



Awareness, Knowledge and Storage Practices of Street Food Vendors concerning Food Safety in Mohali, Punjab, India.

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ABSTRACT

Consumption of street foods as they includes variety of cuisines has recently increased in popularity especially in emerging nations, including India. The large scale utilization of street foods is linked with higher risks of food-borne diseases such as cholera, diarrhea, typhoid and food poisoning. The aim of this study is to determine the awareness, knowledge and storage practices of street food vendors in Mohali district, Punjab, India. In this study, three main surveys were conducted. The first survey utilised questionnaires to determine the street food vendor's knowledge of food safety, while the second survey used questionnaires to assess the vendor's knowledge of food storage practises and street food safety. The observation of the general food safety and the socio-demographic traits of the vendors were analysed using a checklist in the following section. Total 100 street food vendors participated in the survey which were selected using a random sampling technique. Out of the total respondents 90% of the street vendors were male while only 10% were females. All of the vendors i.e., 100% had never taken a course or training on food safety and hygiene techniques and only 10% had done training in food preparation and preservation techniques, in terms of formal education. The study found that while street food vendors had low knowledge of food safety, they were generally aware of it and used reasonable storage practises. This showed that although they had a moderate level of awareness, knowledge, and storage practises regarding the fundamental food safety parameters, they were not putting those practises into practise on a daily basis, which is a major factor in the degradation of the quality of street foods.

KEYWORDS: Awareness, Food preparation, Food Safety Knowledge, Hygiene, Preservation, Street Foods, Storage practices, Safety measures

1. INTRODUCTION:

Food safety is defined as an affirmation that the food is suitable for human consumption. Knowledge, awareness, proper handling, preparation and storage of food are all necessary in order to stop outbreaks of food borne illness in general public. Food safety has become a significant health concern (WHO, 2004). Ready to eat foods, consumables like beverages and

foods served in public places including bus stops, streets, footpaths, next to schools or colleges, offices and government buildings, market places and many locations are referred to as street foods. (Bhattacharjiya and Reang 2014). Street foods may be eaten on the spot or can be transported and consumed elsewhere (WHO, 1996). Anyone who works with food, whether they cook it or serve it, is considered a food vendor (Isara & Isah, 2009) and hence the vendor being the primary exposure to food, they play a key role to ensure street food safety. Due to increases in the number of sponsorships and in low and middle income nations, the street food vending industry has witnessed significant growth and it provides a wide range of clients with access to wide range of cheap foods (Chukuezi, 2010). Street foods are typically consumed in great quantities and valued for their distinctive flavours, low price, convenience, and flavour linkages to social and cultural heritage (Aluko et al., 2014). The street food vending industry is of an informal nature and no relevant authorised government body regulates it (Nkosi and Tabit, 2021). Due to the outbreaks or widespread food borne diseases occurring due to street food consumption and selling food on the street has become a serious problem for public health. (Rane S., 2011). According to the World Health Organization (WHO), microorganisms that enter the digestive system through the consumption of contaminated food can cause disease that are either infectious or poisonous and can be caused by (WHO, 2007). The safety of food prepared and sold under unhygienic conditions cannot be assured, as one cannot see pathogens in food by their naked eyes (Kaferstein, 2003). According to research, millions of people are hospitalised and die each year from food borne illness brought on by eating tainted food or street food (Knight et.al.,2003). People who consume street foods are said to have food poisoning, cholera, diarrhoea, typhoid and other food borne illnesses quite frequently (Rane S., 2011). Food handlers may handle food improperly or exhibit a minimal lack of hygiene, allowing microorganisms to come in contact with it. In rare situations, these pathogens may survive and grow in sufficient numbers to infect consumers with food borne illnesses (Abdalla *et. al*, 2009). Many SFVs frequently use inferior food handling techniques, exposing food to cross contamination and storing it at the wrong temperature and time (Oteri & Ekanem, 1989). As a result of unclean conditions in which the food is cooked, served and consumed, there is prevalent belief among customers that the street foods are usually unsafe (Muinde & Kuria, 2005). Many people from households with low incomes who work as street food vendors rely heavily on the street food vending system for their income (Choudhry *et.al.*, 2011). This study was conducted

to develop an understanding about the awareness, knowledge and storage practices followed by the street food vendors in Mohali, Punjab, India.

2. MATERIALS AND METHODS:

2.1 Study site and area

The primary purpose of the study was to examine the street vended food safety and levels of knowledge, awareness and storage practices of food vendors in Mohali district, Punjab, India. Streets, footpaths, markets and areas close to schools and universities were all used in the study, where the street food vendors have installed their carts or moving with their carts on streets. Mohali is officially known as Sahibzada Ajit Singh Nagar with an estimated surface area of 400 km². The Mohali district have an estimated population of 176,152 people, with the sex ratio of 0.911 males /female and the population comprised of 92,407 males and 83,745 females (2011 census). The city has 600 major neighbourhood parks, 547 government school, many private schools, 78 colleges and multiple markets where street food vendors operate. The main jobs held by locals are in retail, commerce, farming and paid work for the government and commercial businesses. The residents practice Sikhism, Hinduism, Islam, Christianity.

2.2 Study design and data collection:

The primary goal of the survey was to examine knowledge, awareness, and storage practices of street food vendors about food safety. The questionnaire utilized in the study was self designed questionnaire with reference from the previously used questionnaire in the previous studies which includes Thanh T. N. C. (2015), Madhwal, S., and Sharma, S. (2019), Abraham, S., and Krishnan, T. A. (2017), Akabanda, F. *et.al.*, (2017) and Hossen, M. *et.al.*, (2020). This questionnaire was translated into Hindi and English in order to perform the study and use it in Mohali. The survey was divided into five categories, including sociodemographic data, food safety awareness, food safety knowledge, safe storage practices, and survey-related observations. The researcher randomly sampled and approached the food vendors to voluntarily take part in the study up until the completion of 100 vendor target. The majority of respondents were too uneducated to comprehend and complete the questionnaire on their own, thus the researcher

assisted them in order to get accurate information and translation of questionnaires was done for participants during survey conduction. The questionnaire's first section asked about the sociodemographic characteristics of the food vendors, including their residential area, age, sex, marital status, smoking status, type of family, size, level of education, annual income, and whether or not they have successfully completed both food preparation and preservation (TFPP) and food safety and hygiene (TFSH) training. The food safety awareness component of the questionnaire was designed to gauge the vendor's degree of food safety and personnel hygiene, cooking methods, the cleanliness of the water, food pathogens, proper cleaning of raw fruits and vegetables, pre-cooking preparations, and the significance of wearing safety gears. The food safety awareness section contains 14 questions with each question has 5 possible answers such as 'always', 'frequently', 'sometimes', 'rarely', and 'never' and each response of the respondent was awarded with five, four, three, two and one point, respectively. A maximum of 60 points could have been obtained by the respondent in section and with minimum score of 14 points. The total scores were then changed to their equal in order to calculate the outcomes using the $60 = 100$ formula. The scores obtained by individual respondents were categorized into poor, median (adequate) or good food safety awareness. Based on the scores obtained like score of < 50 , 50 to 75 and >75 were considered to be as depicting a poor, median (adequate) and good food safety awareness levels respectively. The questions in the following section are meant to gauge the understanding of vendors regarding food safety. The questions in this part tested the understanding of topics related to food safety, food hygiene, food contamination, cooking methods, applications of worker safety precautions and sterilisation procedures. This section consists of total 14 questions with each question has 2 possible answers 'yes' and 'no'. Each 'yes' in response to a correct answer received one point, whereas a 'no' response to an answer received zero points. A maximum of 14 points could have been scored by the respondent. The total scores were converted to its equivalent such as $14=100$ which were analyzed with the same method used in previous section. The food storage section of the questionnaire was analyzed similar to previous food safety awareness section of the questionnaire, in this section total 18 questions were asked which gives a maximum score of 90 points which were converted to its equivalent such as $90=100$ for analysis purpose, which were further analyzed with the same method used in previous sections.

2.3 Data analysis:

The survey's findings were compiled in excel sheets and each response of survey was converted into likert scale for analysis purpose and with the use of R programming software the responses were analyzed to determine the main variables and obstacles that prevents street food sellers from ensuring the safety of their food. The factors of the interest were summarised using descriptive statistics. P 0.05 was used to indicate statistical significance at a 95% confidence level. The age, residential area, sex, marital status, smoking status, type of family, family size, educational level, annual income, TFSH status and TFPP status were scored according to likert scale and results were separated into many categories. The general food safety, awareness, knowledge, storage practices, diseases prevalence among food vendors and general hygienic conditions observed during survey, the responses of all these parameters in the survey were converted into likert scale and their results were categorised on the basis of different cut off points. Age cutoffs for descriptive analysis were <30, 30 to 45 and >45 years. The cutoff points for respondents' annual income from the food vending business were <2, 2 to 5 and >5 lakhs per annum. The cut off points of awareness, knowledge and storage practices followed by the food vendors were <50, 50 to 75 and >75 mean scores of the respondents and these scores provided with the poor, moderate (adequate) and good categories of scores of the respondents, respectively. In order to determine the means, standard deviations, median, mode, percentage, range, maximum and minimum values of the awareness, knowledge and storage practices scores, descriptive statistical analysis were carried out. The level of significance of the respondents' results was determined using z-test at 95% level of confidence and the hypothesis was accepted or rejected in accordance with the test's findings.

3. RESULTS AND DISCUSSION:

3.1 Socio demographic results of the respondents:

The population is divided into three categories based on their residential area. Slums make up 10% of the population, while 70% reside in rural areas and 20% live in cities. The mean residential area is 33.33 ± 32.14 . The population is categorized into three age groups. 20% of the population are under 30 years old, while 80% of the people are between the ages of 30 and 45 and there are no individuals above 45 years old and the mean age is 50 ± 42.42 . The population is mostly male, with 90% being males and 10% females. The population has a majority of married individuals (85%), followed by unmarried individuals (12%), divorced individuals (2%), and widowed individuals (1%). The mean of marital status is 25.00 ± 44.97 . Among the population, 60% are smokers, 30% are non-smokers, and 10% smoke occasionally. The mean smoking status is 33.33 ± 25.16 . Most of the population (80%) belongs to joint families, while the remaining 20% are from nuclear families. There are no individuals without a family. The mean of family type is 33.33 ± 41.63 . The population has varying family sizes, with 20% having a family size of less than or equal to 4, 70% having a family size between 5 and 8, and 10% having a family size of more than 8. The mean family size is 33.33 ± 32.14 . The education level

of the population shows that 10% are uneducated, 40% have education up to the matriculation level or below, 40% have secondary education, 10% have a diploma, and none of them have graduated or attained a higher level of education. The mean education level is 20.00 ± 18.70 . The vendor's annual income is categorized into three groups. 10% have an income below Rs. 2 lakh, 90% have an income between Rs. 2 and 5 lakh, and none of them have an income above Rs. 5 lakh. The mean annual income is 33.33 ± 49.32 . Nobody in the respondents have completed TFSH (Training on Food Safety – Hygiene). 10% of the respondents have completed training in food preparation and preservation (TFPP), while 90% do not have done TFPP.

Table 1: Socio demographic information of the street food vendors:

Characteristics	Number (%)	Mean \pm Standard deviation
Residential area		
Slum	10 (10%)	33.33 \pm 32.14
Rural	70 (70%)	
Urban	20 (20%)	
Age		
<30 years	20 (20%)	50 \pm 42.42
30 to 45 years	80 (80%)	
> 45 years	0 (0%)	
Gender		
Male	90 (90%)	33.33 \pm 56.56
Female	10 (10%)	
Other	0 (0%)	
Marital status		
Married	85 (85%)	25.00 \pm 44.97
Unmarried	12 (12%)	
Divorced	2 (2%)	
Widowed	1 (1%)	
Smoking status		
Yes	60 (60%)	33.33 \pm 25.16
No	30 (30%)	
Sometimes	10 (10%)	
Type of family		
Joint	80 (80%)	33.33 \pm 41.63
Nuclear	20 (20%)	
No family	0 (0%)	
Family size		
Less than or equal to 4	20 (20%)	33.33 \pm 32.14
5 to 8	70 (70%)	
More than 8	10 (10%)	
Education level		
Uneducated	10 (10%)	20.00 \pm 18.70
Matric or below	40 (40%)	
Secondary education	40 (40%)	
Diploma	10 (10%)	

Graduation or higher	0 (0%)	
Annual income <Rs. 2 lakh Rs. 2 to 5 lakh >Rs. 5 lakh	10 (10%) 90 (90%) 0 (0%)	33.33 ± 49.32
TFSH status Yes No Once	0 (0%) 100 (100%) 0 (0%)	33.33 ± 57.73
TFPP status Yes No Once	0 (0%) 90 (90%) 10 (10%)	33.33 ± 49.32

*TFSH (Training on Food Safety – Hygiene)

*TFPP (Training on Food Preparation – Preservation)

3.2 Food safety awareness results:

Out of total 100 respondents, none of them received a score below 50, indicating that all respondents had atleast a basic understanding of food safety awareness. The majority of the respondents (69%) had scored between 50 and 75, while a smaller percentage (21%) scored above 75. The mean score obtained by the respondents is 64.91 ± 12.50 . The average score reveals the general level of knowledge regarding food safety among Mohali's street food sellers. Range of scores obtained by respondents is from 51.48 to 91.52. The minimum and maximum values in this range demonstrate the degree of score variance. It implies that the street food vendors in Mohali have varying degrees of knowledge about food safety. The mode is 64.35, which represents the most frequently occurring score among the respondents. This suggests that a significant number of respondents had a score close to 64.35, indicating a concentration of scores around that value. The median of score is 60.75. Overall, with some fluctuations in the results, it was discovered that the majority of street food sellers in Mohali have a moderate level of food safety awareness.

Table 2: Food safety awareness scores:

Scores obtained by respondents	Number of respondents	Percentage of respondents	Mean ± Standard deviation	Range	Mode	Median
Score : <50	0	0%	64.91±12.50	51.48- 91.52	64.35	60.75
50 to 75	69	69%				
>75	21	21%				

The sample mean for food safety awareness score is 45.4, indicating the average level of awareness among the sampled street food vendors. The calculated z-score is 0.4576167. The z-score calculates how far the sample mean deviates from the population mean by standard deviations. In this case, the z-score suggests that the sample mean is approximately 0.4576 standard deviations above the population mean. 1.959964 is found to be the critical value of the two-tailed test. In hypothesis testing, the critical value is used to determine cutoff point in order to rule out the null hypothesis. The null hypothesis is rejected if the absolute value of the z score is greater than the critical value. The p-value is 0.6472279. The likelihood of getting a sample mean that is as extreme as observed value is represented by the p-value, assuming that the null hypothesis is true. In this case, p-value is 0.6472279 which indicates that there is a 64.72%, if the null hypothesis is accurate, there is a probability of seeing a sample mean as severe as 45.4. Based on the p-value being greater than the significance level (typically set at 0.05 or 5%), the decision is made to fail to reject the null hypothesis. Null hypothesis (H₀) claims that street food vendors are only moderately mindful of food safety. In this situation, null hypothesis is accepted. On the basis of z-test results, sufficient data is available to conclude that street food vendors have a moderate understanding of food safety.

Table 3 : Food safety awareness z- test

Z test
Food Safety awareness
Sample mean : 45.4
Z Score : 0.4576167
Critical value (two – tailed test) : 1.959964
P- value : 0.6472279
Fail to reject null hypothesis and hence null hypothesis accepted.

3.3 Food Safety Knowledge results:

Out of total 100 respondents, 69 respondents had scored less than 50, which accounts for 69% of the total respondents. The range of scores in this category is 28.56 to 78.56. 21 respondents had scored between 50 to 75, which represents 21% of the total respondents. 10 respondents had scored greater than >75, which accounts for 10% of the total number of respondents. The mean score in this category is 45.76 ± 17.93 . The mode is reported as 28.56. The median is found to be 35.70 when the dataset is organised in ascending order, is the middle value. This information suggests that the majority of Mohali's street food sellers have a knowledge score for food safety that is below 50. The mode being 28.56 indicates that this score is the most common among the respondents. However, the presence of respondents in the other two categories (Score 50 to 75 and Score >75) suggests that there were some vendors with better food safety knowledge, although they represent smaller portion of total respondents.

Table 4 : Food safety knowledge scores:

Scores obtained by respondents	Number of respondents	Percentage of respondents	Mean \pm Standard deviation	Range	Mode	Median
Score : <50	69	69%	45.76 \pm 17.93	28.56 – 78.56	28.56	35.70
Score : 50 to 75	21	21%				
Score : >75	10	10%				

The sample mean is calculated to be 6.5, this represents the study participants' average knowledge score on food safety. The z-score is -1.989975. In this case, the sample mean is below the population mean, as indicated by negative z-score. A two-tailed test's critical value is 1.959964. This value indicates the threshold beyond which the results are considered statistically significant. The p-value is 0.0465937. The likelihood of the observed data, if the null hypothesis is true, is represented by the p-value. In this case, p-value suggests that there are 4.65937% chance of observing the given results, if the null hypothesis is assumed to be correct. The null hypothesis is rejected since the p-value is less than the significance level which is commonly 0.05. Rejecting the null hypothesis in this case, means that there is considerable variation in participants understanding about food safety knowledge. The analysis of the data leads to the conclusion that there is evidence to support the assertion that the participants' knowledge of food safety deviates significantly from the population mean.

Table 5 : Food safety knowledge z test.

z-test Food safety knowledge Sample Mean: 6.5 Z-score: -1.989975 Critical Value (two-tailed test) : 1.959964 P-value: 0.0465937 Reject the null hypothesis and hence alternate hypothesis accepted.

3.4 Food's safe storage practices results:

The scores obtained by the respondents range from <50 to >75. However, there were no respondents who scored less than 50. Out of the total number of respondents, 70% (70 respondents) scored between 50 and 75, while the remaining 30% (30 respondents) scored above 75. The mean score obtained by the respondents is 72.81 \pm 5.44. On average, the respondents have achieved a moderately high score in safe storage practices. The range of scores obtained by the respondents is from 65.49 to 79.92. This indicates the variability in scores and suggests that while some respondents scored relatively lower, others achieved higher scores. The mode of the

scores is 66.6 which is the most frequently occurring score indicating a concentration of responses around this value and the median score is 73.81 which indicates that half of the respondents scored above 73.81, while the other half scored below it. Overall, the information shows that most street food sellers in Mohali, approximately 70%, follow safe storage practices to some extent, with a mean score of 72.81. However, there is still room for improvement as some respondents scored relatively lower, highlighting the need for further efforts to enhance safe storage practices among street food vendors.

Table 6: Food's Safe Storage practices scores.

Scores obtained by respondents	Number of respondents	Percentage of respondents	Mean ± Standard deviation	Range	Mode	Median
Score : <50	0	0%	72.81 ± 5.44	65.49 – 79.92	66.6	73.81
50 to 75	70	70%				
>75	30	30%				

The average score of safe storage practices in the sample is 65.6. The calculated z-score is 1.222688. The sample mean in this instance is 1.222688 standard deviations higher than the population mean. The two-tailed test's critical value is 1.959964. The critical value is the point at which the null hypothesis can be ruled out. In this case, it represents the threshold for determining statistical significance. The calculated p-value is 0.2214475. The p-value is the likelihood that the null hypothesis will hold if outcomes are as extreme as the observed data. The p-value in this instance is 0.2214475, which is higher than the usual significance threshold of 0.05. We are unable to rule out the null hypothesis because the p value is higher than the significance level. Typically the null hypothesis claims that there is no discernible difference or influence. This context defines it as that there is no significant difference in food safe storage practices compared to a predetermined standard or expectation. According to the interpretation of the data, there isn't enough information to justify a major deviation from the expected standard or hypothesis in terms food safe storage practices.

Table 7: Food's safe storage practices z- test

z- test Safe storage practices Sample Mean: 65.6 Z-score: 1.222688 Critical Value (two-tailed test): 1.959964 P-value: 0.2214475 Fail to reject the null hypothesis

4. Conclusion

This study was successful in assessing the awareness, knowledge, and storage practices regarding food safety among street food sellers in Mohali, Punjab, India. Along with these three major objectives the study also achieved findings of socio demographic characters of street food vendors. Although the surveyed vendors were found to had moderate awareness and food storage practices status, while they were found to have poor to adequate food safety knowledge status. The findings also revealed that most street food sellers had very little formal education and no experience in food safety, which is a significant contributor to the dangerous (unhygienic) conditions in which the meals are served. It is emphasised in the research that there is need for education on foodborne and communicable diseases, food safety awareness, knowledge, storage practices, the importance of vaccination, and the significance of maintaining good hygiene practices to minimize health risks for both the vendors and their customers. Street foods are basically consumed on very large scale and hence it is very crucial for the health of country's population that local government and Indian the food administration should cooperate more and should provide standard infrastructures for street vendors so they may get potable water, waste disposal facilities and toilets. Cross-contamination concerns can be reduced by providing these standard infrastructures, and people will have access to clean and wholesome food options.

5. Limitation and recommendations:

- i. The study was conducted in the Mohali regions of Kharar, Landran, and Zirakpur due to time and resource constraints. Only one low-income areas were picked, which may have resulted in an unfair representation of study participants. This selection of areas based on the researcher's convenience may have biased the study.
- ii. The size of selected samples i.e., 100 respondents taken in the survey were was randomly selected and were not computed thoroughly, which may have also influenced the study's findings since the vendors were not categorised based on any specific traits.
- iii. Although the survey of street food vendor's knowledge, awareness, and storage procedures regarding food safety was held in several sites, including those near markets, parks, or public places. In the end, substantial percentage of the voluntary participants were from those locations. This decision may have influenced the vendors' assessed levels of knowledge, awareness, and storage practises regarding food safety due to the significant proportion of standard infrastructural facilities that were not available.

If this study were to be expanded, it is strongly advised that the following crucial factors be considered:

- i. To fully assess the danger of consuming street food-borne pathogenic bacteria, some common pathogens that can be found in ready-to-eat meals, such as Salmonella, Campylobacter, and Clostridium perfringens, should have been studied.

- ii. While preparing, processing and selling street foods, water has the potential to contaminate the foods, hence it should have been possible to examine the microbiological status of the potable water that street vendors use.
- iii. The quality of the raw ingredients used by the vendors may have been examined microbiologically, as the likelihood of food contamination depends on quality of raw ingredients used in preparation of food.

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