VER
Vascular & Endovascular Review

An assessment of the impact of Knowledge, Attitude & Practices of Food Handlers On Consumers' Safety Aspect – A Structural Equation Modelling Approach

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ABSTRACT

Out of the various illnesses of human beings, Food-borne illnesses are one of the most hazardous ones and have been recognized for many years. There is a very little research have been done on finding causes of food safety diseases and monitoring systems. The present study was therefore conducted across various food service outlets in Eastern India to investigate relationships between food handlers' knowledge, attitude and food safety practices that influence on food handlers' intention to implement food safety guidelines regularly. A face to face interview consisting self-reported questionnaire was conducted on 277 food handlers those are working in various food outlets such as University canteens, Hospitals, small kiosks and passed out hospitality management students those are currently employed and responsible for handling food in hotels, in Kolkata city, India. Exploratory Factor Analysis (EFA), Structural Equation Modelling (SEM) and descriptive statistics were used. Results of the analysis revealed knowledge and practices have moderate direct effect on food handlers' intention to food safety ($f2 = 0.14$, and 0.14 respectively), whereas attitude has weaker effect ($f2 = 0.08$). There is a lesser impact of attitude on overall food safety intention. It does not always imply the negligence of the food handlers. Many times, the restaurant/ establishment owners and supervisors control or influence the attitude of the Food Handlers. Hence they are equally responsible for the food safety and the attitude of the Food Handlers while handling food. Therefore, it is recommended that the concerning Food Regulatory bodies make occasional and surprise visits to the different food service outlets to ensure food safety practices are properly implemented.

KEYWORDS: Food Safety, Structural Equation Modelling, Knowledge, Attitude, Practice.

How to Cite: Dr. Soumen Mukherjee, Subrata Routh, (2025) An assessment of the impact of Knowledge, Attitude & Practices of Food Handlers On Consumers' Safety Aspect – A Structural Equation Modelling Approach, Vascular and Endovascular Review, Vol.8, No.12s, 72-79.

INTRODUCTION

In the last few decades, rapid industrialization, modernization, increasing spending capacity and changing lifestyle caused changes to a great extent in the living standards among common Indian citizens. In present times, Indian people go out of their homes more often than before to enjoy good food and drink.

In order to meet the increasing demand for supplying food within the shortest possible time, it becomes necessary to prepare food items in large quantities much ahead of time and served; and in many cases, due to staggered working hours it is important to hold the prepared food till the meal timing is over, and there are chances while holding for service, the temperature of food may remain in the danger zone.

Unfortunately, food hygiene has never been properly understood and given much importance in India, thus conditions of hygiene and sanitation in food service areas is terrible.

It has been observed, most of the cleaning and waste disposal tasks are assigned to the people who have little knowledge, belong to low educational background; they perform the tasks without understanding the consequences of the poor hygienic practices on food safety. All these reasons are most suitable for bacteria to multiply in food which may lead to food borne diseases, and death to some extent. (Roday S, 1999).

The majority of food-borne diseases almost 50% are caused due to poor hygiene and sanitation practices by the food handlers on the premises (Ahmed et al., 2021).

However, in the context of food hygiene standards practiced by food handlers in India, people are less concerned with bacterial contamination as the biggest threat while consuming food (Subba Rao et al., 2007). In the Indian scenario, there is a number of reasons that may cause people to fall sick due to the consumption of food;

1) The tremendous utilization of harmful pesticides by farmers to increase the production rate.
2) Due to vast industrialization many water-bodies have become affected by chemical contamination from industrial waste.
3) Improper storage facilities attract pests e.g. insects, rats and even microorganisms.
4) Increasing demand for fast foods that contain hydrogenated fats, and many preservatives.

According to the study conducted by (Bou-Mitri et al., 2018), poor hygiene plays a pivotal role in spreading 70% of food-borne diseases. The unhygienic conditions such as the location of the outlets; facilities at the premises and lack of basic knowledge of the food handlers related to food hygiene is the major reason for increasing food-borne diseases (Onyeneho & Hedberg, 2013). In relation to food hygiene, the most important is hand hygiene which causes the transmission of bacteria from food handlers to food (Lee et al., 2017).

The food served in most of the catering establishments, either processed in-house or an annual contract is given to a welfare catering company to prepare the meal. The staffs employed in these catering companies especially those who will be handling food directly, in most cases these workers usually have less educational qualification, poor knowledge related to safe food handling. Hence it is necessary to train them to make them understand the need for basic food hygiene (Osaili et al., 2013).

To make sure the food is served to the consumers is safe for consumption, it is very much essential to ensure the food handlers have good knowledge on food safety practices (Ahmed et al., 2021).

The study done by (Bou-Mitri et al, 2018) indicates that the level of knowledge and positive attitude of the food handlers play a major role for producing safe food for the consumers.

Thus a need is being felt to conduct a thorough survey and perform analysis in order to measure the level of knowledge and willingness to perform food safety practices by the food handlers in randomly selected catering establishments.

In most of the developing countries only 10% food safety cases are officially reported, whereas in India the actual findings could be less than 1% (Subba Rao et al., 2007), thus it is almost next to impossible to find the actual sources food borne diseases (Randolph et al., 2007; Savariraj et al., 2019). So to mitigate this regularly occurring food borne diseases, the safe food preparation is very essential for the food industry.

OBJECTIVES OF THE STUDY

Based on the above facts it has been found that there is a huge gap is present in the food industry in context to safe food handling monitoring system which may prevent food borne diseases or may create safe food for the consumers.

In connection to the above, a study had been conducted on major stakeholders of the food industry with following objectives:

a) To evaluate the knowledge level, attitude and practices of food handlers in producing the safe food.
b) To help the policy makers to create the strong monitoring system for creating safe food environment
c) To find out the impact of the food handlers in creating the safe food for the consumers

THEORETICAL BACKGROUND

Food safety knowledge in this context indicates to thorough understanding of safe food handling procedures or information gained through education or working for years in registered outlets (Soon et al., 2020).

The term practice indicates to the steps taken to handle a situation based on the knowledge gained by a person. The more the person gains knowledge, better his intention to practice food hygiene increases (Mihalache et al., 2021).

The term attitude can be described as a perception or views of a person about safe food handling. (Soon et al., 2020).
Hence, based on the theoretical definition obtained from previous studies, the model for our studies as shown in figure 1.

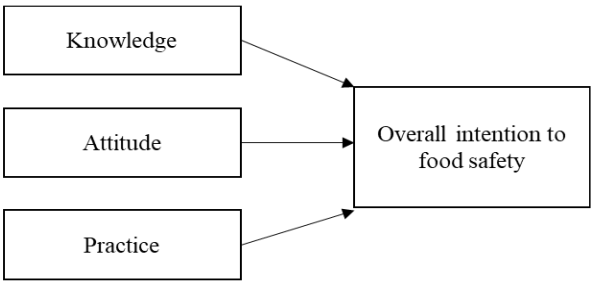

Figure 1

The model indicates the relationship between independent variables knowledge, attitude & practices and dependent variable overall intention to food safety.

Based on the above research model the proposed hypothesis has been framed as follows:

H1: Food handlers' knowledge has positive relationship with overall safe food production

H2: Food handlers' attitude has positive relationship with overall safe food production

H3: Food handlers' practice has positive relationship with overall safe food production

MATERIALS & METHODS

4.1 Questionnaire Design

A self-reported questionnaire consisting 34 questions was developed based on previously used questionnaires which had been used in similar survey (Bou-Mitri et al., 2018; Al-Shabib et al., 2016; Albgumi et al., 2019; Rustiawan & Suryani, 2021; Ahmed et al., 2021).

Each questions (apart from demographic) was given a rating of 5 point Likert scale (where 1 being strongly disagree, 2 is disagree, 3 is neutral, 4 agree, and 5 is strongly agree). Before distributing the questionnaire to the respondents, the questions were pilot

tested on 18 respondents to check the consistency of the data. The Cronbach alpha result revealed overall consistency of the data is 0.897; in the reliability analysis if the Cronbach alpha result value is above 0.7 would indicate the data set has good amount of consistency and thus the reliability analysis for the pilot study in the current survey is found satisfactory (Masrom, 2007; Lee et al., 2009).

Since the results of the reliability analysis fell within acceptable range, hence no items had been deleted. Pilot study responses were excluded from the survey, thus only 277 responses were considered. In addition, individual reliability analysis on each latent variable revealed Cronbach alpha value for Knowledge = .943, Attitude = .906, Practices = .853 and for Overall intention to food safety = .906.

4.2. Data Collection

For the survey, samples were collected from 19 small kiosks, 2 educational hostel canteens (operated under a University), 4 stand-alone restaurants, 3 hospitals, 1 hotel (with dining and lodging facilities), 92 Hospitality & Culinary Art students and 51 chefs.

A random sampling technique had been applied to collect data. Data was collected from various food handlers and undergraduates and passed out students from culinary art institutions (those are currently employed in various food service outlets as food handlers. The samples were chosen for the survey considering they had direct contact with the food, and no other category was considered e.g. delivery boy, order taker, nurses in hospitals etc. Before conducting the survey, purpose of the study had been explained to the respondents, after they agreed to participate in the survey, on a pre-scheduled date with a prior appointment with head of the operation, a face to face interview was conducted with the participants those were on duty. As the participants for the survey belonged to diverse educational background, hence those had reading and writing difficulties were guided by researchers or outlet supervisors (by explaining the meaning of the questions to them) to enable them to fill up the form. While collecting the data from the students and working chefs, many of them who were unable to meet physically, thus the questionnaire link (created in google form) was sent to them through WhatsApp, Facebook messenger.

4.3. Methodology & Statistical Analysis

All the responses were collected from Google data sheets & printed questionnaires, entered into Excel, coded, and then put into SPSS version 26 and SPSS AMOS version 22 for further analysis. Descriptive statistics, Reliability Analysis, Exploratory factor Analysis and Confirmatory Factor Analysis were used to reveal the results.

RESULTS

5.1. Descriptive statistics

Table 1. Demographic Characteristics of the respondents

Demographic Information	Frequency (N)	Percentage (%)
Gender		
Male	221	79.8
Female	56	20.2
Age of the Respondents (Years) Mean ± SD	28.4 ± 8.02	
Less Than 25	114	41.2
Between 26-40	140	50.5
More than 40	23	8.3
Food handling experiences		
Less than 1 year experience	22	7.9
Between 1-5 years of experiences	155	56
Between 5-10 years of experiences	71	25.6
More than 10 years of experiences	29	10.5
Location of the outlet		
City	248	89.5
Village	29	10.5
Education level of the respondents		
Below 10th Std	45	16.2
Between 10th - 12th Std	30	10.8
Above 12th Std	202	72.9
Outlet type		
Private	275	99.3
Government	2	0.7
Attendance of the food safety training		
Yes	203	73.3
No	74	26.7

The demographic survey was conducted among 221 (79.8%) male and 56 (20.2%) female respondents. Out of the total sample size of (N=277), 50.5% respondents are between the age group of 26 -40 years. The recent study shows that maximum respondent 57.4% have food handling experience between 1-5 years and only 39.4% respondents had food handling experience more than 5 years. In this study majority of the respondents (57.4%) having educational qualification up to 12th Std or higher; and most of the respondents worked in private organization or held single ownership. Majority of the respondents 73.3% had attended food safety training. Most of the respondents were collected from the outlets which are located in the city area.

5.2. Exploratory Factor Analysis (EFA)

The Exploratory Factor Analysis had been conducted on 34 responses received from the respondents through interview. In EFA, 4 factors had been constructed i.e. knowledge, attitude, practices & overall intention to food safety. Each of the factor is represented by different sub-factors like Knowledge factor represented 7 items, attitude represented 5 items, practice represented 6 items, and overall intention to perform food safety practices represented 4 items The results of Exploratory Factor Analysis with extracted factor loadings is shown in table 2. The loading factor which shows the values higher than 0.50 have been considered for extracting factor in EFA (Hair et al., 2017). Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity tests results were .924 (> 0.60) and significant (p value < 0.05). (MacCallum, Browne, & Sugawara., 1996) mentioned KMO value must be higher than .060, thus it is confirmed for the corrent study sample size and variance is adequate enough. The obtained Sample size had been considered as sufficient enough as the questionnaire consited 34 items, hence minimum required number of sample size should have 34 x 5 = 170. (Reio & Shuck, 2015) mentioned it is better that the number of participants for the survey is 10 times more than the number of statements, if not then, minimum number of participants should be 5 times.

Table 2: Factor Analysis Result

Construct	Items	Factor loading	% of variance	% of cumulative variance	Cronbach's Alpha
Knowledge	K1	0.823	48.213	48.213	.943
	K2	0.847			
	K3	0.749			
	K4	0.783			
	K5	0.769			
	K6	0.688			
	K7	0.745			
Attitude	A4	0.780	12.468	60.681	.906
	A5	0.739			
	A6	0.826			
	A9	0.750			
	A10	0.707			
Practice	P1	0.827	6.557	67.238	.853
	P2	0.828			
	P3	0.521			
	P4	0.684			
	P5	0.669			
	P6	0.833			
Overall intention to Food safety	OVERFS1	0.706	5.294	72.532	.906
	OVERFS2	0.702			
	OVERFS3	0.816			
	OVERFS4	0.707			

5.3. Structural Equation Model (SEM)

Based on the EFA results, a structural equation model was drawn. A structural equation model consists of 2 parts: the primary measurement model & structural equation model also known as path diagram.

Model fitness was confirmed as the fit indices shows that the CMIN/df value is 2.484. (Barbara G. Tabachnick, 2007) suggested that accepted value for CMIN/df ≤ 3 is accepted, however acceptable value for CMIN/df can be up to ≤ 5 as reported by (Randall E. Schumacker, 2004, Taha et al., 2020). Root Mean Square Error of Approximation (RMSEA) value was 0.073. (Taha et al., 2020) mentioned acceptable value for should be <0.10 for RMSEA, thus the RMSEA value for the current study is considered. The value for Comparative Fit Index (CFI), Normed Fit Index (NFI), Tucker-Lewis Index (TLI), Incremental Fit Index (IFI), Relative Fit Index (RFI) was .948, .916, .939, .948, 903 respectively. (Taha et al., 2020) mentioned fit indices value above .90 indicates that the model is perfect.

Composite reliability for each construct was above 0.70; AVE value (Average Variance Extracted) and factor loading for each construct was above 0.5; and finally AVE value for each construct was greater than MSV value (Maximum shared variance). According to (Suki, 2011) composite reliability can be ascertained if the value for each construct is above threshold value of 0.70 or above; and convergent validity can be confirmed if AVE value for each construct is above 0.5; discriminant validity can be confirmed if the AVE value is above MSV value (Almén et al., 2018). The results of model fitness and discriminant validity have been shown in table 3 & table 4.

Table 3

Fit indices for Measurement Model

Parameters	Current value in model	Accepted value
CMIN/DF	2.484	≤ 3 ≤ 5
Comparative Fit Index (CFI)	0.948	>0.90
Normed Fit Index (NFI)	0.916	>0.90
Tucker-Lewis Index (TLI)	0.939	>0.90
Incremental Fit Index (IFI)	0.948	>0.90
Root Mean Square Error of Approximation (RMSEA)	0.073	<0.10

Table 4

Discriminant Validity among constructs

	CR	AVE	MSV	Practice	Knowledge	Attitude	Food safety intention
Practice	0.890	0.671	0.294	**0.819**			
Knowledge	0.942	0.701	0.555	0.426	**0.837**		
Attitude	0.907	0.662	0.555	0.430	0.745	**0.813**	
Food safety intention	0.911	0.720	0.523	0.542	0.723	0.696	**0.848**

Figure 2: **Structural Equation Model showing effect of Knowledge, attitude & practices on food safety intention**

Table 5

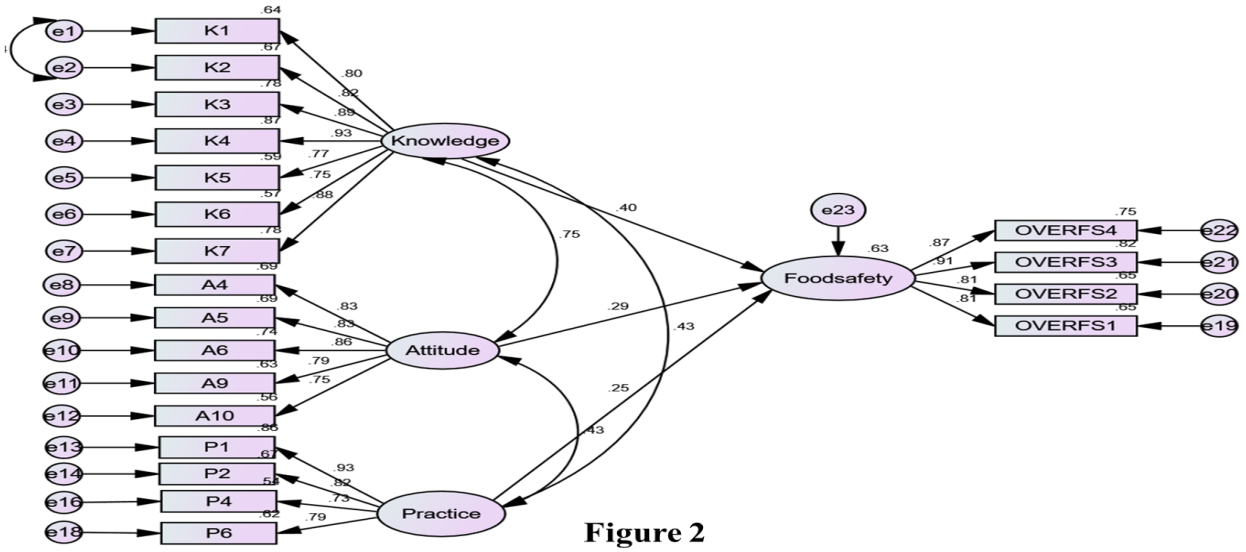

Figure 2

Estimates of Regression Weights for latent variables

Hypothesis		Std Regression weights	Regression weights	Standard Error	C.R	Significant	Result
H1	Food safety <--- Knowledge	.401	.268	.051	5.305	***	Supported
H2	Food safety <--- Attitude	.291	.225	.058	3.881	***	Supported
H3	Food safety <--- Practice	.246	.164	.035	4.746	***	Supported

***indicates p value < 0.001

1st row in table 5 proved that the knowledge of the food handlers has a significant impact on overall food safety intention, as the standard regression weights between food safety knowledge to food safety intention is 0.401 with having critical ratio > 1.96 and p value <0.05, thus H1 is accepted (Clayton & Pett, 2008; Gerrans et al., 2014; Setiono et al., 2019). Thus it can be said the more the food handlers gain knowledge related to safe-keeping of food, the greater the intention to implement food safety practices increases.

2nd row in the table 5 displays standardized regression weights between attitude of the food handlers towards the intention to food safety practices, that is represented with beta value 0.291 with having critical ratio > 1.96, p <0.05, thus H2 is accepted (Clayton & Pett, 2008; Gerrans et al., 2014; Setiono et al., 2019), that indicates attitude of the food handlers determines whether they are interested to implement food safety practices or not.

3rd row in the table 5 displays standardized regression weights between food safety practices by food handlers and their intention to implement food safety practices at regular basis, that is represented with beta value 0.246 with having critical ratio > 1.96, p <0.05, thus H3 is accepted (Clayton & Pett, 2008; Gerrans et al., 2014; Setiono et al., 2019), that means the more the food handlers follow the food safety guidelines while preparing, processing food, automatically their intention to food safety practices also increases.

Table 6 shows to what extent knowledge, attitude and practices influence food handlers' intention to implement practice food safety at regular basis. (Hair et al., 2017; Chin et al., 2010) mentioned the formula to calculate effect size for each independent variable on dependent variable, the formula is mentioned below.

$$f2 = \frac{R^2 \text{ Included} - R^2 \text{ Excluded}}{1 - R^2 \text{ Included}}$$

Where
f^2 = effect size
R^2 included = effect strength of all independent variables together on dependent variable
R^2 excluded = exclusion of one individual independent variable one at a time, and counting effect strength of remaining variables on dependent variable

Table 6
Effect strength of knowledge, attitude and practices on food safety intention

Independent variable	R_E2	$R_I2 - R_E2$	$R_I2 - R_E2 / 1- R_I2$	Results (f^2)
Knowledge	0.58	0.05	0.14	Weak
Attitude	0.60	0.03	0.08	Very Weak
Practice	0.58	0.05	0.14	Weak

Based on the analysis as shown in structural equation model (figure 2), we can understand effect of knowledge, attitude and practices together has positive direct effect on food safety intention, all these three variables together are able to explain only 63% variance in the model. The researchers examined further to understand the impact of each individual independent variable on dependent variable, and the analysis as shown in table 6. After calculating the effect using the formula mentioned above, the result revealed the effect strength of each individual variable i.e. knowledge, attitude and practices on food safety intention is 0.14, 0.8 and 0.14 respectively. (Hair et al., 2017; Chin et al., 2010, p. 675) mentioned as a thumb rule, values for effect size is less than 0.15 = weak, values between 0.15 to 0.35 = moderate, values above 0.35 – strong. Since the value of each individual variable is less than 0.15, thus it shows that effects of knowledge, attitude and practice all together are weak, however, if value for effect size of each variable is considered, we can see effect strength of attitude variable is much lower than 0.15, thus it is concluded that effect of attitude on food safety intention is very low, whereas though the impact of knowledge and practice variables both are having effect size is closer to 0.15, thus the researchers conclude that knowledge and practice both have moderate effect on food safety intention than attitude.

DISCUSSION & FINDINGS

Based on the literature review it has been found that previous researchers tried to reveal the important factors which creates the impact on safe food preparation by the food handlers. In the current study researchers attempted to determine which of these variables have greater impact on food handlers' overall intention to practice food safety, so that corrective actions may be suggested on those variables which have lower impact, to improve food safety.

The descriptive study of this research reveal that out of 277 respondents, majority are young generation people, belong to the age group between 26-40 years; they are more concerned with safe food preparation whereas the other groups aged more than 40 years are more reluctant.

In order to find out the inter-relationship between food handlers' knowledge, attitude and their practice in producing safe food preparation, the authors had applied the multivariate statistical tool and perform SEM analysis.
The results of the analysis revealed that the three psychological factors like knowledge, attitude & practice of the food handlers show 63% variance in this model and have positive impact on food handlers' intention to produce safe food, and this justifies that those identified variables together are dependent on each other to influence the food handlers' intention; hence rest of the 37% variance still not properly identified; that shows the pathway for future contribution of this research.

CONCLUSIONS

Out of the three psychological factors of the food handlers, the authors found that the knowledge & practices of the food handlers create significant equivalent impact on the intention of the food handlers for the preparation of safe food, whereas the attitude has lowest impact significant impact.

It has also come out from the study that most of the young educated food handlers have the intention for the preparation of safe food by utilizing their knowledge and proper practice, but due to some unidentified reasons they could not produce safe food which creates negative impact on the society.

The future researchers will try to identify those reasons after referencing the present study. The present study will also help the

administrative policy makers of the food industry (FSSAI) to create structural policy for the food industry to create safe food

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