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A study on Knowledge, Attitude and Practices (KAP) regarding Food Safety and Hygiene of Pani Puri Street Food Vendors in Noida, Uttar Pradesh

Deepti Chugh
Research Scholar, School of Continuing Education, Indira Gandhi National Open University
Email- deeptichugh0001@gmail.com
Ankita Gupta
Assistant Professor, School of Continuing Education, Indira Gandhi National Open University
Email- ankitagupta@ignou.ac.in
Namrata Singh
Assistant Professor, School of Continuing Education, Indira Gandhi National Open University
Email: namratasingh@ignou.ac.in

Abstract

Research Background: *Pani puri, a widely consumed street food across urban India, offers an economical meal for many, yet presents notable food safety concerns owing to its intensive manual preparation. This study explored the knowledge, attitudes, and practices of pani puri vendors in Noida with respect to food hygiene and safety.*

Methodology: *A cross-sectional study was conducted with 100 male pani puri vendors across various sectors of Noida. Data collection included a structured socio-demographic questionnaire, a Knowledge-Attitude-Practice (KAP) survey on food safety, and direct observations of hygiene practices.*

Major Findings: *Regarding the socioeconomic background, the average age of the vendors was 37.3 ± 10 years, reflecting a predominantly young to middle-aged workforce. Educational attainment varied: 40 vendors (45.45%) had only primary education, 29 vendors (33.33%) had completed secondary education, and a smaller group of 17 vendors (19.32%) had pursued higher secondary or graduate studies. Most vendors belonged to nuclear families.*

From a socioeconomic perspective, a critical concern was the low rate of formal compliance—only 7 out of 100 vendors were registered with the FSSAI, pointing to a significant regulatory gap.

The mean Knowledge, Attitude, and Practice (KAP) score among pani puri vendors stood at 97.08 ± 6.10 (maximum score 111), suggesting good overall awareness of food safety and hygiene. However, observational findings revealed disparities: only 11 vendors fell into the 'good' category, while 55 were rated 'fair' and 34 'poor.'

No statistically significant relationship was found between education level and knowledge scores. However, there were notable positive correlations between knowledge and attitude ($r = 0.268$, $p < 0.01$) as well as knowledge and observation ($r = 0.206$, $p < 0.05$).

Conclusion: *The study concludes that while pani puri vendors in Noida demonstrate good knowledge, attitudes, and self-reported practices regarding food hygiene, their actual observed behaviours often fall short. The lack of a significant association with education and low FSSAI registration emphasises the need for targeted training, stricter monitoring, and improved regulation to ensure safer street food practices and protect public health.*

Keywords: *Cross-sectional study, Food safety, Hygiene practices, Knowledge-Attitude-Practice (KAP), Noida, Street food vendors.*

Introduction

Street food refers to “ready-to-eat foods and beverages prepared and/or sold by vendors in streets and other similar public places” (FAO, 1989). These foods are a vital part of the informal economy, providing affordable and accessible meals, especially in urban areas of developing countries. According to the World Health Organization (WHO, 2015), street food plays a significant role in meeting the nutritional needs of urban populations, particularly among low-income groups. However, WHO also raises concerns about street foods being frequently associated with poor hygiene and safety standards, making them potential vehicles for foodborne illnesses.

In India, the Food Safety and Standards Authority of India (FSSAI) classifies street food vendors under the unorganized food sector and outlines specific guidelines for hygiene and food safety under its "Eat Right India" initiative and the Food Safety and Standards (Licensing and Registration of Food Businesses) Regulations, 2011. The informal nature of street food vending in India makes regulatory compliance challenging, and many vendors lack awareness of or access to proper food safety training. Despite the availability of FSSAI registration and guidelines, awareness and implementation remain low.

A study conducted in Delhi found that a significant proportion of street food vendors failed to follow basic hygiene practices, such as washing hands before handling food, with only 3% using gloves and only 2% washing their hands before preparing or serving food. The study also found that 72% of vendors disposed of garbage in open bins, and the presence of flies was observed at 45% of vending sites (Thakur et al., 2023). In addition to hygiene practices, food safety knowledge among street food vendors varies widely. In Pune, for example, while nearly all vendors (99.1%) were aware of food hygiene concepts, only 84.8% consistently followed hygiene protocols, indicating a gap between knowledge and actual practice (Mishrikoti et al., 2021). Similarly, studies from other regions, including Tamil Nadu and Uttar Pradesh, have found that while food safety knowledge is relatively high, its application is often inconsistent, particularly when vendors work under resource constraints or in poorly regulated environments (Singh et al., 2018). In a study in Chennai, the presence of pathogens like *E. coli* and *Salmonella* in street food samples was found to be alarmingly high, particularly in foods like pani puri, which require multiple handling steps and serve as a breeding ground for bacterial growth if not properly prepared (Gawande et al., 2013). These findings underscore the critical importance of improving hygiene standards, as even a slight lapse in food handling can lead to serious health consequences.

Knowledge, Attitude, and Practices (KAP) are essential components in understanding and improving hygiene and food safety behaviors among street food vendors. KAP refers to the levels of knowledge, attitudes toward food safety, and actual practices that individuals or groups follow in their daily operations. In the context of street food vending, especially for pani puri vendors, KAP assessments help identify gaps in vendors’ understanding of safe food handling, their attitudes toward hygiene, and the actual safety measures they implement. Therefore, the present study aims to assess the existing knowledge, attitudes, and practices of pani puri street vendors regarding food safety and hygiene in Noida, Uttar Pradesh, India.

Methodology

Study Design: The study design was cross-sectional and descriptive in nature, conducted from January to March 2024 to capture a snapshot of vendors’ KAP at a single point in time.

Study locale: The study was conducted in various sectors of Noida, Uttar Pradesh, covering high-footfall areas where street food vendors commonly operate. The selected sectors were: Sectors 12, 22, 33, 34, 51, 59, 61, and 62. These areas were chosen based on their commercial activity, density of street food vendors, and consumer demand, as identified through preliminary field visits and local market surveys indicating high vendor presence.

Sample, Sampling Technique & Sample size: A total of 100 pani puri vendors were selected for the study using convenience sampling. A non-probability sampling method was used based on the convenience of the investigator. A purposive sampling method was employed for the selection of the sample units,

targeting a sample size of 100 to ensure sufficient statistical power for descriptive analyses, based on prior KAP studies in similar settings (Singh et al., 2018). Only male vendors were included due to the predominance of male pani puri vendors in Noida's street food sector, as observed during initial scoping.
Inclusion criteria: Vendors actively selling pani puri within the designated sectors of Noida, operating using a movable cart, located in high-traffic areas such as markets and public spaces, and operating regularly (not seasonal vendors).
Exclusion criteria: Vendors selling foods other than pani puri (e.g., dairy products, full meals, snacks), operating from fixed stalls, tables, or permanent setups, unwilling to share information, or operating only occasionally in Noida were excluded.

Tools & Techniques

A pre-structured questionnaire containing closed-ended (multiple-choice) questions was used to collect information from the pani puri vendors on socio-demographics, FSSAI registration, reasons for choosing street food vending, challenges faced in business, and knowledge, attitudes, practices, and observations related to food safety and hygiene. The questionnaire was prepared in Hindi, translated by a bilingual expert, and back-translated to English to ensure linguistic accuracy. The questionnaires and checklists for this study were meticulously designed following key Food Safety and Standards Authority of India (FSSAI) guidelines to comprehensively assess food safety and hygiene practices among street food vendors. The primary criteria for designing these tools included alignment with FSSAI regulations, covering essential parameters such as personal hygiene of vendors, cleanliness of utensils, proper food storage, and the use of safe water, drawing on FSSAI's "Food Safety Training and Certification" manual and prior KAP studies (Thakur et al., 2023).

Assessing the Knowledge, Attitude & Practices of Pani Puri Vendors related to Food safety and Hygiene

A self-developed questionnaire was used to assess KAP:

1. **Assessment of Knowledge:** The knowledge component of the KAP tool was designed to assess factual understanding and awareness of food safety and hygiene among pani puri vendors. This section consisted of 23 multiple-choice questions (MCQs) with five options: one correct answer, three incorrect, and a "Don't Know" option. Correct answers were awarded 1 point, while incorrect and "Don't Know" responses received 0 points (total score range: 0–23). The questions in this section covered various important themes related to safe food handling practices, such as personal hygiene (e.g., "Why is handwashing important before food preparation?"), safe food storage and temperature control, cleanliness of utensils and preparation surfaces, foodborne illnesses and symptoms of contamination, and cross-contamination risks, including the use of the same cloth or tools for raw and ready-to-eat foods. The knowledge score was categorized as good, fair, or poor knowledge based on percentage thresholds (>70%, 50–70%, <50%, respectively).
2. **Assessment of Attitude:** The attitude section aimed to capture vendors' beliefs, perceptions, and willingness to adopt food safety practices. It included 13 items, each rated on a 5-point Likert scale, ranging from Strongly Positive Attitude (5 points) to Strongly Negative Attitude (1 point). Some questions were reverse-coded, meaning that disagreement indicated a positive attitude (e.g., "It is not important to wash hands before serving food"), with reverse-coded items adjusted during scoring to ensure consistent positive orientation. Key themes assessed in this section included vendors' perceptions of cleanliness and hygiene, their beliefs about the importance of customer safety, openness to training and improving their practices, and attitudes toward government regulations and registration with FSSAI. The total possible score ranged from 13 to 65, and, like the knowledge section, attitude scores were categorized as good, fair, or poor based on percentage categories (>70%, 50–70%, <50%, respectively).
3. **Assessment of Practice:** The practice domain focused on the self-reported hygiene and food handling behaviours of the vendors. The questionnaire included 23 questions, with scores ranging from 0 to 23, where good practices were scored as 1 and bad practices as 0, each assessing a

specific action or behaviour, such as frequency of handwashing (e.g., "Do you wash hands before serving each customer?"), whether serving utensils were cleaned regularly, how leftover food was stored, use of aprons, gloves, and head coverings, and waste disposal practices at the vending site. For open-ended responses, the classification of "good" or "bad" practice was determined based on established food safety guidelines. Scores were categorized into good, fair, or poor based on percentage outcomes (>70%, 50–70%, <50%, respectively).

4. **Assessment of Observation:** To validate the self-reported behaviours, an observation checklist consisting of 14 items was used during field visits, with scores ranging from 0 to 14, where good practice was scored as 1 and bad practice as 0. This allowed the researcher to assess real-time food handling practices and hygiene conditions at the vending sites. The observation covered practical aspects such as cleanliness of hands, nails, and clothing, proper covering of food items (e.g., "Are food items covered to prevent contamination?"), clean and sanitized utensils, use of clean water for food preparation, presence of pests or stagnant water around the stall, and overall tidiness and waste management. Scores were categorized as good, fair, or poor based on percentage thresholds (>70%, 50–70%, <50%, respectively).

Table 1: KAP Questionnaire and Scoring

Parameters	**Knowledge (K)**	**Attitude (A)**	**Practices (P)**	**Observation (O)**
No. of items	MCQs, 23	Likert Scale, 13	Binary, 23	Binary Checklist, 14
Options with scores	Correct: 1 Incorrect:0	Strong Positive-5 Positive- 4 Neutral- 3 Negative-2 Strongly Negative-1	Good Practices:1 Bad Practices:0 (For open-ended questions, Good or Bad practices were decided based on the response given)	Good Practice:1 Bad Practice:0
Total Scoring (min-max.)	0-23	13-65	0-23	0-14
Score (%) of each respondent	Score of K /A/P/O X 100 ---------- Maximum Score			
Categories of Score	Good	Fair	Poor	
Score (%)	>70%	50%-70%	<50%	

Pretesting of Developed Tools: Information was collected through face-to-face discussions with the vendors using the developed proforma. A pilot test of the proforma was conducted with 20 pani puri vendors who were not part of the final study. This pretest helped identify and refine any unclear or ambiguous questions in the questionnaire and checklist. Expert validation was sought to align the tools with FSSAI guidelines and study objectives, involving three food safety experts from academic and regulatory backgrounds who reviewed content validity and relevance. Post-pilot revisions included simplifying complex questions (e.g., rephrasing technical terms like "cross-contamination") and adjusting response options for clarity. Based on feedback, unclear or ambiguous questions were revised or replaced to align with study objectives and enhance participant understanding.

Statistical Analysis:
The data collected from questionnaires and observational checklists were systematically entered into Microsoft Excel and analyzed using SPSS (Statistical Package for the Social Sciences) version 20. A combination of descriptive and inferential statistical methods was employed to assess food safety knowledge, attitudes, and practices (KAP) among street food vendors. The quantitative data were expressed as means, standard deviations, and minimum and maximum scores (knowledge, attitude, practice, and observation). Frequencies were calculated to understand compliance levels with hygiene practices, such as handwashing frequency, use of protective clothing, and food handling measures. Data cleaning was performed to address missing or inconsistent entries, with less than 5% missing data imputed using mean substitution. Normality was assessed using Shapiro-Wilk tests to ensure appropriateness of Pearson's correlation. The Chi-square test was used to determine associations between categorical variables (e.g., age group, education level, FSSAI registration) and categorized KAP scores, while Pearson's correlation coefficient was used to analyze relationships between variables such as knowledge scores, attitude scores, practice scores, age, and education level to determine any significant associations, with significance set at $p < 0.05$.

Findings

Socio-Demographic Profile:
The data presented in Table 2 revealed that the mean age of pani puri vendors was 37 ± 10 years. Their educational levels varied, with the highest number of vendors having completed primary school (40%), followed by secondary school (29%). Most vendors belonged to nuclear families (72%), while 28% lived in joint or extended families. Marital status showed that 71% were married. Only 7 vendors were registered with FSSAI. Most vendors (61%) cited financial need as the reason for entering the street food business, while high competition (51%) was the challenge reported by most vendors.

Table 2: Frequency Distribution of Pani Puri Vendors based on their Socio Demographic Profile

Parameter		N (100)
Gender	Male	100
Age (Years) (Mean ± S.D)		37.3 ±10
Educational Qualification	No formal education	14
	Primary school (1st to 5th class)	40
	Secondary school (6th to 10th)	29
	Higher secondary (11th and 12th)	17
Family Type	Nuclear	72
	Joint or Extended	28
FSSAI Registration	Registered	7
	Not Registered	93
Marital Status	Unmarried	25
	Married	71
	Divorced	2
	Widowed	2
Reasons for Choosing this Business	Financial Need	61
	Family Tradition	18
	Passion for Food	7
	Lack of Job Opportunities	12
	Other	2
Challenged Faced	Lack of capital	27

	Competition	51
	Lack of skills/knowledge	2
	Poor location	3
	Poor location	13
	Unpredictable customer demand	1
	None	3

Knowledge, Attitude, Practice and Observation Assessment:

Table 3: Distribution of Pani Puri Vendors according to their Knowledge Score (N=100)

Category	**Score of Knowledge Tool (Min-Max)**	**Knowledge Score (Min-Max)**	**N**	**Knowledge Score Mean ±S.D**
Good (>70%)	16-23	16-22	48	17.65 ± 1.701
Fair (50-70%)	12-15	12-15	48	13.97 ± 1.185
Poor (<50%)	0-11	8-11	4	9.25 ± 1.258
Total Mean Knowledge Score ± S.D	15.59 ±2.66			

Table 3 shows that the majority of pani puri vendors have good to fair knowledge regarding personal hygiene, handling, and safety, with only 4% of pani puri vendors having poor knowledge.

Table 4: Distribution of Pani Puri Vendors according to their Attitude Score (N=100)

Category	**Score of Attitude Tool (Min-Max)**	**Attitude Score (Min-Max)**	**N**	**Attitude Score Mean ±S.D**
Good (>70%)	46-65	50-65	100	59.59 ± 4.714
Fair (50-70%)	33-45	-	0	
Poor (<50%)	<32	-	0	
Total Mean Attitude Score ± S.D	59.59 ± 4.71			

Table 4 shows that 100% of pani puri vendors had a good attitude toward personal hygiene, food handling, and safety. None of the vendors had fair or poor attitude scores.

Table 5: Distribution of Pani Puri Vendors according to their Practice Score(N=100)

Category	**Score of Practice Tool (Min-Max)**	**Practice Score (Min-Max)**	**N**	**Practice Score Mean ±S.D**
Good (>70%)	16-23	19-23	100	22.31 ± 0.647
Fair (50-70%)	12-15	-	0	-
Poor (<50%)	<11	-	0	-

Total Mean Practice Score ± S.D	22.31 ± 0.647

Table 5 shows that all pani puri vendors have good practice scores for personal hygiene, food handling, and safety. None of the pani puri vendors fell in the fair or poor practice score categories.

Table 6: Distribution of Pani Puri Vendors according to their Observation Score (N=100)

Category	Score of Observation Tool (Min-Max)	Observation Score (Min-Max)	N	Observation Score Mean ±S.D
Good (>70%)	10-14	8-12	11	10.09 ± 0.944
Fair (50-70%)	7-9	6-9	55	8.02 ± 1.340
Poor (<50%)	0-6	1-5	34	4.79 ± 2.086
Total Mean Observation Score ± S.D	7.15±2.40			

Table 6 shows that the majority of respondents have fair to poor observation scores regarding personal hygiene, food handling, and safety, with only 11% of pani puri vendors having good observation scores.

Table 7: Distribution of Vendors according to their Total KAP Score (N=100)

Category	Score of KAP Tool (Min-Max)	Total KAP Score (Min-Max)	N=100	KAP Score Mean ±S.D
Good (>70%)	77-111	83-108	100	97.08± 6.10
Fair (50-70%)	55-76	-	0	-
Poor (<50%)	13-54	-	0	-
TOTAL KAP (Mean ±S.D)	97.08± 6.10			

Table 8: Association between Education level and Categories of Knowledge Score (N=100)

Educational Level	Categories of Knowledge Score			
	Good	Fair	Poor	p-value
No formal education	7	5	2	0.263
Primary School (1st to 5th class)	21	17	2	
Secondary School (6th to 10th class)	15	14	0	
Higher Secondary (11th and 12th)+ Graduate	5	12	0	

Table 8 shows that there was no statistically significant ($p > 0.05$) association between education level and categories of knowledge score. Therefore, it can be said that education did not affect the knowledge score of pani puri vendors.

Table 9: Association between Categories of Knowledge Score and Categories of Practice Scores (N=100)

Categories of Knowledge Score	Categories of Practice Score			
	Good	Fair	Poor	p-value
Good	48	0	0	-
Fair	0	48	0	
Poor	0	0	4	

In Table 9, the relationship between knowledge score categories and practice score categories was assessed. However, no meaningful association could be evaluated.

Table 10: Association between Family Type and Reason for Choosing (N=100)

Family Type	Financial Need	Family Tradition	Passion for Food	Lack of Job Opportunities	Other	p-value
Nuclear	44	10	6	11	1	0.211
Joint	17	8	1	1	1	

Table 10 shows that there was no statistically significant ($p > 0.05$) association between family type and reasons for choosing pani puri vending as a business.

Table 11: Correlation Coefficient for Variables of the Pani Puri Vendors

Variables Compared	Pearson Correlation (r)	Significance (p-value)	Interpretation
Knowledge Score & Attitude Score (N=100)	0.268	0.007**	Weak but significant correlation
Knowledge Score & Practice Score (N=100)	0.145	0.151	Weak correlation, not significant
Knowledge Score & Observation Score (N=100)	0.206	0.040*	Weak but significant correlation
Attitude Score & Practice Score (N=100)	0.027	0.789	Weak correlation, not significant
Attitude Score & Observation Score (N=100)	-0.043	0.674	Weak negative correlation, not significant
Practice Score & Observation Score (N=100)	0.188	0.061	Weak correlation, not significant
Observation Score & Total KAP Score (N=100)	0.079	0.436	Very Weak Correlation, not significant

*Correlation is significant at the 0.05 level, ** Correlation is significant at the 0.01 level

Correlation between knowledge, attitude, practice, observation, and total KAP was assessed. The findings show a correlation between knowledge and attitude ($r=0.268^{**}$) ($p<0.01$), knowledge and observation($r=0.206^{*}$) ($p<0.05$).

Discussion

Street food—especially pani puri—is an essential element of India's urban culinary landscape, providing affordable and easily accessible meals to millions. In cities like Noida, where many rely on street vending for a livelihood, lapses in food safety can pose serious public health threats. The handling of raw

ingredients such as flavoured water, tamarind chutney, and chickpeas often takes place under unsanitary conditions, making the food prone to microbial contamination and foodborne diseases.

Although the Food Safety and Standards Authority of India (FSSAI) has issued food safety guidelines, adherence among vendors remains limited. Studies have highlighted critical hygiene violations, including improper waste disposal, inadequate handwashing, and poor storage of perishable goods. These unhygienic practices have been linked to outbreaks of typhoid, cholera, and gastrointestinal infections, impacting thousands each year.

Research shows that while many vendors possess basic knowledge of hygiene, there is a significant gap between awareness and actual application. Socioeconomic constraints—such as low income, limited education, and resource scarcity—also hinder vendors from maintaining hygienic practices. Many are unable to afford essentials like clean water, gloves, or waste disposal facilities. Additionally, the absence of formal training leaves vendors dependent on traditional methods rather than standardized safety protocols.

This study assessed the Knowledge, Attitude, Practices (KAP), and observation levels of 100 pani puri vendors with respect to personal hygiene, food handling, and safety**.**

The average age of the vendors was 37.3 ± 10 years, comparable to findings from Patna, Bihar (mean age 34 ± 10.4 years; Singh & Khan, 2016). Only 7 vendors were registered with the FSSAI, reflecting a broader trend of informality among street vendors as noted by Bhowmik and Saha (2012). Most vendors entered the profession due to financial necessity (N = 61) or lack of employment opportunities (N = 12), mirroring findings by Singh et al. (2017).

High competition (N = 51) and lack of capital (N = 27) were the most commonly reported challenges. Additional issues included legal hurdles, poor vending locations, and fluctuating customer demand—challenges also identified in research by Gadaga et al. (2008).

The study revealed strong scores in attitude and practices, while knowledge and observation varied considerably. The mean knowledge score was 15.59 ± 2.66, with 96% falling into fair or good categories, and only 4% scoring poorly. These results are in line with earlier studies from Patna (Singh & Khan, 2016) and Guwahati (Choudhury et al., n.d.).

Attitude scores were uniformly high (mean = 59.59 ± 4.71), with all vendors categorized as "good," suggesting a positive outlook on food hygiene, likely influenced by consumer expectations and awareness efforts. This mirrors findings by Shinde et al. (2023) among vendors in Pune.

Practice scores also reflected high compliance (mean = 22.31 ± 0.647), aligning well with the observed attitudes. This correlation supports the KAP model, which posits that positive attitudes often translate into sound practices. Similar observations were made in a national study by the National Association of Street Vendors of India (NASVI, 2020).

In contrast, observation scores were notably lower (mean = 7.15 ± 2.40). Only 11% of vendors demonstrated good observable hygiene, while 55% were categorized as fair and 34% as poor. This discrepancy suggests the presence of social desirability bias—where self-reported practices differ from actual behaviour—as noted in studies by Singh and Khan (2016) and Choudhury et al. (n.d.).

The study found no statistically significant association between education and knowledge scores ($p = 0.263$), indicating that formal education does not necessarily enhance hygiene awareness. This supports findings by Shinde et al. (2023) and Singh and Khan (2016), who emphasized experience and informal learning over formal education.

Likewise, no significant correlation was observed between family structure and reasons for choosing vending ($p = 0.211$), reinforcing the notion that economic necessity is the primary motivator across different demographics, as seen in studies conducted in Aurangabad (Pund & Tiwari, 2019) and Jamshedpur (Das & Maji, 2018).

Conclusion

The study sheds light on the intricate relationship between knowledge, attitude, practice, and observed behavior among pani puri vendors concerning personal hygiene and food safety. Although vendors exhibited high scores in knowledge, attitude, and practice, their relatively low observation scores revealed a notable disparity between self-reported and actual hygienic behaviors. This discrepancy underscores the limitations inherent in self-reported data and suggests the presence of social desirability bias.

Correlation analysis indicated that while knowledge has a modest influence on attitudes and observable behaviors, it is not a strong predictor of actual hygiene practices. Moreover, no significant associations were found between education level or family background and vendors' knowledge or occupational choices. This highlights the predominance of informal learning and economic necessity as driving forces behind their involvement in the trade.

These findings are consistent with earlier research conducted across various Indian cities and underscore the importance of implementing focused, hands-on training initiatives alongside stricter regulatory mechanisms. For meaningful improvements in public health—particularly in densely populated urban environments—interventions must go beyond raising awareness to ensure that awareness is consistently translated into visibly improved hygienic practices among street food vendors.

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