

**FOOD SAFETY AND SECURITY ASPECTS OF STREET
FOODS: AN INTERVENTIONAL STUDY**

**SUMMARY OF
THESIS**

**SUBMITTED TO THE
BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY, LUCKNOW
FOR THE AWARD OF THE DEGREE OF**

Doctor of Philosophy

IN

HOME SCIENCE



**SUBMITTED BY
RUCHI VERMA
RESEARCH SCHOLAR
ENROLMENT No 1075/17**

**UNDER THE SUPERVISION OF
PROF. SUNITA MISHRA**

**DEPARTMENT OF HUMAN DEVELOPMENT AND FAMILY STUDIES
SCHOOL FOR HOME SCIENCE
BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY
(A CENTRAL UNIVERSITY)
VIDYA VIHAR RAEBARELI ROAD, LUCKNOW-226025
UTTAR PRADESH, INDIA
2023**

Introduction

Street foods play an important role in the lives of urban population members in developing countries. The food industry provides many job opportunities. Street foods is a source of inexpensive, convenient, appealing food for the consumers and these foods are most liked to eaten by adolescents and adults. Nutritional or healthy diet contributes a most significance role in rapid physical growth and development in adolescents. However, street foods are frequently connected with nutritional components associated with a poor diet and may provide a higher risk of contamination, they have become a severe food safety concern. The food safety knowledge, attitude, and practices of vendors are important aspects, as these individuals provide food and nourishment at very low prices to people all over the world. Street foods can cause the emergence of foodborne diseases, due to the ease of contamination by microorganisms, and the development of chronic foodborne diseases. Nutrition and Food safety are closely related. Unsecured food generates a vicious cycle of illness and nutritional deficiency influencing consumers. Street food safety is extremely high dependent at the handling of raw food to the cooking of food till its consumption. The aim of this study is explain the various Food Safety issues related to Street Foods, know how food-borne diseases occur and perceive the significance of food safety management systems. To determine the most preferred street foods by the consumers and quality testing of selective street foods in the laboratory. To increase regular food safety and personal hygiene awareness training program among food handlers in order to prevent the spread of microbes and ensure food safety.

Recent study has focused on the laboratory testing of the most preferred street foods by the consumers, to protect public health. as well as, focused on implementation of awareness and training programmes on regular basis to increase food safety knowledge, attitudes, and practises among vendors to ensure the food quality. As a result, once food safety standards are acceptable, it would be vital to ensure that poor people in developed cities like Lucknow may earn a living through a "convenient" business like street food vending.

Several researches have revealed the knowledge, attitude, and working practices of food vendors at the vending site such as preparing food without washing hands and serving food to consumers with bare hands, not using gloves, head caps, aprons , Reheating the food repeatedly which causes the food to lose its nutrients but still scientists have adopted and continued their research on good scientific techniques such as food safety and personal hygiene training programs to enhance the knowledge,

attitude and practice of food vendors . Scientifically this technology has helped in changing the behaviour of food vendors, has helped in increasing the knowledge about food safety and personal hygiene and has helped in achieving the goal.

Based on the above-mentioned scientific data, current literature research is scientifically not yet for regular awareness training programme for street food vendors and in addition, not yet regular concentrate for identifying microorganisms and assessing the nutritional content of street food in the laboratory.

The **first chapter** discusses the history of street food and food handlers, as well as the socioeconomic position of food handlers and how food vendors make a living. And the eating habits of street food customers have been explained. What is the nutritional worth of street food, and how does a nutrient excess or deficit affect the body? What are food vendors' knowledge, attitude, and behaviour in terms of food safety and personal hygiene? The risks associated have been explained due to street food vendors' lack of knowledge of food safety and personal hygiene. A side from that, the preventive measures that must be taken to lessen these hazards have been outlined.

The research was conducted by using following objectives:

- 1- To find out the Socio Economic aspects of Street Foods.
- 2- Physiochemical analyses and nutritive value of the Street Foods.
- 3- Microbial analysis of selected street foods.
- 4- To examine the safety aspect of Street Foods.
- 5- To recommended measures for food safety handling, personal hygiene of Street Food handlers.
- 6- To impact food safety training to the foods handlers.

Hypothesis:

Ho1: Age have no significant influences on FSK, FSA, FSP.

Ho2: Education have no significant influences on FSK, FSA, FSP.

Ho3: Experience have no significant influences on FSK, FSA, FSP.

Ho4: There are no significant differences in FSK,FSA,FSP among Male and Female.

Ho5: Tanning have no significant influences on FSK, FSA, FSP

Ho6: There is no significant effect of intervention on Knowledge.

Ho7: There is no significant effect of intervention on Attitude.

Ho8: There is no significant effect of intervention on Practices.

The **second chapter** literature review of the studies dealt with. This chapter deals with the socio-economic status of street food vendors, their food safety knowledge, attitude, practices towards street foods. How well trained are the vendors in food safety, personal hygiene. Also focused on the public health implications of high consumption of street food, and laboratory testing (physico-chemical, microbial and nutrient evaluation) of street food, and including the most commonly consumed by consumers.

Chapter 3 deals with the proposed content and method in summary, a study on the topic "Food Safety and Security Aspects of Street Foods" was conducted to get an overall idea about the study. The study was conducted on 320 respondents which included 120 food vendors and 200 consumers. The questionnaire on food vendors asked questions on food safety knowledge, attitude and practice of vendors based on their age and education, gender, marital status, experience, training. The information was collected through a structured questionnaire using the KAP (Knowledge Attitude Practice) scale for food safety. Four food samples were selected on the basis of most preferred street foods by 200 consumers and these samples were tested for quality of food by various methods in the laboratory.

The intervention phase was of one month in which, in the lab carried out physiochemical analysis, nutritional analysis, SEM, XRD and microbiological analysis of the most preferred street foods by consumers. Thereafter the vendors were given an awareness training program related to food handling and personal hygiene. All the vendors were distributed personal protective equipment (PPE) related to personal hygiene and they were also told about the use of PPE (Gloves, mask, caps etc.) so that they could understand better.

An awareness training program on prevention and control of personal hygiene was carried out with street food vendors. The training module was created, and the personal protective equipment (PPE) and skill demonstrations were all part of the training process.

Vendors were given an awareness training program related to food safety hygiene practice and food handling. All the vendors were distributed personal protective equipment (PPE) related to personal hygiene and they were also told about the use of PPE (Gloves, mask, caps etc.) so that they could understand better.

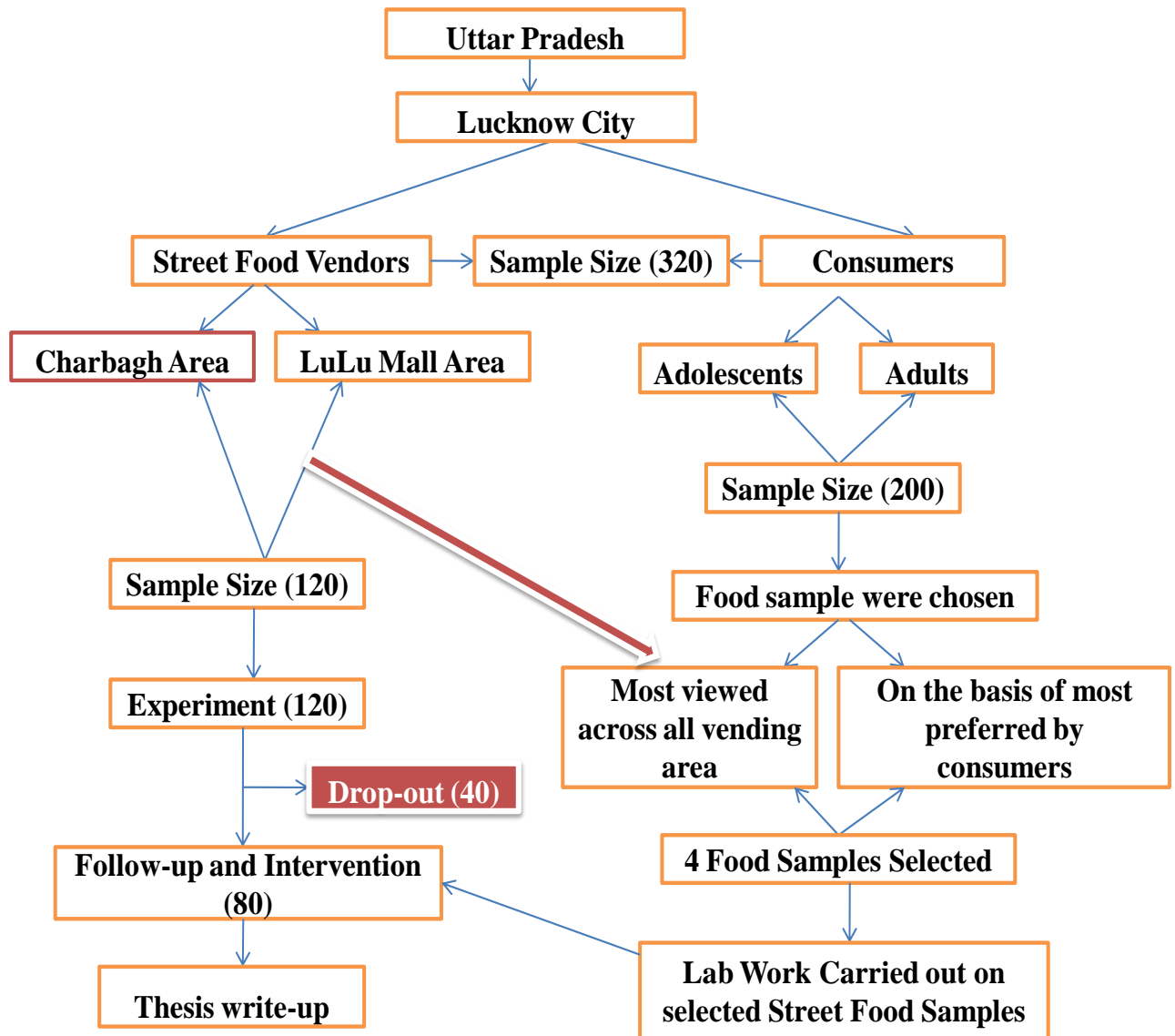


Fig. Systematic diagram of research.

The intervention group was evaluated during the post-interventional phase. A total of 80 participants that participated in the intervention were chosen, and a pre-designed and pre-tested questionnaire. For the purpose of measuring food safety knowledge, 13 questions using a dichotomous (Yes/No) scale was asked. A Yes answer received a value of 1, while a No answer received a value of 0. The maximum score on this scale ranged from 0-13. Food safety attitude was measured by the use of 13

questions answered on a three-point scale ranging from 2-strongly agree, 1- agree and 0-disagree; the total score ranged from 0-26. Food safety practices were assessed by the use of 16 questions answered on a three-point scale with answer options of 2-always, 1-sometimes, 0-never. Food safety practice questions no. 4, 5, 6 will be reverses coded as 0-always, 1-sometimes, 2-never, with total scores ranging from 0-32.

The data was entered onto an SPSS data sheet, which displayed different items/variables in columns and subjects in rows. The statistical programme SPSS version 20.0 was also used for data analysis. Frequency tables, percentage graphs, independent t-tests, mean values, and standard deviations (SD) were used to describe the demographic profile and food safety knowledge, attitudes, and practises items of food vendors. For continuous variables, ANOVA, independent t-test, mean values, and SD were calculated. Hypothesis of the study was tested at 5% of level of significance.

Chapter 4 dealt with result and discussion of the study. Statistical analysis was done through Frequency tables, percentage graphs, independent t-tests, mean values, and standard deviations (SD) were used to describe the demographic profile and food safety knowledge, attitudes, and practises items of food vendors. For continuous variables, ANOVA, independent t-test, mean values, and SD were calculated.

- The majority of respondents (68.3%) were 20-40 years old. Fewer (15%) were older than 50 years. Almost 45.8% of the respondents were illiterate, and only a small number (6.7%) had achieved graduate-level education. In addition, most vendors (87.5%) were unaware of the importance of food safety training, and few vendors (4.2%) had been formally trained. The majority of vendors (91.7%) did not have any food safety training. Almost 46.7% of the vendors had more than five years of working experience, whereas 29.2% of the vendors had less than one year of experience.
- The almost of consumers (50%) were 13-19 years adolescents and 50% were above 20 years (adults). majority 48% of the consumers were preferred street food on the basis of taste and 20% consumers were preferred street foods on the basis of Large portion size, and only 12.5% consumers were preferred street foods on the basis of Cost.

- The almost majority of the consumers were most preferred street foods Samosa, Panipuri, Chawmein and Chole bhature.
- The pH value of selected street foods, chowmein, samosa, panipuri, and chola were recorded 5.26, 5.18, 5.03, and 6.04 respectively. The TSS value of selected street foods, chowmein, samosa, panipuri, and chola were recorded at room temperature 0.0, 1.4, 2.8, and 4.8 respectively.
- SEM images were used to study surface morphology and texture on the sample surface. Figures 4.2.3 (a, b, c, d) show the morphology of all dehydrated food samples such as CH, CM, PP, SS, respectively. At high magnification ($\times 550$) and at spectrum 3, 2, 5, 6 respectively, all figures a, b, c, d respectively, shows the deterioration of such quality attribute texture on the surface of the all food sample, the food particles disappearance led to homogenous phase or absence of air spaces inside. The irreversible loss of shape was, however, evident when using drying temperatures of 70 and 90 °C for 4 to 6 hrs and some food particles were fused together. The drying temperature led to food particles becoming more shapeless, flattened and rough. Temperature significantly influences the morphology of food particles, so it is likely that other properties will also be affected.
- The Energy Dispersive X-Ray analysis of CH, CM, PP, SS food particle and indicates that the particles were nearly about stoichiometry. In CH sample the weight amount of C determined by EDX was 48.64 and O was 48.74. Oxygen in the samples had a greater ratio than that of Carbon. The EDX spectra also showed the presence of other elements, such as Na, P, Cl, and K. In CM sample the weight amount of C determined by EDX was 58.11 and O was 38.35. Carbon in the samples had a greater ratio than that of Oxygen. The EDX spectra also showed the presence of other elements, such as Na, P, Cl, K, and Ca. In PP sample the weight amount of C determined by EDX was 56.03 and O was 41.31. Carbon in the samples had a greater ratio than that of Oxygen. The EDX spectra also showed the presence of other elements, such as Na, P, S, Cl, and K. In SS sample the weight amount of C determined by EDX was 59.30 and O was 38.92 with very less impurities. Carbon in the samples had a greater ratio than that of

Oxygen. The EDX spectra also showed the presence of other elements, such as Na, P, S, Cl, and K. The EDX spectra only contained a little amount of impurities. The majority of the material is carbonaceous/organic compounds, as shown by the high carbon and oxygen content, whereas the remaining elements suggest that there are several inorganic minor/trace components.

- The higher counts peaks in XRD pattern was observed at 2θ - 59.643, 59.658, 59.965 in CH sample. These higher peaks observes at higher counts 16.0. The higher counts peaks in XRD pattern was observed at 2θ - 59.637 in CM sample. These higher peaks observes at higher counts 58.0. The higher counts peaks in XRD pattern was observed at 2θ - 59.730, 59.975 in PP sample. These higher peaks observes at higher counts 130. The higher counts peaks in XRD pattern was observed at 2θ - 59.903 in SS sample. These higher peaks observes at higher counts 19.0. This peak which indicates the presence of V-type crystallites. This might be attributed due to the amylose–lipid complex formation during hydrothermal operation. The diffractogram of food samples revealed prominent peaks at diffraction angles of 16.0, 58.0, 130, and 19.0 degrees. The diffractogram of food particles revealed low prominent peaks at diffraction angles of 6.00, 42.0, 86.0, and 6.00 counts, albeit these peaks were underdeveloped. The increased impact of frying on oil has a negative impact on its physicochemical and microbiological characteristics. These higher peaks observes at higher counts 19.0. This peak which indicates the presence of V-type crystallites.
- In the present study, the average moisture content of Chowmein, Samosa, Panipuri and Chole was 31.5g/100g, 27.23g/100g, 33.46g/100g, and 26.83g/100g of sample. The average ash, fat, and protein content of Chowmein, Samosa, Panipuri and Chole samples was 1.213, 2.34, 1.02 and 3.25g/100g (ash), 20.2, 19.46, 17.3 and 20.46g/100g (fat), and 19.56, 22.37, 10.81 and 26.25g/100g (Protein) respectively. The average carbohydrate content of Chowmein, Samosa, Panipuri and Chole (Table 4.3.5) was 27.527g/100g, 28.6g/100g, 37.41g/100g, and 23.21g/100g. The average calories provided by 100g of Chowmein, Samosa, Panipuri and Chole were 527 Kcal, 262 Kcal, 180-215 Kcal, and 180 Kcal. Samosas, pani puris, chawmein and chole bhature are a few examples of popular street cuisine. The majority of street food in India is made by deep-frying in fat. Consuming a diet that is high in calories, sugar, and fat might cause

consumers (adults, adolescents) to develop obesity, hypertension, dyslipidemia, cardiovascular illnesses, and impaired glucose tolerance at a young age.

- Four different organisms were isolated from the samples from open stalls: *S. aureus* was found in cooked spicy chickpeas, *Campylobacter lanienae* in samosa, *Priestia megaterium* in chowmein, and *Klebsiella* sp. in spicy pani puri. In total, four different organisms were isolated from the samples from indoor shops: *Lactobacillus acidophilus* from cooked spicy chickpeas, *Brevibacterium linens* from samosa, *Staphylococcus epidermidis* from chowmein, and *E. coli* from spicy pani puri. The finding of this study concluded that the sample collected from the open stall were contaminated with pathogenic bacteria which showed the unhygienic nature of the food and not good for health. While the food sample collected from the closed stall of mall were contaminated with non-pathogenic bacteria that showed the hygienic nature of the food and can be consumed without any health problem.
- The results of the study indicated that the overall food handler's food handling practices scores were lower than their knowledge scores based on the questionnaire responses. Out of total vendors only 23.33 % vendors have adequate knowledge and 76% vendors have poor knowledge, where as there was no evidence of vendors having high level of knowledge. Only 1.7 % vendors have good practices and 98.3% vendors have poor practice, where as there was no evidence of vendors having excellent level of practice. All the sampled vendors have negative (low) attitude towards the food safety.
- The descriptive statistics for pre-intervention knowledge of hygiene among vendors are 2.3 with S.D. of 1.2, and the score after intervention is 3.3 with S.D. of 1.0, indicating that the average knowledge score improved with improved variability. The knowledge t-statistic was 7.0 and statistically significant as the p value was 0.00 at the 5% level of significance; this suggests that the study was unable to accept the null hypothesis. As a result, the intervention is effective in improving the vendor's knowledge.

- The descriptive statistics for the pre-intervention score of hygienic attitude among vendors is 2.5 with S.D. of 1.1, whereas the score after intervention is 2.9 with S.D. of 1.2, indicating that the average attitude score was improved with improved variations. The t-statistic for the attitude was 2.40 and statistically significant as p value is 0.01 at 5% level of significance; this indicates that study unable to accept the null hypothesis. This results that intervention is effective to improve the attitude of the vendor.
- The descriptive statistics for pre score of practice of hygiene among vendors is 10.4 with S.D. of 2.7, where as the score after intervention is 11.5 with S.D. 2.7, these statistics' shows that average practice score was improved with improved variations. The t-statistic for the practice was 3.12 and statistically significant as p value is 0.00 at 5% level of significance; this indicates that study unable to accept the null hypothesis. This results that intervention is effective to improve the practice of the vendor.

Testing of Hypothesis

Ho1: Age have no significant influences on FSK, FSA, FSP.

It was observed from the table no. 4.5.1.1 that there was no age significant influences on FSK, FSA, and FSP, hence the null hypothesis was accepted and simultaneously proven.

Ho2: Education have no significant influences on FSK, FSA, FSP.

It was observed from the table no. 4.5.1.2 that there was no education significant influences on FSK, FSA, and FSP, hence the null hypothesis was accepted and simultaneously proven.

Ho3: Experience have no significant influences on FSK, FSA, FSP.

It was observed from the table no. 4.5.1.3 that there was no experience significant influences on FSK, FSA, and FSP, hence the null hypothesis was accepted and simultaneously proven.

Ho4: There are no significant differences in FSK, FSA, FSP among Male and Female.

It was observed from the table no. 4.5.1.4 that there was no gender significant influences on FSK, FSA, and FSP, hence the null hypothesis was accepted and simultaneously proven.

Ho5: Training have no significant influences on FSK, FSA, FSP

It was observed from the table no. 4.5.1.5 that there was no training significant influences on FSK, FSA, and FSP, hence the null hypothesis was accepted and simultaneously proven.

Ho6: There is no significant effect of intervention on Knowledge.

It was observed from the table no. 4.7.1 that there was significant effect between pre and post intervention score of knowledge, hence null hypothesis was rejected and simultaneously proven.

Ho7: There is no significant effect of intervention on Attitude.

It was observed from the table no. 4.7.2 that there was significant effect between pre and post intervention score of attitude, hence null hypothesis was rejected and simultaneously proven.

Ho8: There is no significant effect of intervention on Practices.

It was observed from the table no. 4.7.3 that there was significant effect between pre and post intervention score of practices, hence null hypothesis was rejected and simultaneously proven.

Conclusion

Millions of people consume street foods, which play an important socioeconomic role in many nations. Many regional food authorities play an important role in enhancing street food food safety. In a country like India, where unemployment is widespread, a huge section of the population still lives in poverty. Many people are ignorant and lack formal education; they are also quite poor. A food safety training programme that incorporates both theoretical and practical activities is an essential tool for food handlers to apply what they've learned. Vendor training programmes are required to educate vendors on food safety and sanitary practices, as well as to adapt their requirements to their circumstances. To promote safe food handling knowledge and attitudes, the government should put into place necessary measures as well as suitable food hygiene norms and regulations. The amount of experience among the vendors rises along with knowledge and attitude levels. Then, through training, vendors might be made aware of the advantages of food safety knowledge, attitudes, and practices in order to maintain

the standard of street food and contribute to the public's protection against microorganisms and communicable illnesses.

Recommendations

- Further research should be carried out in street food vendors for effective planning and implementation of control programs.
- Periodic distribute PPE Kit and awareness training program can be organized at municipal level.
- Awareness and training programs necessary to improve the food safety knowledge, attitudes and practices among vendors. In addition to awareness training programme, supportive measures such as financial aid and constant monitoring are required to improve food safety practices and vendor personal hygiene.
- Future research should concentrate on identifying the microorganisms from food handlers and utensils as well as, to laboratory analysis of water used for washing utensils and preparing street food. Determining periodic evaluation of nutrient content and microbial quality of the street food in the laboratory.