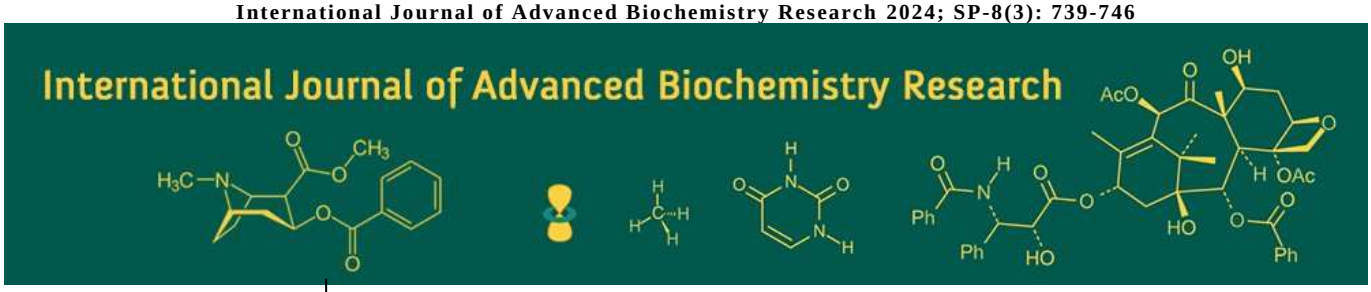

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Study on food safety standards practiced by street food vendors & household women in Varanasi district

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Abstract
Food safety is an important issue that affects the health and wellbeing of people around the world. This research investigates the food safety standards practiced by both street food vendors and household women in the Varanasi district of India. Street food, a popular and affordable choice for millions in developing nations, is a longstanding tradition in India driven by factors such as affordability and convenience. However, the unhygienic preparation of street foods poses potential health hazards. Street vendors often lack formal training in food safety protocols, leading to an increased risk of foodborne illnesses. This study employs a purposive cum random sampling approach to assess the food safety practices of 50 household women and 20 street food vendors. Data collection involves interviews and observations, with both quantitative and qualitative analyses conducted to explore various aspects of food safety standards.

The findings reveal disparities in food safety knowledge and practices among respondents, highlighting the need for targeted awareness and training initiatives. By enhancing adherence to food safety standards, street food vending can continue to offer a viable livelihood opportunity for the urban poor while ensuring consumer safety. Additionally, the study sheds light on the existing working conditions of street vendors, emphasizing the importance of addressing issues such as income, working hours, and discrimination by municipal authorities. The results indicate that while a significant proportion of both household women and street food vendors demonstrate awareness of food safety measures, there are notable gaps in implementation. Factors such as age, education, and social group influence the adherence to food safety standards, underscoring the importance of tailored interventions. Recommendations include targeted training programs and regulatory measures to improve food safety practices among both street food vendors and household women, thereby mitigating the risks of foodborne illnesses and enhancing consumer confidence in street food consumption.

Keywords: Food safety standards, street food vendors, household women, hygiene awareness, foodborne illness

1. Introduction

Street food, consisting of ready-to-eat items sold by vendors and hawkers, is a popular and affordable choice for millions in developing nations (Pokhrel *et al.*, 2016) [14]. For a significant portion of the Indian population, consuming street food has been a long-standing tradition, driven by factors such as affordability and the limited availability of traditional restaurants (S. Mishra, 2004) [15]. Moreover, the convenience and economical prices associated with street food make it the preferred choice for migrant laborers residing in major metropolitan areas (Choudhury M. *et al.*, 2011) [7]. However, these foods are often prepared under unhygienic conditions with little regard for the quality of raw materials, posing potential health hazards (Singh *et al.*, 2018) [16]. While large companies adhere to safety protocols like HACCP to prevent contamination, street vendors rarely receive formal training (Njaya, 2014) [12]. The burden of foodborne illnesses is widespread, afflicting both developed and developing nations, with the latter bearing a more significant brunt of these diseases (Aziz, S.A.A., & Dahan, H.M.; 2013) [6]. Street foods serve as a major source of cuisine for millions, yet they are often linked to foodborne illnesses. Educating street food vendors on maintaining proper hygiene is imperative to ensure food safety (Singh A.K. *et al.*, 2016; Liu, S, 2014) [17, 9]. Poor hygiene practices such as handling food with bare hands, not covering hair or wearing aprons are common (Singh *et al.*, 2018; Alimi, 2016) [16, 4].

Non-compliance with food safety guidelines risks outbreaks of foodborne illnesses, which contribute to over 2 million annual deaths globally, mostly among children (Abdulkareem *et al.*, 2014; WHO; Nayansi *et al.*, 2014) [1, 11].

Amidst the COVID-19 pandemic, heightened awareness of hygiene has become evident. Agarwal & Verma's (2024) [2]; Joshi A. & Shadale M.'s (2021) [8] and Albattat, A., *et al.* (2022) [3] studies found that customers prioritize safety measures such as takeaway options over taste and cost when selecting street vendors post-lockdowns, reflecting increased caution regarding safe food handling practices. Verma R. *et al.* (2023) [19] highlighted significant disparities among street vendors in terms of qualifications, knowledge, attitudes, and practices related to food safety. These findings underscore the necessity for targeted awareness and training initiatives to enhance food safety knowledge, attitudes, and practices among this vital segment of the urban food supply chain. By promoting adherence to food safety standards, street food vending can continue to offer a viable livelihood opportunity for the urban poor in cities like Varanasi while safeguarding the safety and well-being of consumers (Malhotra S., 2017; Pooja K., 2020) [10, 13]. Additionally, it is critical to note that the existing working conditions of street vendors have not changed in regard to income, working hours, health, and access to finance, workplace safety, and discrimination by municipal authorities, among other critical aspects.

2. Materials and Methods

2.1 Sampling Design

The study aimed to evaluate the food safety practices of both household women and street food vendors. A purposive cum random sampling approach was employed. One household woman residing in BHU Campus and one street food vendor near Lanka were randomly chosen based on availability and suitability for investigation. A total of 50 household women and 20 street food vendors operating in busy streets were included in the sample.

2.2 Tools and Techniques

A pre-tested interview questionnaire schedule was developed to gather necessary data from both household women and vendors regarding their food safety practices. The questionnaire covered aspects such as general requirements, health and hygiene standards, and cleaning and sanitation maintenance in the study area. Data collection involved asking participants various questions and making observations as required by the study protocol.

2.3 Data Analysis

Quantitative data collected from the surveys were analyzed using appropriate statistical techniques such as descriptive statistics to summarize the characteristics of the study population and inferential statistics to examine association between variables whereas, the qualitative data, including open-ended responses from the questionnaires, were thematically analyzed to identify common themes and patterns related to food safety practices.

3. Results and Discussion

3.1 Basic Characteristics of Sample Respondents.

The demographic characteristics of household women, including age, education, and social group, are summarized in Table 1. The distribution by age group reveals that 52% of women were below 35 years old, 34% fell within the 36-54 years range, and 14% were aged 55 years and above. Regarding education, 4% were categorized as illiterate, while 12%, 22%, 26%, and 36% possessed qualifications below high school, high school, intermediate, and graduate levels respectively. Social-economic categorization showed that 10% belonged to SC and ST groups, 34% to OBC, and 56% to the General category. In terms of occupation, 66% were identified as housewives, while 34% were professionals. Monthly family income varied, with 32% reporting less than Rs 10,000, 20% reporting Rs 10,000-20,000, and 48% reporting above Rs 20,000. Notably, a majority of households in nuclear family setups reported higher consumption of street foods (52%), whereas joint families and extended families accounted for 36% and 12%, respectively.

The demographic characteristics of street food vendors, encompassing age, education, and social group, are outlined in Table 2. Analysis by age group indicates that 45% of vendors were below 35 years old, 30% fell within the 36-44 years range, and 25% were aged 45 years and above. Regarding education, 55% of vendors had qualifications below high school, 40% had attained high school to intermediate qualifications, and 5% were graduates. Social status distribution revealed that 10% of vendors belonged to SC & ST groups, while OBC and General Caste groups accounted for 45% each.

Table 1: Basic characteristics of household women

Variables	Categories	Count	Percentage (%)
Age	Up to 35 years	26	52
	36 to 54 years	17	34
	55 and above	7	14
Education	Illiterate	2	4
	Below High school	6	12
	High school	11	22
	Intermediate	13	26
	Graduate	18	36
Social group	SC/ST	5	10
	OBC	17	34
	General	28	56
Occupation	Housewives	33	66
	Professionals	17	34
Monthly family income	< 10000	16	32
	10000 -20000	10	20
	>20000	24	48
Family consume street foods	Nuclear	26	52
	Joint	18	36
	Extended	6	12

Table 2: Basic characteristics of Street Food Vendors

Variables	Categories	Count	Percentage (%)
Age	Upto-35 Years	9	45
	36-44 Years	6	30
	45 & above	5	25
Education	Below High School	11	55
	High School – Intermediate	8	40
	Graduate	1	5
Social group	SC & ST	2	10
	OBC	9	45
	General	9	45

3.2 Food Safety Standards Practiced by Household Women

The distribution of household women across various age groups according to their adherence to low, moderate, and high food safety standards is depicted in Figure 1. The data suggests that a notable percentage of sampled individuals aged 55 years and above tended to follow moderate food safety standards. Similarly, Figure 2 showcases the distribution of household women across different education levels concerning their compliance with low, moderate, and high food safety standards. It was observed that the largest proportion of sampled women fell into the graduate education group. Moreover, Figure 3 highlights that among the sampled respondents belonging to the general category, the majority adhered to moderate food safety standards.

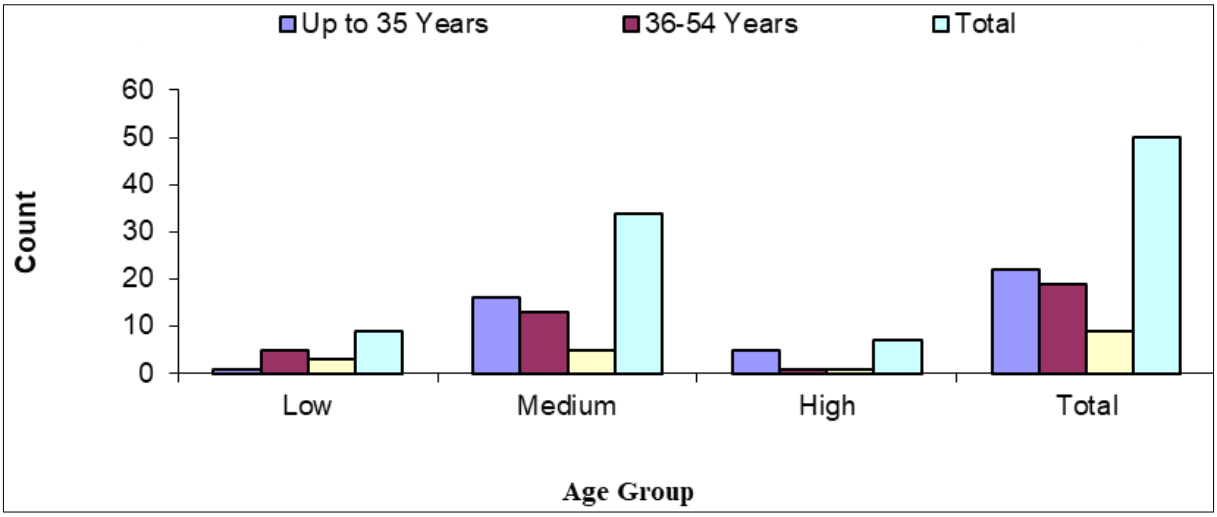

Fig 1: Cross tabulation of age vs food safety standards of household women

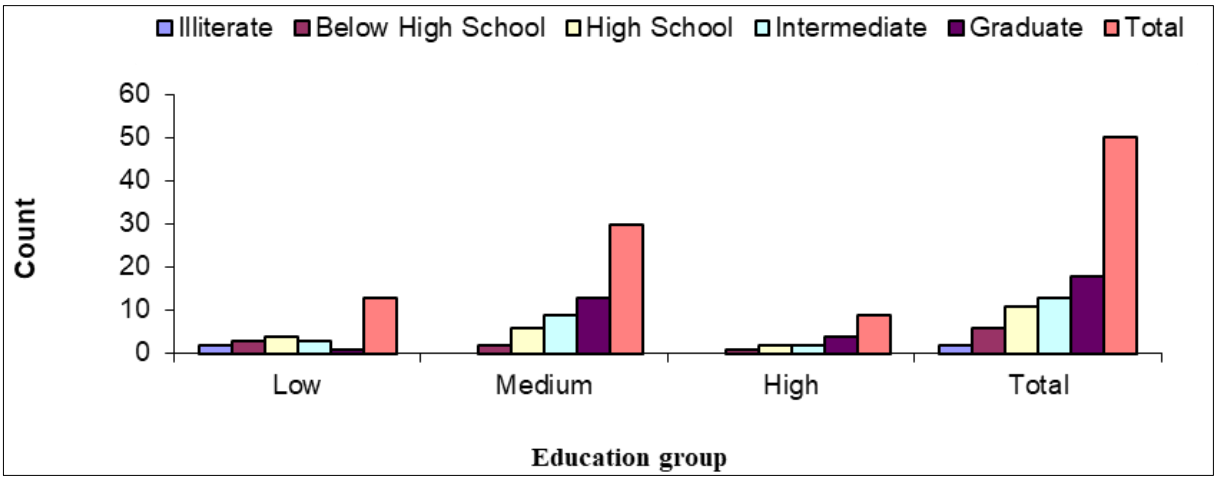

Fig 2: Cross tabulation of education qualification vs food safety standards of household women

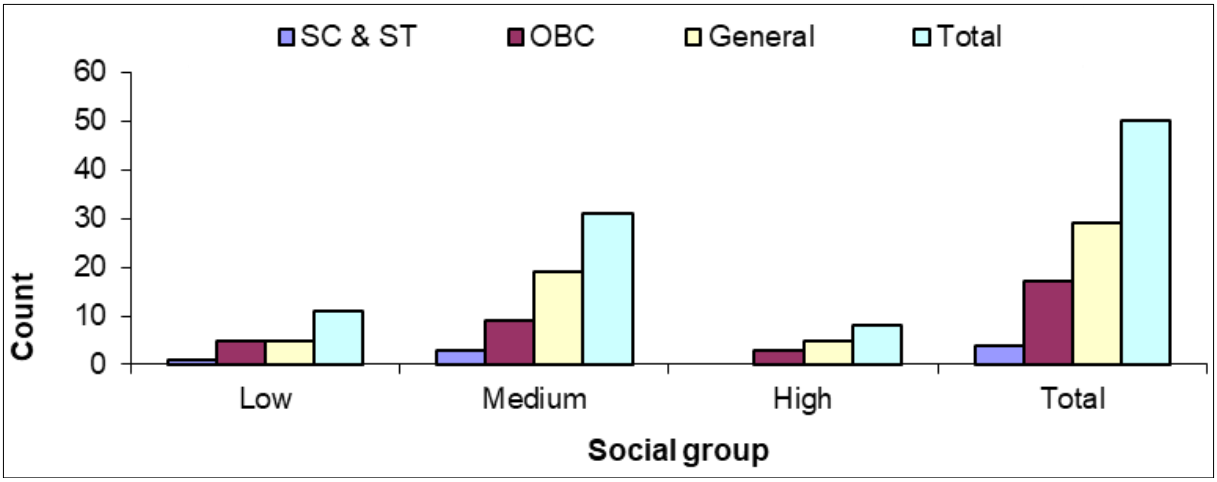

Fig 3: Cross tabulation of social group vs food safety standards of household women

Analysis of Food Safety Standards Practiced by Household Women

Table 3: General Requirements

Variables	Percentage (%)
Knowledge on food protected from the contamination while buying	78.6
Knowledge on food stored in contamination free environment	68.0
Knowledge on measures to prevent cross contamination	72.0
Knowledge on heating/ reheating procedures	73.3
Is ready to eat food stored protected from contamination	86.0
Practice of packaging in a manner that protects it from contamination	74.6
Practices of disposing or throwing out food	70.0
Frequency of cooking the food daily	87.3

The results pertaining to general food safety requirements are detailed in Table 4. Among these requirements, it was observed that a significant proportion of women followed specific practices: 87.33% cooked meals three times daily, 86% ensured the protection of ready-to-eat food from contamination, and 78.6% possessed knowledge on preventing food contamination during purchase. However, there was a lower level of awareness regarding the proper storage of food in contamination-free environments, with only 68% of households exhibiting this understanding. Overall, the majority of household women prioritized cooking meals three times daily, followed by ensuring the protection of stored ready-to-eat food from contamination, as evidenced by the findings presented in the table.

Table 4: Health and hygiene requirements'

Variables	Categories	Percentage (%)
Awareness regarding health hazard associated with fast food use	Present	66.0
	Absent	34.0
Consumption of street foods	Continued even after aware its health hazards	93.0
	Discontinued eating	7.0
Do you ensure domestic worker do not engage in food handling if they are suffering from a food-borne disease	-	94.0
Personal Hygiene		
Use of apron	Yes	28.0
	No	72.0
Short nails	Yes	74.0
	No	26.0
Bare hands	Yes	78.0
	No	22.0
Hair cover	Yes	14.6
	No	85.3
Cleanliness of clothing	Yes	86.0
	No	14.0
Hand washing	Before preparation of food	38.0
	After touching each food items	12.0
	After using toilets	10.6
	Before preparation of food + after using toilet	44.6

Among the health and hygiene criteria, the data presented in Table 4 reveals several notable findings. It indicates that less than half of the food handlers (38%) reported washing their hands prior to food preparation, with only 12% adhering to handwashing after handling each food item. Furthermore, a mere 10.67% of respondents mentioned washing their hands after using the toilet, while 44.67% claimed to follow handwashing practices at appropriate intervals. Interestingly, a significant majority of households (94%) ensured that domestic workers refrained from handling food during periods of foodborne illness. However, personal hygiene practices among women were reported at a slightly lower rate of 80%, with 72% not utilizing aprons and 85% neglecting to cover their hair. Additionally, characteristics such as short nails (74%), bare hands (78%), and clean clothing (86%) were observed among respondents. Despite awareness of health hazards associated with fast food consumption among 66% of respondents, a considerable 93% continued to consume fast food. In summary, while many households exhibited diligence in preventing ill workers from handling food, there remained disparities in personal hygiene practices, alongside a prevalent continuation of fast food consumption despite knowledge of associated risks.

Table 5: Cleaning, Sanitation and Maintenance

Variables	Categories	Percentage (%)
Kitchen Maintenance	Before cooking	18.0
	After cooking	24.0
	During cooking	22.0
	Before cooking+ after cooking	36.0
Premises maintenance	Daily	56.0
	Twice in a week	22.0
	Once in a week	14.0
	Seldom	08.0
Water purifier is available in working condition in house	Present	75.0
	Absent	25.0
Maintenance of clean and sanitary equipment	Wash in warm soapy water	26.0
	Wash in cold soapy water	55.0
	Wash in cold water	19.0
House toilet maintenance	Daily	18.0
	Twice in a week	28.0
	Once in a week	34.0
	Seldom	20.0

Table 5 provides insights into cleaning, sanitation, and maintenance practices among respondents. The majority reported daily maintenance of household toilets (18%), followed by kitchen cleanliness (36%), and equipment sanitation using warm soapy water (26%). Additionally, 56% of households maintained overall premises cleanliness daily, with nuclear families and working women tending to clean premises weekly or less frequently (14% and 8% respectively). Notably, approximately 75% of households recognized the importance of maintaining water purifiers.

Furthermore, Figure 4 illustrates the relationship between age groups and food safety standards among street food vendors. It shows that a higher percentage of sampled individuals aged 24 and above adhered to moderate food safety standards. In terms of education, Figure 5 indicates that a greater percentage of respondents with graduate-level education followed low food safety standards. Additionally, a higher percentage of sampled individuals from the general category adhered to moderate food safety standards (Figure 6).

3.3 Food Safety Standards Practiced by Street Food Vendors

The illustrations concerning food safety standards practiced by street food vendors reveal crucial insights into their adherence to hygiene and sanitation practices. Figure 4 suggests that a significant proportion of street food vendors aged 24 and above tend to follow moderate food safety standards, highlighting a potentially more conscientious approach among older vendors. Meanwhile, Figure 5 sheds light on the educational background of vendors, indicating that a notable percentage of respondents with graduate-level education adhere to low food safety standards, signaling potential gaps in knowledge or implementation among this demographic. Additionally, Figure 6 underscores the importance of considering socio-economic factors, as it indicates that a higher percentage of street food vendors from the general category adhere to moderate food safety standards, emphasizing the need for targeted interventions to improve food safety practices across all segments of the vendor population.

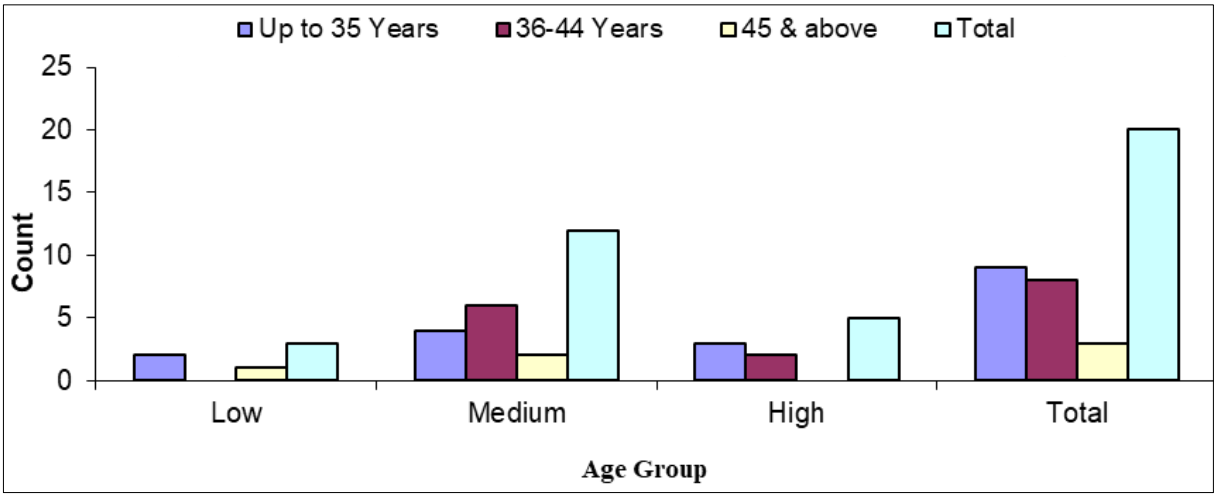

Fig 4: Cross tabulation of age vs food safety standards of street food vendors

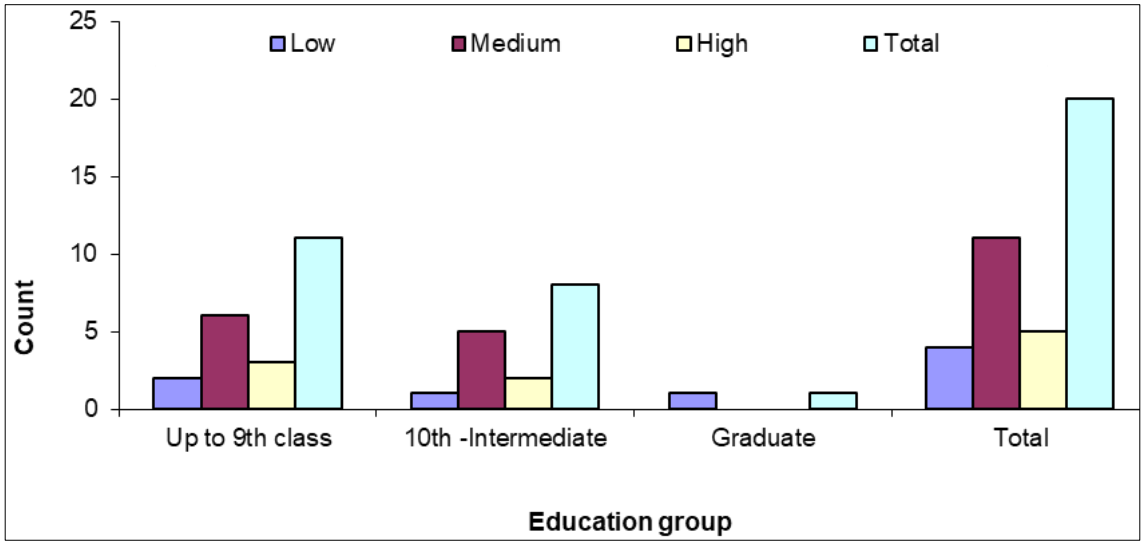

Fig 5: Cross tabulation of education vs food safety standards of street food vendors

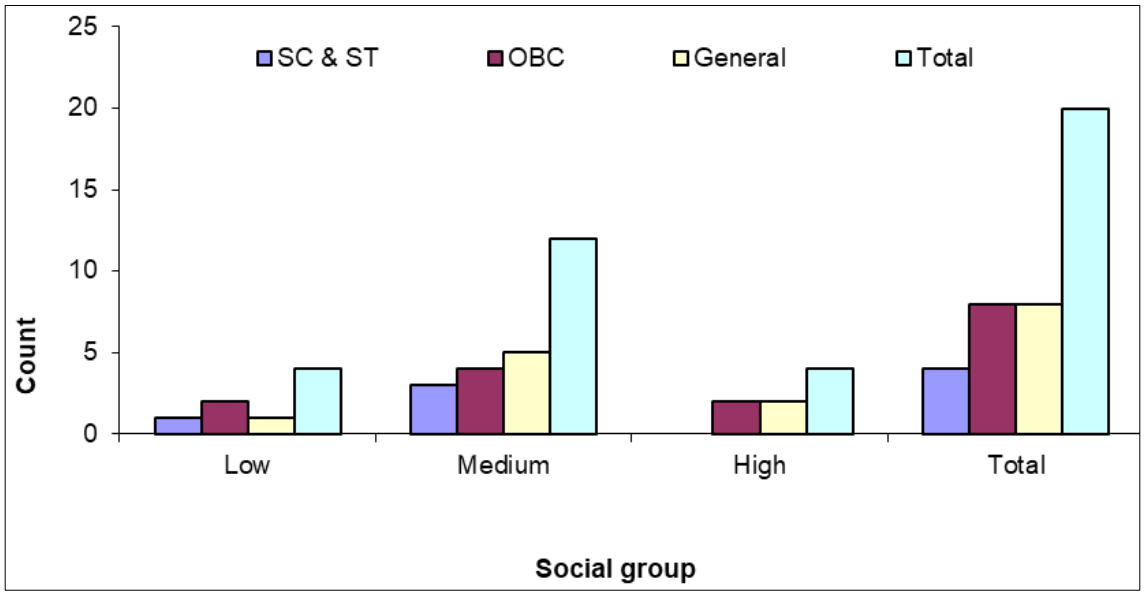

Fig 6: Cross tabulation of social group vs food safety standards of street food

Table 6: General requirements

Variables	Percentage (%)
License to run the business	90.0
Current license displayed prominently on the premises	45.0
Knowledge on food stored in contamination free environment	40.0
Knowledge on measures to prevent cross- contamination	35.0
Knowledge on heating/reheating procedures followed	35.0
Knowledge on protecting displayed food from contamination	45.0
Practice of packaging in a manner that protects it from contamination	50.0
Practices of disposing or throwing out food	75.0
Knowledge about the food safety and standards act/food safety act	35.0
Food inspector inspection or checking	90.0

In terms of general requirements for food safety standards, it was found that 90% of vendors possessed a valid license to operate their businesses, with 45% prominently displaying their current license on their premises. Additionally, approximately 40% demonstrated knowledge of storing food in contamination-free environments, while 35% were aware of measures to prevent cross-contamination and heating/reheating procedures.

Furthermore, 45% had knowledge of protecting displayed food from contamination, and 50% practiced packaging in a manner that safeguards it from contamination. Moreover, 75% exhibited knowledge of proper practices for disposing or discarding food, while 35% had familiarity with food safety standards and regulations. Notably, 90% of street food vendor establishments were inspected by food inspectors to ensure compliance with food safety protocols.

Table 7: Health and hygiene requirements

Variables	Categories	Percentage (%)
Staff members do not engage in food handling if they are suffering from a food-borne disease	-	80.0
Personal Hygiene	Use of apron	05.0
	Short nails	70.0
	Bare hands	90.0
	Hair cover	10.0
	Cleanliness of clothing	85.0
Washing Hands At Appropriate Time	Before preparation of food	30.0
	After touching each food items	10.0
	After using toilets	05.0
	Before preparation of food + after using toilet	35.0
Water purifier is availability in working condition	Present	30.0
	Absent	70.0
Purified water purchasing	Present	60.0
	Absent	40.0

Upon examining health and hygiene requirements, it was observed that 80% of respondents were knowledgeable about ensuring that staff members refrain from handling food if they are afflicted with a food-borne illness. However, less than half of the food vendors washed their hands before food preparation (30%) and after touching each food item (10%), with only 5% practicing handwashing after using the toilet. Moreover, 35% of respondents adhered to handwashing at appropriate times, such as before food preparation and after using the toilet. Regarding personal hygiene practices, only 5.0% of vendors wore aprons, while 70.0% maintained short nails, and 10.0% covered their heads. Additionally, 90.0% of vendors handled food with bare hands, and 85.0% maintained cleanliness of their clothing. Surprisingly, despite 60% of vendors purchasing purified water, a significant portion did not utilize it for cooking purposes. Overall, the majority of vendors enforced a policy prohibiting workers from handling food while suffering from a foodborne illness, as indicated by the findings from the table.

Table 8: Cleaning, Sanitation and Maintenance

Variables	Categories	Percentage (%)
Kitchen Maintenance	Before cooking	10.0
	After cooking	25.0
	During cooking	20.0
	Before cooking+ after cooking	45.0
Premises maintenance	Daily	55.0
	Twice in a week	25.0
	Once in a week	15.0
	Seldom	05.0
Maintenance of clean and sanitary equipment	Wash in warm soapy water	30.0
	Wash in cold soapy water	45.0
	Wash in cold water	25.0
Staff toilet maintenance	Daily	5.0
	Twice in a week	30.0
	once in a week	40.0
	Seldom	25.0
Use of tissue paper while cooking and serving	-	20.0

In above Table 8, it is evident that only 10% of respondents clean their kitchen before cooking, while 25% do so after cooking. Additionally, 20% of vendors clean their kitchen during the cooking process. The majority of respondents (45%) adhere to cleaning and sanitation maintenance requirements for their kitchens. Regarding premises maintenance, 55% of vendors clean their premises daily, while 25% do so twice a week. Moreover, 56% ensure the cleanliness of sanitary equipment. However, only 15% and 5% of respondents clean their premises once a week and rarely, respectively. When it comes to staff toilets, 40% of vendors maintain them properly, while only 20% use tissue paper during cooking and serving

4. Conclusion

In conclusion, the study sheds light on the food safety practices of street food vendors and household women in Varanasi. While both groups show some adherence to safety protocols, there are notable gaps in knowledge and practices (Tomaszewska, M. *et al.*, 2018) [18]. Household women exhibit awareness of general requirements but lack understanding in certain areas like food storage and prevention of cross-contamination (Al-Shabib, *et al.*, 2015) [5]. Street vendors, although licensed, demonstrate inconsistent hygiene practices, particularly in hand washing and equipment maintenance.

The findings of this study underscore the importance of targeted interventions and awareness campaigns to promote better food safety practices among both street food vendors and household women. By enhancing education and training initiatives, addressing gaps in knowledge and practices, and implementing stricter monitoring and enforcement mechanisms, it is possible to mitigate the risks associated with consuming street foods and ensure the health and well-

being of consumers. Additionally, efforts should be made to improve working conditions for street vendors, including access to resources and support services, to enable them to uphold food safety standards effectively.

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