
	Rodents	1	0.4
	Raw meat & vegetables	24	10.3
	All of the above	187	80.3
Of the following, which is the correct way to heat leftovers?	Heat it to the temperature you prefer	86	36.9
	Reheat is not necessary if it‘s during the summer	2	0.9
	Heat until they are boiling	86	36.9
	Heating is not important if it is at room temperature	27	11.6
	Do not know	32	13.7
Why must raw and cooked food be separated during food preparation and refrigeration?	Kitchen will be more organized	16	6.9
	The flavor may be affected	23	9.9
	To avoid cross-contamination (the transfer of harmful	150	64.4

	microorganisms)		
	To organize the fridge compartments	35	15.0
	None of Above	9	3.9
The safe use of a cutting board and utensils for fresh produce and raw meat shall be in the case of:	Washing the cutting board and utensils with hot water	48	20.6
	Using fresh produce before raw meat	8	3.4
	Using a separate cutting board and utensils for fresh produce and another cutting board and utensils for raw meat	90	38.6
	Washing the cutting board and utensils with tap water	31	13.3
	Washing the cutting board and utensils with detergent and water	56	24

–Correct answers have been highlighted in bold‘.

Awareness about food preparation

Participants were asked eight questions relating to food preparation in order to assess their knowledge. Women, only 61.8%, knew the correct way to wash hands before food preparation. Around 86% women knew the correct way to wash hands after handling raw meat. The questions relating to proper cooking of food, consumption of freshly prepared food, and correct way to clean kitchen counter received less than 50% correct answers (Table 4).

Table 4: Participants' awareness on food preparation (n=233)

Questions	Category	Respondents (n)	Percentage (%)
Of the following, which is the correct way to wash hands?	Wash with running cold water, wipe dry	13	5.6
	Just wash with running cold water.	9	3.9
	Wash with running warm water, wipe dry	10	4.3

	Wash hands with cold water in a basin, use soap and then wash hands with cold water in the basin, wipe dry	57	24.5
	Wash hands with running warm water, use soap and then wash with running warm water, wipe dry	144	61.8
Of the following, which is the correct way to wash hands after handling raw meat?	Wipe with towel	5	2.1
	Wash with cold water, wipe dry	9	3.9
	Wash with warm water, wipe dry	18	7.7
	Wash with soap and warm water, wipe dry	201	86.3
	No need to wash	0	0
After touching, which of the following should you wash your hands during the course of preparing food?	Face	22	9.4
	A pimple on the surface of skin	36	15.5
	Clothes	8	3.4
	Hair	5	2.1
	All of the above	162	69.5
People with which of the following symptoms should not cook for others?	**Diarrhea, Fever, Sore throat or Flu**	144	61.8
	Can cook even if they are sick.	10	4.3
	Skin allergies	41	17.6
	AIDS	38	16.3
	Headache	0	0
Proper cooking of food includes	Meat and poultry cooked to 40 °C	29	12.4
	For meat and poultry, cook until juices are clear and not pink	108	46.4
	Both well cooked and rare meats can be consumed	33	14.2
	Under cooked eggs and seafood are safe to consume	5	2.1
	None of the above	58	24.9
What should be done with freshly prepared food that will be consumed 3 h later?	**Put in the fridge, then reheat when ready to eat**	97	41.6
	Put in the cupboard and reheat when ready to eat	7	3.0
	Put in the microwave oven	10	4.3
	Cover it and put it on the cabinet	15	6.4
	Leave it on the kitchen counter covered.	104	44.6
Safe/ boiled water should be used	Only for drinking	38	16.3
	Only for cooking purposes	1	0.4

	For both drinking and cooking purposes	186	79.8
	Tap water can be used for drinking purpose	1	0.4
	Tap water can be used for cooking	7	3.0
Which of the following is the correct way to clean the kitchen countertop and stove?	Clean with dry cloth/rag	7	3.0
	Clean with wet cloth/rag	39	16.7
	Clean with detergent and warm water	98	42.1
	Clean with glass cleaner	6	2.6
	All of the above	83	35.6

–Correct answers have been highlighted in bold‘.

Awareness about food storage

A total of six questions were asked on food storage, in this section the question relating to recommended temperature for a refrigerator received highest number of correct responses (61.8%). The questions on recommended freezer temperature, raw meat storage, thawed meat, storage of fruits and vegetables, and bacteria were answered wrong by approximately 70% of the participants.

Table 5: Participants' awareness on food storage (n=233)

Questions	category	Respondents (n)	Percentage (%)
What is the recommended temperature for a refrigerator (°C)?	0	21	9.0
	1	12	5.2
	4	144	61.8
	12	38	16.3
	16	18	7.7
What is the recommended temperature for a freezer (°C)?	**-18**	50	21.5
	- 4	134	57.5
	0	35	15.0
	4	9	3.9
	18	5	2.1
Where should raw meat be stored?	**The bottom shelf of fridge**	67	28.8
	The center of fridge	12	5.2

	The top shelf of the fridge	83	35.6
	In the fridges door	3	1.3
	None of above	68	29.2
Should thawed meat be frozen for later use?	Yes, totally	44	18.9
	Yes, partly	32	13.7
	No	77	33.0
	May be	38	16.3
	Do not know	42	18.0
Where should fruit and vegetables be stored?	The bottom shelf of fridge	161	69.1
	The center of fridge	41	17.6
	The top shelf of the fridge	18	7.7
	In the fridges door		
	None of above	13	5.6
Can bacteria in food be killed by freezing at −18 °C?	Yes, totally	37	15.9
	Yes, partly	36	15.5
	Not at all	54	23.2
	May be	48	20.6
	Do not know	58	24.9

–Correct answers have been highlighted'.

4.2.2. Food safety practices

The table below presents food safety practices among women. Out of 13 variables correct practices of more than 50% were observed in seven variables, whereas six variables received less than 50% favorable answers.

Table 6: Participants' practices of food safety (n=233)

	Always	**Most times**	**Sometimes**	**Not often**	**Never**
I wash my hands before and during food preparation.	**191 (82.0)**	37 (15.9)	5 (2.1)		
I clean surfaces and equipment used for food preparation before re-using on other food.	**181 (77.7)**	38 (16.3)	14 (6.0)		
I use separate utensils and cutting-boards when preparing raw and cooked food.	**113 (48.5)**	72 (30.9)	37 (15.9)	9 (3.9)	2 (.9)
I separate raw and cooked food during storage.	**197 (84.5)**	26 (11.2)	4 (1.7)	2 (.9)	2 (.9)
I check that meats are cooked thoroughly by ensuring that the juices are clear or by using a	**118 (50.6)**	49 (21.0)	36 (15.5)	18 (7.7)	12 (5.2)

thermometer.					
I reheat cooked food until it is piping hot throughout.	**108 (46.4)**	64 (27.5)	35 (15.0)	16 (6.9)	10 (4.3)
I thaw frozen food in the refrigerator or other cool place.	**84 (36.1)**	92 (39.5)	33 (14.2)	13 (5.6)	11 (4.7)
After I have cooked a meal I store any left-overs in a cool place within two hours.	**98 (42.1)**	83 (35.6)	35 (15.0)	7 (3.0)	10 (4.3)
I check and throw away food beyond its expiry date.	**180 (77.3)**	43 (18.5)	5 (2.1)	4 (1.7)	1 (.4)
I wash fruit and vegetables with safe water before eating them.	**199 (85.4)**	25 (10.7)	6 (2.6)	2 (.9)	1 (.4)
I always boil milk before consuming it	**199 (85.4)**	28 (12.0)	3 (1.3)	1 (.4)	2 (.9)
I cook even when I fall very sick	34 (14.6)	62 (26.6)	91 (39.1)	19 (8.2)	**27** (11.6)
I do consume food stored in fridge for more than 3 days	99 (42.5)	82 (35.2)	30 (12.9)	13 (5.6)	**9** (3.9)

–Correct answers have been highlighted‘.

4.3. Computed score for food safety awareness and food safety practices

4.3.1. Overall awareness on Food safety level

The women were scored according to their overall awareness on food safety. One point was awarded for every correct answer for the 22 variables. The wrong answers were marked as zero. The minimum score obtained was 4 and highest score 22. The score was 10.9±3.2, on a scale from 0-22 (Dagne et al., 2019).

4.3.2. Overall practices on Food safety level

The women were scored according to their overall practices on food safety. One point was awarded for every correct answer for the 13 variables. The wrong answers were marked as zero. The minimum score obtained was 0 and highest score 12. The score was 7.3±2.4,on a scale from 0-13 (Dagne et al., 2019).

4.4. Inferential results

ANOVA one-way was carried out to investigate whether significant differences in awareness and practices existed between participants with different demographic characteristics.A p-value of less than 0.05 was considered to indicate statistically significant results.

Statistically significant relationships were observed between the participants‘ age, education, employment status, occupational level, type of family system and monthly household income and their overall food safety awareness ($p < 0.002$), as Table. 7 shows. High mean scores were observed in age group 26-41 years 11.5±3.1, university education 11.1±3.1, working employment status 11.7±3.4, middle to upper occupational level 11.4±3.9, living alone 12.6±3.6 and monthly household income less than Rs 15000 11.5±2.6.

Table 7: Associations between the demographic characteristics of the participants and their food safety awareness (n=233)

Demographic Characteristics	Category	Respondents (n)	Mean score ± SD (x ± SD)	F(df)	p-value
Age	18-25	38	9.05±2.4		
	26 - 41	151	11.5±3.1	11.7(232)	**0.0001**
	>41	44	10.2±3.5		

Marital status	Single	95	11.0±3.2		
	Married	119	10.6±2.8	1.69(232)	0.203
	Divorced	19	11.95±4.8		
Education	Matric	16	8.5±2.9		
	Intermediate	8	9.1±2.9	6.53(232)	**0.002**
	University	209	11.1±3.1		
Education of spouse	Not applicable	109	3.6±0.34		
	Matric	6	1.9±0.8		
	Intermediate	3	1.0±0.6	0.68(227)	0.566
	University	110	3.8±0.3		
Employment status	Working	135	11.7±3.4		
	Non-working	64	9.8±2.4	12.5(232)	**0.0001**
	Not working currently	34	9.6±2.5		
Occupational level	Not applicable	74	9.9±2.4		
	Middle to upper level employee	126	11.5±3.2		
	Self-employed	27	11.4±3.9	8.5(232)	**0.0001**
	Laborer	6	6.8±2.4		
Number of children	0	121	11.0±3.5		
	1-3	97	10.5±2.4	1.4(232)	0.258
	4 or more	15	11.8±4.6		
Type of family system	Nuclear	79	10.9±3.5		
	Joint	103	10.0±2.3	11.8(232)	**0.0001**
	Living alone	51	12.6±3.6		
Monthly income (Household)	Less than 15000	32	11.5±2.6		
	15000-30000	37	9.2±3.1	5.8(232)	**0.001**
	31000-60000	36	10.2±3.6		
	More than 60000	128	11.4±3.0		

Statistically significant associations were observed between the participants‘ age ($p<0.020$), number of children ($p<0.010$), type of family system ($p<0.0001$) and monthly household income ($p<0.001$) and their overall food safety practices ($p< 0.005$), as can be seen in Table.8. High mean scores were observed in women with age group 26-41 years7.6±2.3, having 4 or more children 8.3±1.2, type of family system: living alone 8.4±1.8 and monthly household income less than Rs 15000 8.3±2.7.

Table 8: Associations between the demographic characteristics of the participants and their food safety practices (n=233)

Demographic Characteristics	Category	Respondents (n)	Mean score ± SD (x ± SD)	F(df)	p-value
Age	18-25	38	6.3±2.9		
	26 - 41	151	7.6±2.3	4.0(232)	**0.020**
	>41	44	7.5±2.1		
Marital status	Single	95	7.0±3.0		
	Married	119	7.7±1.9	2.5(232)	0.087
	Divorced	19	6.9±2.2		
Education	Matric	16	6.9±1.7		
	Intermediate	8	8.8±2.2	1.7(232)	0.187
	University	209	7.3±2.5		
Education of spouse	Not applicable	109	7.0±2.8		
	Matric	6	7.8±1.2	1.0(227)	0.378
	Intermediate	3	8.0±5.3		
	University	110	7.6±1.91		
Employment status	Working	135	7.1±2.5		
	Non-working	64	7.7±2.0	1.4(232)	0.254
	Not working currently	34	7.4±2.8		
Occupational level	Not applicable	74	7.7±2.0		
	Middle to upper level employee	126	7.2±2.6	1.1(232)	0.339
	Self-employed	27	7.0±2.6		
	Laborer	6	6.5±0.5		
Number of children	0	121	6.9±2.9		
	1-3	97	7.7±1.7	4.7(232)	**0.010**
	4 or more	15	8.3±1.2		
Type of family system	Nuclear	79	7.6±2.3		
	Joint	103	6.5±2.5	11.8(232)	**0.0001**
	Living alone	51	8.4±1.8		
Monthly income (Household)	Less than 15000	32	8.3±2.7		
	15000-30000	37	6.4±2.6	5.7(232)	**0.001**
	30000-60000	36	8.2±1.2		
	More than 60000	128	7.1±2.4		

4.5. Comparison between working and non-working women

Among 233 participants, working women were 135 and non-working 98. The mean score of overall awareness for working women was 11.7±3.4 which was more than the non-working, 9.7±2.4. The p-value was significant, that is, less than 0.05 for both working and non-working women.

Table 9: Comparison of working and non-working women for their overall food safety awareness (n=233)

Category	Respondents (n)	Mean score ± SD (x ± SD)	F(df)	p-value
Working	135	11.7±3.4	12.8(231)	**0.0001**
Non-working	98	9.7±2.4	12.8(231)	**0.0001**

The mean score of overall practices for working women was 7.1±2.5 while for non-working was 7.6±2.3.The result is statistically insignificant p-value >0.05.

Table 10: Comparison of working and non-working women for their overall food safety practices (n=233)

Category	Respondents (n)	Mean score ± SD (x ± SD)	F(df)	p-value
Working	135	7.1±2.5	0.3(231)	0.14
Non-working	98	7.6±2.3	0.3(219)	0.13

CHAPTER V: DISCUSSION

In the present study, overall level of awareness and practices on household food safety were assessed among working and non-working women (aged 18 years and above) who visited the grocery stores of the sector markets of Islamabad. Among the study population the overall food safety awareness score of the participants was 10.9±3.2, on a scale from 0-22; with and overall practices score was 7.3±2.4, on a scale from 0-13.

The age in years 26-41 (64.85%) showed more awareness with overall food safety awareness ($p=0.0001$) in the respondents in current study. Statistically significant relationships were also observed between the participants‘ age, marital status, whether they had children, educational level, and their overall food safety knowledge ($p < 0.001$) in a study conducted on females in Saudi Arabia (Arfaoui et al., 2021). The inadequate food safety awareness in youngerwomen has also been reported in several previous studies elsewhere(Alqurashi et al., 2019; Arfaoui et al., 2021; W. O. Ayaz et al., 2018); the contributing factor to this is the less amount of time spent by this age group in the kitchen thus resulting lack of hands-on experience and information related to food safety.Moreover, such lack of experience in food preparation and cooking among younger women may also be associated with the absence of related courses in their middle and high school courses compared with the generations before them. Additionally, more women areworking and therefore devoting less time to cooking and teaching, their daughters and sisters, appropriate food safety and handling(Arfaoui et al., 2021).

According to the current study higher level of food awareness was seen in women (89.7%) who went to universities for higher education ($p< 0.002$). A significant relationship ($p< 0.001$) was found between educational level and overall food safety knowledge in Lahore, 100% of the postgraduate household women had safer food handling practices(Naeem et al., 2018). While Saudi women holding a bachelor‘s degree had more awareness regarding purchasing, storage, preparation and cooking, food handling than women who were either uneducated or with lower educational levels(Arfaoui et al., 2021). These results were consistent with those of previous studies concluding that more educated women, had higher levels of food safety aware nesses (W. Ayaz et al., 2018; Farahat et al., 2015a; Fawzi & Shama, 2009). As compared with the mothers who were uneducated, the likelihood of a good level of self-reported food safety practice among mothers who had secondary educational status was 3.09 times higherand among mothers who had college and university level educational status 2.95 times higher(Dagne et al., 2019).

Employment status showed a significant statistical relationship with the overall food safety awareness, p-value less than 0.0001 in 57.9% of working women. Other studies show that significant statistical difference existed in the overall food safety awareness scores of employed and unemployed females ($p< 0.05$). Employed women recorded a higher score (20.5 ± 0.1) than unemployed females (18.6 ± 0.1)(Osaili et al., 2022). This is similar to the observations of Saudi Arabia, where working females showed a higher foods safety knowledge score than non-working women (Farahat et al., 2015b).

Additionally, occupational status that is women who were middle to upper level employees showed significant relationship with overall awareness scores in 54.1%

women in Islamabad with p-value <0.000. Similarly other study indicated that women working in a health-related profession had significantly (p< 0.001) higher scores than the housewives (Arfaoui et al., 2021).

Women living on their own showed statistically significant relationship with overall FS awareness and practices (p-value<0.001) in 21.9% of Islamabad residents, in contrast to similar studies with better levels of FS practices observed in nuclear family system in 52.4% of female respondents (Harani et al., 2018).

The study showed statistically significant relationship between number of children to overall level of food safety practices p-value<0.010, women with 4 or more children showed better practices as compared with other groups. A Saudi survey showed housewives were more knowledgeable with a pass rate of 53.8% and those who had four or more children reported a better pass rate of 45.7% (W. Ayaz et al., 2018).

Women under the study 67% had the correct knowledge when to purchase frozen food while shopping, similarly majority of the Saudi respondents (73.6%) were aware that frozen foods must be purchased at the end of the shopping(W. Ayaz et al., 2018).

When purchasing food purchasing majority women 75.5%, under study had correct approach towards important points pertaining to food purchase that included checking expiry dates of food, ingredients of food packages and nutritional values, ensuring cleanliness of sites of purchasing food and damaged packages. Similar approach with 96.2% positive response was seen in females residing in Lahore and 98.8% mothers in Karachi who checked the ‗best before' date while purchasing food items in order to prevent food related diseases(Harani et al., 2018; Naeem et al., 2018).Similar results were

shown in studies done in Egypt (Awad Allah, 2017), and in Saudi Arabia(Farahat et al., 2015a), where majority of the women reported reading expiry dates. 60% of the women read the expiry date before purchasing foods, and always consumed food items in their order of purchase (Arfaoui et al., 2021).Almost all mothers knew that ingredients should be checked while purchasing food products. However less than half (44.6%) of them actually checked for ingredients before purchasing food items because it might consume time and require effort which busy mothers with young children may not have or they may be ignorant (W. Ayaz et al., 2018). Seventy-five percent of the respondents in Sharjah, didn‘t read the label of food products including expiry date and product components(Saeed et al., 2021).

Mothers studied in Saudi Arabia, 30.2% respondents knew the correct temperature for storing frozen food(W. O. Ayaz et al., 2018).A total of 70% of the respondents were knowledgeable about not freezing thawed meat for later use (Saeed et al., 2021).

Women under current study, 41.6%, and 37.8% respondents from a similar study in Sharjah, showed that women knew that for consuming freshly prepared food 3 h later, it must be put in the fridge, and reheated when ready to eat. Seventy-four % of them left cooked food in the kitchen counter for more than two hours which shows wrong approach towards prevention of food poisoning. The results of the operating temperatures of refrigerator and freezer reported in a study in Sharjah were very low, 25% (Saeed et al., 2021)which may expose them and their families to a higher risk of foodborne illness. Nearly one-third of participants did not store cooked or leftover foods in the refrigerator for more than three days, and they usually reheated them sufficiently before eating(Arfaoui et al., 2021) in contrast only 3.9% did not consume food stored in fridge

for more than 3 days, in this current study, which is very risky and utterly neglecting behavior towards FBD outbreak at homes. Half of Saudi participants knew that microorganisms cannot be killed by refrigeration or freezing(Arfaoui et al., 2021). This knowledge level is about two times higher than those in the study done currently where around 21.2% women knew that freezing food cannot kill the bacteria on in similarity with Egyptian women, where only 26% knew that microorganisms cannot be destroyed in the freezer(Fawzi & Shama, 2009).

A study done in Lahore over women answered incorrectly when asked about food storage to prevent FBD; 89.1% were incorrect when acquired if eating cooked food, kept at room temperature for >4 hours, is at high risk to cause food poisoning, 90.7% were incorrect when asked about defrosting frozen meat or poultry on the lower shelf of refrigerator is the right method?"(Naeem et al., 2018),however, almost equal number of respondents (33.1%) incorrectly thought that it can be covered and put on the cabinet(W. Ayaz et al., 2018).

Around 86% women in current study, knew the correct way to wash hands after handling raw meat. The questions relating to proper cooking of food, consumption of freshly prepared food, and correct way to clean kitchen counter received less than 50% correct answers from the study respondents. In Islamabad, 61.8 females, in current study had similar findings to Saudi women (65.3%) who knew the correct way of washing hands was with running warm water using soap and then wiping them dry (W. Ayaz et al., 2018). However,about 96% of females in Canada had correct practices for cleaning food preparation surfaces(Murray et al., 2017). Only 55% thought that persons who present symptoms of diarrhea, vomiting, flu, or sore throat may contaminate food and cause food

poisoning(Arfaoui et al., 2021), which is less number of females as compared to the current study where 61.8% knew that people with diarrhea, fever, sore throat or flu cannot cook for others in order to avoid FBD outbreak. While only 68% had correct practices to prevent cross-contamination in a Canadian study (Murray et al., 2017). Proper cooking of food for meat and poultry, cook until juices are clear and not pink only 46% of respondents were correct which is higher than in Sharjah where only 18% knew that food should be cooked at recommended time and temperatures, 22% did not know that it was not safe to consume non-boiled milk(Saeed et al., 2021), however, in the current study, 85.4% of the women always boiled milk before consuming it. Comparing females, 48% and 36% of them showed, respectively, low and intermediate awareness of safety in food preparation and cooking however, 86% of them were aware that microbial growth occurs faster at room temperature than in the refrigerator(Arfaoui et al., 2021).

For safer food practices on food preparation and cooking almost every woman lacked knowledge whether to use thermometer for cooking meat, in current study only 50.6% cooked meat thoroughly when the color is not pink and all juices evaporate or use thermometer, while when same was asked from other women 100% gave wrong answer which shows that average household women had unhygienic food handling practices (Naeem et al., 2018). Woman living in Middle-eastern countries only 36.1% used thermometer to cook meat fully (Saeed et al., 2021). While 32% reported using thermometer to know if their meat was cooked enough to consume safely in Canada (Murray et al., 2017).

A general lack of knowledge in Saudi women was seen, about sources offood poisoning during food storage. In general, the percentage of participants who knew that the

following practices could cause food poisoning was low: thawing frozen food at room temperature (24%), inadequately heating raw milk (39%), and ineffective reheating of refrigerated cooked food (54%) (Arfaoui et al., 2021), this is quite similar to the current study where the awareness on food storage such as freezer temperature, raw meat storage, thawed meat and storage of fruits and vegetables were answered wrong by approximately 70% of the participants. While, study in Lahore on household awareness showed more than half positive response against–ooked food leftover should be reheated thoroughly" (Naeem et al., 2018). Current study states that around 57.9% incorrect approach was seen towards the practice of storing left-overs in a cool place within 2 hours which was low but still better than as seen in Lahore where incorrect approach was seen in 74.5%(Naeem et al., 2018).

Safer food handling requires prevention of contamination to avoid FBD, in current study 38% had correct awareness on using a separate cutting board and utensil (knife) for raw meat and fresh produce which was less than what was observed in Lahore where 94.4% knew that raw vegetables and meat should not be cut using the same knife(Naeem et al., 2018). In a similar study on mothers in Karachi, they were unaware that they should not use the same cutting boards for raw and cooked food(Harani et al., 2018).It has been assumed that the use of same cutting boards for raw and cooked food of animal and vegetable origin without proper washing can be one of the causes of food poisoning(Fawzi & Shama, 2009). In the current study 48.5 % have habit for using same cutting board and knife for fresh produce and raw as compared to similar finding 45.4% of mothers in Karachi used the same cutting boards for raw and cooked food(Harani et

al., 2018).While in Lahore women when asked –do you use different chopping boards for cutting raw meat, poultry, and vegetables?', 99.6% answered wrong (Naeem et al., 2018).

Ninety-one percent of the women from current study and 66% Saudi participants did not recognize that food contaminated with food poisoning bacteria does not always look and/or taste abnormal, having high chances to transfer FBD as good awareness can prevent it (Arfaoui et al., 2021). This is in contrast with the findings where high score was seen in study from Lahore against –harmful microbes cause food poisoning that aren't visible to nakedeye" with 94.8% correct (Naeem et al., 2018), and in another study carried out in the United Stateswhere 70% of food preparers, were aware that food that appeared and/or smelled normal may contain food poisoning bacteria (Meysenburg et al., 2014). While 80% from the current research reveals that they knew how bacteria can be transferred from people, insects, rodents raw meat and vegetables to others, similar to that 86% insects such as cockroaches and flies could be vectors of food poisoning pathogens answered correctly by Saudi(Arfaoui et al., 2021), and Egyptian women (Fawzi & Shama, 2009). In contrast only half females in Lahore responded correctly to –insects such as cockroaches and flies can transfer food- borne pathogens" (Naeem et al., 2018), showing there are high chances of contamination of food leading to FBD.

The current study revealed, 82% had habit of washing hands before and during food preparation, comparatively, almost all respondents in Saudi used to wash their hands with soap prior to food preparation (Arfaoui et al., 2021). Good practices were observed in current study where 77.7% women cleaned surfaces and equipment used for food preparation before re-using on other food, however, Murray mentioned there are still chances that 1 in 10 women may use unsafe practices putting them at risk for FBD and

very unhygienic approach seen in study conducted in Lahore only 52.5% (Naeem et al., 2018). The recommended food safety practices for the clean, chill, and separate themes, with correct responses fell in between 81 to 93% range(Murray et al., 2017). Separating cooked food from raw will decrease the chances of cross-contamination. Respondents in current study had good practices 84.5% to separate fresh from raw food as compared to those seen in Lahore with only 51.3% correct responses to –do you separate raw from cooked foods while refrigerating" with (Naeem et al., 2018).

The current study shows that 91% did not have the appropriate awarenessregarding recognition of contaminated food resulting in poor food handling practices. While only 8.9% of household women in Lahore, had the appropriate food safety awareness regarding this(Naeem et al., 2018). Results of a study demonstrated that the enrolled women had better practices than knowledge in purchasing and storage and in preparation and cooking similarly, mothers, because of the high workload, sometimes are careless to put the knowledge they have gained into practice(Dagne et al., 2019). Similar results were obtained in other studies conducted in Saudi Arabia (Farahat et al., 2015b) and Egypt (Fawzi & Shama, 2009). In fact, in the Saudi community, local meals are prepared and cooked at homes using customary and safe practices that are inherited over generations without an understanding of the underlying scientific basis(Arfaoui et al., 2021), similar could be the answer in this study.

5.1. Strength

The current study has used validated and internationally-accepted questionnaire (Five keys to safer food, manual by WHO) which is better at identifying the awareness and practices levels of food safety. The present study is somehow successful in assessing the

awareness and practices on household food safety among women.It will provide the means to promotefurther research to assess the barriers to safer food practices which could aid in more successful foodborne diseases preventive measures.According to my best knowledge, no study has been done in twin cities on household food safety among women.

5.2. Limitations

One of the limitations of this research study is that food safety practices were evaluated through a self-reporting questionnaire, which may have over-estimated the actual correct practices. Secondly, different levels of food safety awareness and practices can be seen in different communities on the basis of their beliefs and traditions. Since the study sample was limited to the same study setting, it cannot be generalized to Pakistani population. Furthermore, the sampling technique was consecutive non-probability sampling in this study, may show some bias.

5.3. Conclusion

In present study, the overall level of food safety awareness and practices was better in higher educated women, age group 26-41 years, who worked as middle to upper level employees and lived alone. The study concluded that the inadequate overall level of food safety awareness and practices was more prevalent among less educated, non-working women in younger 18-25 years and > 41 year, age groups. There is a need for a more robust reinforcement on household food safety educational programs to prevent foodborne diseases.Education on food safety is recommended for a wide range of

consumers and should focus on the _5 Keys to Safer Food‘ guide by the World Health Organization.

5.4. Recommendations

- The food safety practices should be improved and it is important to know the current practices in the kitchen, especially the reasons for poor food handling, preparation and storage can be understood. Knowing the baseline knowledgeand perceptions of household women is crucial to understanding thestatus of food safety among them, so they could be recommended to educational programs.
- Food safety educational programs must be advertised through formal and informal educational mass media and repeated at specific intervals targeting the non-working women at homes. Introduce WHOs Five Keys to Safer Food Manual by giving out pamphlets or through billboards.
- Health and educational institutions can provide short-training courses to women of all ages especially targeting the specific age group 26-41 years who are actively participating in household activities, and especially at universities as education has a bigger impact on food safety as seen in current study.
- All the workplaces, where women are working as middle to upper level employees, should arrange and conduct workshops to give training to women on safer foods.

References

Admin, O. (2020). Determination of Awareness Regarding Food Safety Among Students and Staff Members of University of Lahore. *Asian Journal of Allied Health Sciences (AJAHS)*, *03*(01), 46–50. https://doi.org/10.52229/ajahs.v3i1.325

Ahmed, W. A. M. (2015). Mothers‘ Knowledge Regarding Preventive Measures of Food Poisoning in Yemen. *Food and Nutrition Sciences*, *06*(01), 49–53. https://doi.org/10.4236/fns.2015.61006

Akhtar, S. (2015). Food Safety Challenges—A Pakistan‘s Perspective. *Critical Reviews in Food Science and Nutrition*, *55*(2), 219–226. https://doi.org/10.1080/10408398.2011.650801

Alqurashi, N. A., Priyadarshini, A., & Jaiswal, A. K. (2019). Evaluating Food Safety Knowledge and Practices among Foodservice Staff in Al Madinah Hospitals, Saudi Arabia. *Safety*, *5*(1), 9. https://doi.org/10.3390/safety5010009

Arfaoui, L., Mortada, M., Ghandourah, H., & Alghafari, W. (2021). Food Safety Knowledge and Self-reported Practices among Saudi Women. *Current Nutrition & Food Science*, *17*(8), 891–901. https://doi.org/10.2174/1573401317666210322115237

Awad Allah, B. M. (2017). Knowledge, Attitude and Practice of Female Teachers Regarding Safe Food Handling; Is It Sufficient? an Intervention Study, Zagazig, Egypt. *Egyptian Journal of Occupational Medicine*, *41*(2), 271–287.

Ayaz, W. O., Priyadarshini, A., & Jaiswal, A. K. (2018). Food safety knowledge and practices among Saudi mothers. *Foods*, *7*(12). https://doi.org/10.3390/foods7120193

Ayaz, W., Priyadarshini, A., & Jaiswal, A. (2018). Food Safety Knowledge and Practices among Saudi Mothers. *Foods*, *7*(12), 193. https://doi.org/10.3390/foods7120193

Chellaiyan, V. G., . J., Fasna, L., . L., & Mallika, S. V. (2018). Food safety awareness and food handling practices among rural population of Tamil Nadu. *International Journal Of Community Medicine And Public Health*, *5*(4), 1441. https://doi.org/10.18203/2394-6040.ijcmph20181214

Dagne, H., Raju, R. P., Andualem, Z., Hagos, T., & Addis, K. (2019). Food Safety Practice and Its Associated Factors among Mothers in Debarq Town, Northwest Ethiopia: Community-Based Cross-Sectional Study. *BioMed Research International*, *2019*, 1–8. https://doi.org/10.1155/2019/1549131

Farahat, M. F., El-Shafie, M. M., & Waly, M. I. (2015a). Food safety knowledge and practices among Saudi women. *Food Control*, *47*(October 2011), 427–435. https://doi.org/10.1016/j.foodcont.2014.07.045

Farahat, M. F., El-Shafie, M. M., & Waly, M. I. (2015b). Food safety knowledge and practices among Saudi women. *Food Control*, *47*, 427–435. https://doi.org/10.1016/j.foodcont.2014.07.045

Fawzi, M., & Shama, M. E. (2009). Food Safety Knowledge and Practices among Women Working in Alexandria University, Egypt. *The Journal of the Egyptian Public Health Association*, *84*(1–2), 95–117.

Gong, S., Wang, X., Yang, Y., & Bai, L. (2016). Knowledge of food safety and handling in households: A survey of food handlers in Mainland China. *Food Control*, *64*, 45–53. https://doi.org/10.1016/j.foodcont.2015.12.006

Harani, V. K., Andrades, M., Beg, A. A., & Mohammad, Z. (2018). Knowledge and Practices of Mothers Regarding Food Safety Presenting to Family Medicine Clinics at a Teaching Hospital in Karachi Pakistan. *Journal of Rawalpindi Medical College*, *22*(3), 278–282.

Kamboj, S., Gupta, N., Bandral, J. D., Gandotra, G., & Anjum, N. (2020). Food safety and hygiene: A review. *International Journal of Chemical Studies*, *8*(2), 358–368. https://doi.org/10.22271/chemi.2020.v8.i2f.8794

Kosi, C., Saba, S., Bamidele, F. A., Abughoush, M., Asghar, A., Dongho, F. F., Macer, D., & Aberoumand, A. (2018). Food safety knowledge, attitudes and practices among consumers in developing countries: An international survey. *Food Research International*, #pagerange#. https://doi.org/10.1016/j.foodres.2018.10.030

Mead, P. S., Slutsker, L., Dietz, V., McCaig, L. F., Bresee, J. S., Shapiro, C., Griffin, P. M., & Tauxe, R. V. (1999). Food-related illness and death in the United States. *Emerging Infectious Diseases*, *5*(5), 607–625. https://doi.org/10.3201/eid0505.990502

Meysenburg, R., Albrecht, J. A., Litchfield, R., & Ritter-Gooder, P. K. (2014). Food safety knowledge, practices and beliefs of primary food preparers in families with young children. A mixed methods study. *Appetite*, *73*, 121–131. https://doi.org/10.1016/j.appet.2013.10.015

Mkhungo, M. C., Oyedeji, A. B., & Ijabadeniyi, O. A. (2018). Food safety knowledge and microbiological hygiene of households in selected areas of Kwa-Zulu Natal, South Africa. *Italian Journal of Food Safety*, *7*(2), 126–130. https://doi.org/10.4081/ijfs.2018.6887

Munir, S., Ali, S. H., & Ali, S. A. (2019). A systematic review on shifting trends of foodborne diseases in Pakistan. *Abasyn Journal Life Sciences*, *2*(2), 66–81. https://doi.org/10.34091/ajls.2.2.4

Munir, S., & Hafsa Ali, S. (2019). Assessing Awareness, Attitude, and Practice of Food Safety Among the Population of Quetta, Pakistan. *Advances in Bioscience and Bioengineering*, *7*(3), 43. https://doi.org/10.11648/j.abb.20190703.14

Murray, R., Glass-Kaastra, S., Gardhouse, C., Marshall, B., Ciampa, N., Franklin, K., Hurst, M., Thomas, M. K., & Nesbitt, A. (2017). Canadian consumer food safety practices and knowledge: Foodbook study. *Journal of Food Protection*, *80*(10), 1711–1718. https://doi.org/10.4315/0362-028X.JFP-17-108

Naeem, N., Raza, S., Mubeen, H., Siddiqui, S. A., & Khokhar, R. (2018). Food safety knowledge, attitude, and food handling practices of household women in Lahore. *Journal of Food Safety*, *38*(5), 1–7. https://doi.org/10.1111/jfs.12513

Nonworking definition and meaning | Collins English Dictionary. (n.d.). Retrieved May 16, 2022, from https://www.collinsdictionary.com/dictionary/english/nonworking

Osaili, T. M., Saeed, B. Q., Taha, S., Omar Adrees, A., & Hasan, F. (2022). Knowledge, Practices, and Risk Perception Associated with Foodborne Illnesses among Females Living in Dubai, United Arab Emirates. *Foods*, *11*(3), 290. https://doi.org/10.3390/foods11030290

Przyrembel, H. (2008). Food safety. In *Pediatric Nutrition in Practice* (pp. 71–75). https://doi.org/10.1159/B978-380558477-7.15525-1

Raza, A., Sultan, F., Mahboob, A., Nizammudin, S., & Nazeer, S. H. (2014). Salmonella bacteraemia among healthcare workers and their dependents. *Journal of the Pakistan Medical Association*, *64*(7), 748–750.

REDMOND, E. C., & GRIFFITH, C. J. (2003). Consumer Food Handling in the Home: A Review of Food Safety Studies. *Journal of Food Protection*, *66*(1), 130–161. https://doi.org/10.4315/0362-028X-66.1.130

Riaz, B. K., Alim, M. A., Islam, A. N. M. S., Amin, K. M. B., Sarker, M. A. B., Hasan, K., Ashad-Uz-Zaman, M. N., Selim, S., Quaiyum, S., Haque, E., Hossain, S. M., Ryder, J., & Khanam, R. (2016). Role of courtyard counselling meeting in improving household food safety knowledge and practices in Munshiganj district of Bangladesh. *Nagoya Journal of Medical Science*, *78*(4), 387–398. https://doi.org/10.18999/nagjms.78.4.387

Ruby, G. E., Abidin, U. F. U. Z., Lihan, S., Jambari, N. N., & Radu, S. (2019). Self-reported food safety practices among adult consumers in Sibu, Malaysia: A cross-sectional study. *Food Protection Trends*, *39*(5), 366–376.

Ruby, G. E., Ungku Zainal Abidin, U. F., Lihan, S., Jambari, N. N., & Radu, S. (2019). A cross sectional study on food safety knowledge among adult consumers. *Food Control*, *99*(December 2018), 98–105. https://doi.org/10.1016/j.foodcont.2018.12.045

Saeed, B. Q., Osaili, T. M., & Taha, S. (2021). Foodborne diseases risk factors associated with food safety knowledge and practices of women in Sharjah-United Arab Emirate. *Food Control*, *125*(February), 108024. https://doi.org/10.1016/j.foodcont.2021.108024

Safari, Y., Maleki, S., Karimyan, K., Arfaeinia, H., Gupta, V. K., Yoosefpour, N., Shalyari, N., Akhlaghi, M., Sharfi, H., & Ziapour, A. (2018). Data for interventional role of training in changing the knowledge and attitudes of urban mothers towards food hygiene (A case study of Ravansar Township, Kermanshah, Iran). *Data in Brief*, *19*, 67–75. https://doi.org/10.1016/j.dib.2018.05.021

Scott, E. (1996). Foodborne disease and other hygiene issues in the home. *Journal of Applied Bacteriology*, *80*(1), 5–9. https://doi.org/10.1111/j.1365-2672.1996.tb03181.x

Tomaszewska, M., Trafialek, J., Suebpongsang, P., & Kolanowski, W. (2018). Food hygiene knowledge and practice of consumers in Poland and in Thailand - A survey. *Food Control*, *85*, 76–84. https://doi.org/10.1016/j.foodcont.2017.09.022

Workingwoman definition and meaning | Collins English Dictionary. (n.d.). Retrieved May 16, 2022, from https://www.collinsdictionary.com/dictionary/english/workingwoman

World Health Organization. (2009). Five Keys To Safer Food Manual Safer Food Manual. *International Journal of Environmental Research and Public Health*, *6*(11), 2833–2842. http://www.mdpi.com/1660-4601/6/11/2833/

World Health Organization. (2017). The Burden of Foodborne Diseases in the WHO European Region. *World Health Organization*, 1–48. http://www.euro.who.int/en/health-topics/disease-prevention/food-safety/publications/2017/the-burden-of-foodborne-diseases-in-the-who-european-region-2017

Zeeshan, M., Shah, H., Durrani, Y., Ayub, M., Jan, Z., & Shah, M. (2017). A Questionnaire-Based Survey on Food Safety Knowledge during Food-Handling and

Food Preparation Practices among University Students. *Journal of Clinical Nutrition & Dietetics*, *03*(02), 1–8. https://doi.org/10.4172/2472-1921.100052

ANNEXURE 1

Data Collection Tool

Awareness and Practices on Household Food Safety among Working and Non-working Women of Islamabad

Demographics

Serial No._____ Date_____

(Please answer all the following questions after reading them carefully)

SECTION I

1. Age (years):
   ☐ 18-25 ☐ 26-41 ☐>41

2. Marital status:
   ☐Single ☐Married ☐Divorced

3. Education:
   ☐Matric ☐Intermediate ☐University

4. Education of spouse: (please skip only for married)
   ☐Matric ☐Intermediate ☐University

5. Employment status:
   ☐Working ☐Non-working ☐Not currently working

6. Occupational level (skip this question if housewife):
   ☐Middle to upper level employee ☐Self-employed ☐Laborer

7. Number of children:
   ☐ 0 ☐ 1-3 ☐ 4 or more

8. Type of family system:
   ☐Nuclear ☐ Joint ☐Live independently alone

9. Monthly income(household):
   ☐Less than 15000 ☐15000-30000 ☐30000-60000☐60000 and above

SECTION II

FOOD SAFETY AWARENESS

Food purchasing

1. When is the best time to purchase frozen food when shopping?
   ☐ At the beginning of the shopping time
   ☐At the end of the shopping time
   ☐Whenever, passing the frozen food section
   ☐Anytime during shopping
   ☐Don‘t know

2. Of followings, what is important when purchasing food?
   ☐Checking expiry dates of food
   ☐Checking ingredients of food packages
   ☐Ensuring cleanliness of sites of purchasing food
   ☐Checking for nutritional values and damaged packages
   ☐All of above

Food handling

3. How food contaminated with food poisoning bacteria can be recognized?
   ☐Tasting it
   ☐ Smelling it
   ☐ Looking at it (Change in color or texture)
   ☐ Reheating it
   ☐ None of Above

4. How should vegetables and fruit be washed?
   ☐ Soak in detergent
   ☐ Wash with soap and water
   ☐ Wash with hot water
   ☐ Wash with running cold water
   ☐ Soak in cold water, then wash

5. How bacteria can be transferred to the food?
   ☐People
   ☐ Insects
   ☐ Rodents
   ☐ Raw meat & vegetables
   ☐ All of the above

6. Of the following, which is the correct way to heat leftovers?
   ☐ Heat it to the temperature you prefer
   ☐ Reheat is not necessary if it‘s during the summer
   ☐Heat until they are boiling
   ☐Heating is not important if it is at room temperature
   ☐ Do not know

7. Why must raw and cooked food be separated during food preparation and refrigeration?
   ☐Kitchen will be more organized
   ☐ The flavor may be affected
   ☐ To avoid cross-contamination (the transfer of harmful microorganisms)
   ☐ To organize the fridge compartments
   ☐ None of Above

8. The safe use of a cutting board and utensils for fresh produce and raw meat shall be in the case of:
   ☐Washing the cutting board and utensils with hot water
   ☐ Using fresh produce before raw meat
   ☐ Using a separate cutting board and utensils for fresh produce and another cutting board and utensils for raw meat
   ☐ Washing the cutting board and utensils with tap water
   ☐ Washing the cutting board and utensils with detergent and water

<u>Food preparation</u>

9. Of the following, which is the correct way to wash hands?
   ☐Wash with running cold water, wipe dry
   ☐Just wash with running cold water.
   ☐Wash with running warm water, wipe dry
   ☐Wash hands with cold water in a basin, use soap and then wash hands with cold water in the basin, wipe dry
   ☐Wash hands with running warm water, use soap and then wash with running warm water, wipe dry

10. Of the following, which is the correct way to wash hands after handling raw meat?
    ☐Wipe with towel
    ☐Wash with cold water, wipe dry
    ☐Wash with warm water, wipe dry
    ☐Wash with soap and warm water, wipe dry
    ☐No need to wash

11. After touching, which of the following should you wash your hands during the course of preparing food?
    ☐Face
    ☐A pimple on the surface of skin
    ☐Clothes
    ☐Hair
    ☐All of the above

12. People with which of the following symptoms should not cook for others?
    ☐Diarrhea, Fever, Sore throat or Flu
    ☐Can cook even if they are sick.
    ☐Skin allergies
    ☐AIDS
    ☐Headache

13. Proper cooking of food includes
    ☐Meat and poultry cooked to 40 °C
    ☐For meat and poultry, cook until juices are clear and not pink
    ☐Both well cooked and rare meats can be consumed
    ☐Under cooked eggs and seafood are safe to consume
    ☐None of the above

14. What should be done with freshly prepared food that will be consumed 3 h later?
    ☐ Put in the fridge, then reheat when ready to eat
    ☐ Put in the cupboard and reheat when ready to eat
    ☐ Put in the microwave oven
    ☐ Cover it and put it on the cabinet
    ☐ Leave it on the kitchen counter covered.

15. Safe/ boiled water should be used
    ☐Only for drinking
    ☐Only for cooking purposes
    ☐For both drinking and cooking purposes
    ☐Tap water can be used for drinking purpose
    ☐Tap water can be used for cooking

16. Which of the following is the correct way to clean the kitchen countertop and stove?
    ☐Clean with dry cloth/rag
    ☐Clean with wet cloth/rag
    ☐Clean with detergent and warm water
    ☐Clean with glass cleaner

☐All of the above

Food storage

17. What is the recommended temperature for a refrigerator (°C)?
    ☐ 0
    ☐ 1
    ☐ 4
    ☐ 12
    ☐ 16

18. What is the recommended temperature for a freezer (°C)?
    ☐-18
    ☐- 4
    ☐0
    ☐4
    ☐18

19. Where should raw meat be stored?
    ☐ The bottom shelf of fridge
    ☐ The center of fridge
    ☐ The top shelf of the fridge
    ☐ In the fridges door
    ☐ None of above

20. Should thawed meat be frozen for later use?
    ☐Yes, totally
    ☐ Yes, partly
    ☐ No
    ☐ May be
    ☐ Do not know

21. Where should fruit and vegetables be stored?
    ☐ The bottom shelf of fridge
    ☐ The center of fridge
    ☐ The top shelf of the fridge
    ☐ In the fridges door
    ☐ None of above

22. Can bacteria in food be killed by freezing at −18 °C?
    ☐ Yes, totally
    ☐ Yes, partly

☐ Not at all
☐ May be
☐ Do not know

SECTION III

FOOD SAFETY PRACTICES

Question Title	Always	Most times	Sometimes	Not often	Never
1. I wash my hands before and during food preparation.	☐	☐	☐	☐	☐
2. I clean surfaces and equipment used for food preparation before re-using on other food.	☐	☐	☐	☐	☐
3. I use separate utensils and cutting-boards when preparing raw and cooked food.	☐	☐	☐	☐	☐
4. I separate raw and cooked food during storage.	☐	☐	☐	☐	☐
5. I check that meats are cooked thoroughly by ensuring that the juices are clear or by using a thermometer.	☐	☐	☐	☐	☐
6. I reheat cooked food until it is piping hot throughout.	☐	☐	☐	☐	☐
7. I thaw frozen food in the refrigerator or other cool place.	☐	☐	☐	☐	☐
8. After I have cooked a meal I store any left-overs in a cool place within two hours.	☐	☐	☐	☐	☐
9. I check and throw away food beyond its expiry date.	☐	☐	☐	☐	☐
10. I wash fruit and vegetables with safe water before eating them.	☐	☐	☐	☐	☐
11. I always boil milk before consuming it	☐	☐	☐	☐	☐
12. I cook even when I fall very sick	☐	☐	☐	☐	☐
13. I do not consume food stored in fridge for more than 3 days	☐	☐	☐	☐	☐

ANNEXURE 2

Figures

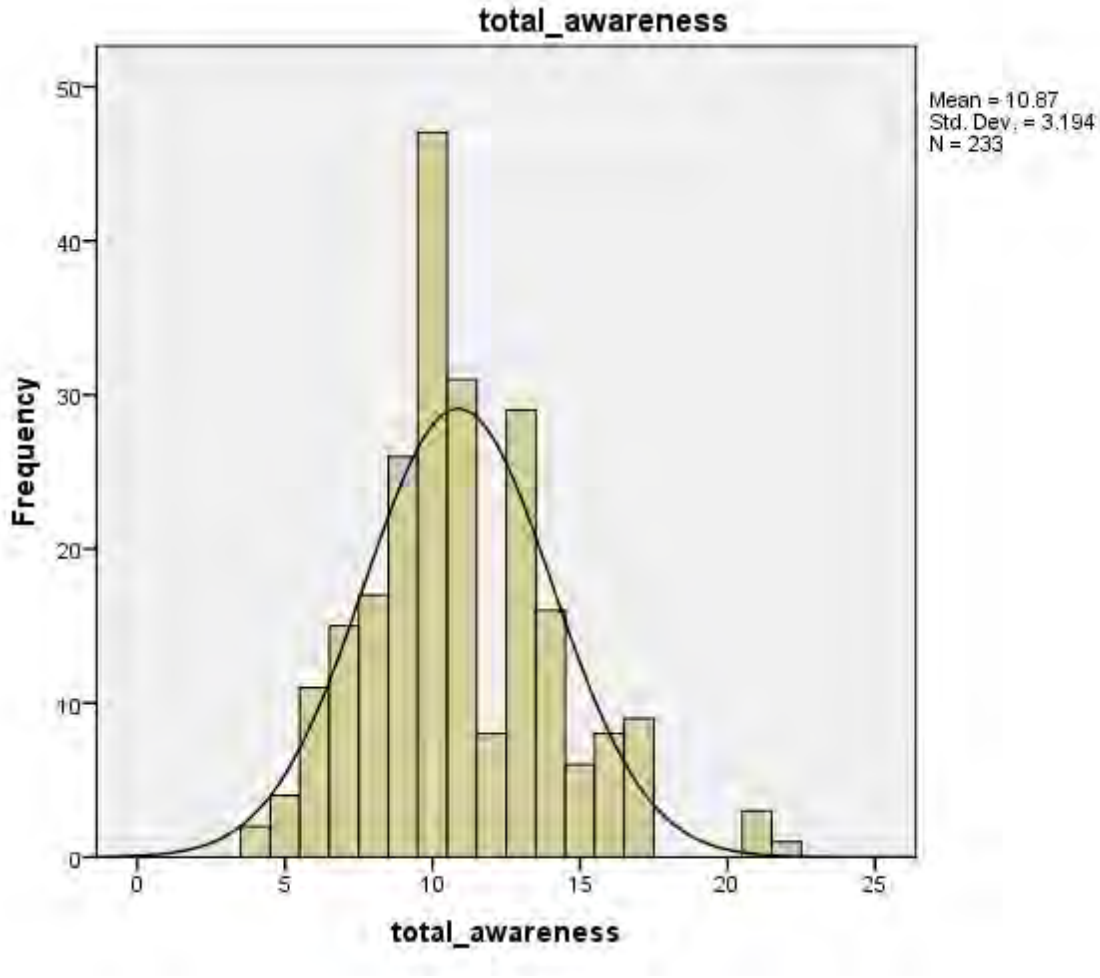

Figure 1: Overall Awareness Mean Score

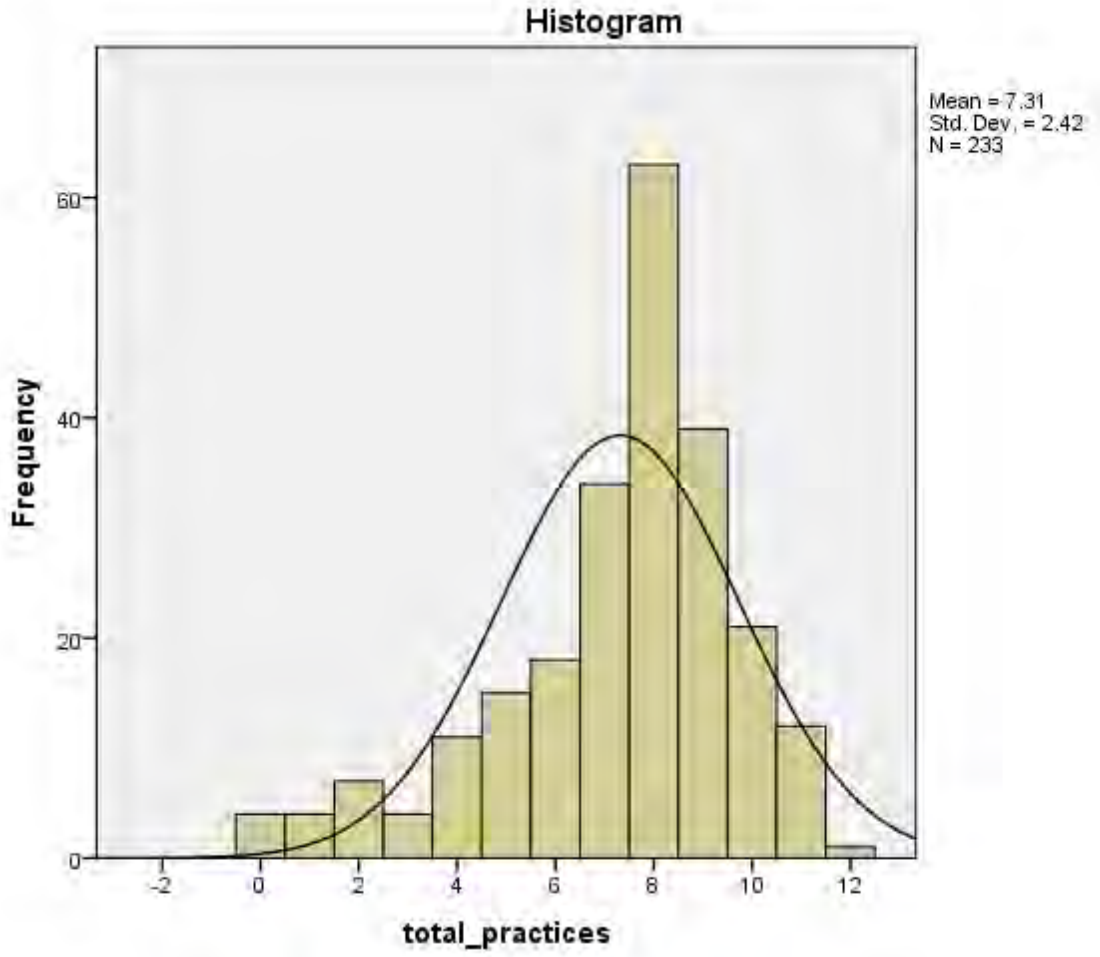

Figure 2: Overall Practices Mean Score

ANNEXURE 3

Informed Consent Form

IamDr. Sidra Masaood Shah,studentofMSPH-FinalSemester,Al-ShifaSchoolofPublicHealth,Al-ShifaEye Hospital, Rawalpindi. I am doing research on Awareness and Practices on Household Food Safety among Working and Non-working Women of Islamabad.

PURPOSE OF THE RESEARCH

The purpose of this study is to determine the gaps in food safety awareness and practice levels among women in Islamabad.

PARTICIPATION

I do not anticipate that taking this study will contain any risk or inconvenience to you. Your participation is strictly voluntary and you may withdraw your participation at any time without penalty. I request you to answer the questions as honestly as possible. It will take no longer than 20 minutes to complete a questionnaire. All information collected will be used only for research purpose and will be kept highly confidential. Your identity and your responses will not be identifiable; all data will be stored anonymously. As this is solely a student project no incentive will be provided. Once study is completed, I would be happy to share the results with you if you desire.

Thank you for agreeing to participate in this study. Your feedback is important.

Consent

I have read and understand the information sheet and agree to take part in the study.

Signature_____**Date**_____

ANNEXURE 4

IRB Letter

AL-SHIFA SCHOOL OF PUBLIC HEALTH
PAKISTAN INSTITUTE OF OPHTHALMOLOGY
AL-SHIFA TRUST, RAWALPINDI

No. MSPH-IRB/12-03
Date: 01st Oct, 2021

TO WHOM IT MAY CONCERN

This is to certify that **Sidra Masaood Shah** D/O **Mohammad Masaood Alam Shah** is a student of Master of Science in Public Health (MSPH) final semester at Al-Shifa School of Public Health, PIO, Al-Shifa Trust Rawalpindi. She has to conduct a research project as part of curriculum & compulsory requirement for the award of degree by the Quaid-I-Azam University, Islamabad. Her research topic which has already been approved by the Institutional Review Board (IRB) is **"Awareness and practices on household food safety among working and nonworking women of Islamabad".**

Please provide her necessary help and support in completion of the research project. Thank you.

Sincerely,

Dr. Ayesha Babar Kawish
Head of Department, MSPH
School of Public Health, PIO
Al-Shifa Trust, Rawalpindi

AL-SHIFA TRUST, JEHLUM ROAD, RAWALPINDI – PAKISTAN
Tel: +92-51-5487820-472 Fax: +92-51-5487827
Email: info@alshifaeye.org, Web Site: www.alshifaeye.org

ANNEXURE 5

Gantt Chart

Activities	December 2021	January 2022	February 2022	March 2022	April 2022	May 2022
Literature search						
Synopsis writing and IRB approval						
Pilot testing						
Data collection and entry						
Data analysis						
Writeup						
Thesis submission						

ANNEXURE 6

Budget

Budget item	Transport	Stationery and internet	Printing	Publishing
Pilot testing	**500 Rs/-**	**5000Rs/-**	**5000Rs/-**	**-**
Data collection	**10,000Rs/-**	**7,000Rs/-**	**-**	**-**
Thesis writeup	**1,000Rs/-**	**5,000Rs/-**	**8,000Rs/-**	**25,000 Rs/-**
Total expenditure	**11,500Rs/-**	**17,000Rs/-**	**13,000Rs/-**	**25.000 Rs/-**
Grand total	**66,500 Rs/-**			