ORIGINAL RESEARCH PAPER

Nursing

"KNOWLEDGE REGARDING MAINTENANCE OF FOOD SAFETY AMONG FOOD HANDLERS AT CANTEENS OF A TERTIARY LEVEL HOSPITAL OF EASTERN NEPAL"

KEY WORDS: Knowledge, Maintenance of Food Safety, Food handlers

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ABSTRACT

Background: Food safety is of great concern in the current situation Unsafe food handling practices in food service establishments are a major contributor to the transmission of food-borne illness. This research entitled "Knowledge Regarding Maintenance of Food Safety Among Food Handlers at Canteens of a Tertiary Level Hospital of Eastern Nepal," was conducted to access the knowledge regarding maintenance of food safety among food handlers and to find out the association of knowledge score by socio-demographic variables.

Method: A descriptive cross-sectional study design was adopted with self-developed semi-structured tool. Interview was used to collect the data. All canteen serving food to NMCTH Biratnagar situated inside and outside of hospital territory was included. All the canteen worker, total 87 were included in study. Data were analyzed by using descriptive as well as One-way ANOVA and independent t-test.

Results: Among 87 respondents, only 41 respondents had heard about food safety. The study also revealed that majority of the respondents i.e. 56.3% had moderate knowledge, 25.3% had inadequate knowledge and 18.4% had adequate knowledge regarding food safety. The result revealed that there is significant difference in mean knowledge score of the maintenance of food safety by age (P=0.033), educational level (P=0.040), work experience (p=0.006) and monthly income (P=0.000).

Conclusion: The study showed that majority of respondents had moderate knowledge regarding maintenance of food safety. Thus, the study concluded that efforts should be made to increase the knowledge regarding maintenance of food safety among food handlers.

Introduction

Access to sufficient amounts of safe and nutritious food is key to sustaining life and promoting good health. Unsafe food containing harmful bacteria, viruses, parasites or chemical substances, causes more than 200 diseases – ranging from diarrhea to cancers.(WHO, 2017) Majority of people will experience a foodborne disease at some point in their lives. Food can become contaminated at any point during production, distribution and preparation. Everyone along the production chain, from producer to consumer, has a role to play to ensure the food we eat does not cause diseases.("WHO | 10 facts on food safety," 2016)

An estimated 600 million, almost 1 in 10 people in the world fall ill after eating contaminated food and 420 000 die every year, resulting in the loss of 33 million healthy life years (DALYs). Children under 5 years of age carry 40% of the foodborne disease burden, with 125 000 deaths every year.(WHO, 2017) Diarrhoeal diseases are the most common illnesses resulting from the consumption of contaminated food, causing 550 million people to fall ill and 230 000 deaths every year. Food safety, nutrition and food security are inextricably linked. Unsafe food creates a vicious cycle of disease and malnutrition, particularly affecting infants, young children, elderly and the sick.(WHO, 2017)(Scallan et al., 2011) Foodborne diseases impede socioeconomic development by straining health care systems, and harming national economies, tourism and trade. Food supply chains now cross multiple national borders. Good collaboration between governments, producers and consumers helps ensure food safety.(WHO, 2017)

The Second International Conference on Nutrition (ICN2), held in Rome in November 2014, reiterated the importance of food safety in achieving better human nutrition through healthy nutritious diets. Improving food safety is thus a key in achieving Sustainable Development Goals. Governments should make food safety a public health priority, as they play a pivotal role in developing policies and regulatory frameworks, establishing and implementing effective food safety systems that ensure that food producers and suppliers along the whole food chain operate responsibly and supply safe food to consumers.(WHO, 2017)

Urbanization and changes in consumer habits, including travel, have increased the number of people buying and eating food prepared in public places.(WHO, 2017) Where food supplies are insecure, people tend to shift to less healthy diets and consume more "unsafe foods" – in which chemical, microbiological and other hazards pose health risks.(WHO, 2017)

Hygiene and food safety is very important in a hospital because patients in the hospital are the higher risk group of foodborne illness. Unsafe food cause complication to patients affecting reputation to hospital, economic losses, legal action by authority and negative impacts to organization. Food hazards may cause Biological, Chemical, Physical and Allergenic Hazards and consequences to patient and patient party. It's ironical to state that, awareness on food safety is of poor standard among food handlers working in canteen, hotel or cafeteria situated in hospital or hospital premises. Food handlers in hospitals contribute to the incidence of foodborne disease to consumers; therefore, it is essential that workers and management staff have a thorough understanding of safe food practices since hospitalized patients and patient party are more vulnerable to potential hazards, and neglecting these principles can lead to increased morbidity and mortality.

Most of the tertiary level hospital have well established dietary section, where principle of food safety is followed but in NMCTH there is no dietary section and kitchen. There is no canteen in hostel where undergraduate, graduate, post-graduate student of medical, nursing and health sciences are studying. So, all the consumer including patient, patient party, student and hospital staff are compelled to eat food prepared in outside canteen where principle of food safety is in question. The researcher has observed and experience many foods borne illnesses and associated complications. So, the purpose of this study is that the findings may throw light on knowledge level of food service staff on food safety, thus helping in creating awareness in reducing the incidence of food borne illnesses. The present study results may help the canteen staff and hospital authorities to take appropriate measures to reduce the spread of food borne illnesses; thereby enhance organizational growth and preserve public health. Objectives of the study were to assess the level of knowledge regarding maintenance of food safety and among the food handlers at canteens and find out the association between the level of knowledge regarding maintenance of food safety among the food handlers with their selected demographic variables.

RESEARCH METHODOLOGY

Descriptive cross-sectional research design was adopted to find out level of knowledge among food handlers working at canteens of a tertiary level hospital. In province 1, there are two hospitals more than 700 bedded. That is B. P. Koirala Institute of Health Science and Nobel Medical College and Teaching Hospital (NMCTH). Hospital was selected randomly that is NMCTH. NMCTH is multi-specialty, tertiary level medical college and hospital, where 70 percent occupancy rate in 750 beds and 1500 cases come in outpatient department per day. All canteens that are inside and surrounding the NMCTH, were enrolled. All food handlers working at the canteens of NMCTH, meeting eligibility criteria and present at the time of data collection were enrolled as study population. Altogether 87 workers were working as cooks, helpers and service staffs. Complete enumeration (whole census) sampling method was used to assess the knowledge regarding maintenance of food safety among food handlers working at canteens of NMCTH. The tool was developed on the basis of objectives of study, literature review, and book. A self-developed semi-structured questionnaire was used and interview was taken by researcher herself. The tool consists of two sections, Section A consists of socio-demographic data and section B consists of knowledge based questionnaire regarding food safety. The knowledge regarding food safety among food handlers was measured in terms of knowledge score. Each correct response was scored as 1 and incorrect response was scored as 0. Knowledge was categorized based on the quartiles of the knowledge percentage.

- Adequate knowledge: ≥78.19%
- Moderately adequate knowledge: 60.1-78.18%
- Inadequate knowledge: ≤60%

Content validity of the tool was established by extensive literature review, peer review, consultation with subject experts and research advisor and statistician. Pretesting of tool was done on 10% of the total sample size i.e. 7 in similar settings for maintaining its clarity, sequencing and feasibility during administration. After pretesting necessary modification was done for its ambiguity in knowledge related questions. Reliability of the knowledge related questionnaire was tested by using Cronbach's alpha which value was 0.937. Permission from NMCTH authorities and Institutional Ethical Review Board (IRRB) was taken. The data was collected in the period of two weeks i.e. from 15th Jan- 27th Jan 2017. Explanation about the purpose of study was done to the respondents and informed verbal consent was taken before collecting data. The completed format of data collection was rechecked to ensure completeness of the information. Data were entered in Microsoft Excel 2010 and converted to SPSS version 17. Descriptive statistics i.e. frequency, percentage, mean and standard deviation are used to describe the socio-demographic and other related variables. Inferential statistics i.e. t-test and ANOVA test are used to show the association between knowledge regarding maintenance of food safety with their socio-demographic variables.

Results

Table 1: Distribution of respondents according to socio-demographic variable

n=87

Demographic variables	Category	Frequency	Percent (%)
Age in years	15 - 24	18	20.7
	25 - 34	**36**	**41.4**
	35 – 44	25	28.7
	45 - 54	8	9.2
		Mean ± SD = 31.44 ± 9.814%	
Sex	Male	**45**	**51.7**
	Female	42	48.3
Marital Status	Married	**66**	**75.9**
	Unmarried	21	24.1
Religion	Hindu	**87**	**100**
Ethnicity	Upper high caste	25	28.7
	Relatively advantage Janjati	**44**	**50.6**
	Non-advantage Janjati and others	18	20.7
Residence	Urban	**79**	**90.8**
	Rural	8	9.2
Monthly income	1000 – 5000	16	18.4
	6000 – 10000	**26**	**29.9**
	11000 – 15000	18	20.7
	16000 – 20000	22	25.3
	21000 – 25000	3	3.4
	26000 - 30000	2	2.3
		Mean ±SD=13022.99 ± 5225.4	
Educational level	Illiterate	14	16.1
	Literate	13	14.9
	Primary level	21	21.1
	Secondary level	**32**	**36.8**
	Higher secondary and above	7	8.0
Work experience	Less than 1 year	13	14.9
	1-5 years	**43**	**49.4**
	6-10 years	20	22.9
	More than 10 years	11	12.6
Training	No	**87**	**100**
Heard about food safety	Yes	41	47.1
	No	**46**	**52.9**
Source of information	Media	**31**	**35.6**
	Health worker	10	11.5

Table 1 reveals that among 87 respondents, 41.4 % were in age group 25-34 years. In relation to gender, 51.7% of the respondents were male and remaining 48.3% were female.

Majority of the respondent 75.9% were married. Hindu religion was followed by the entire respondent i.e. 100%. Similarly, 50.6% were from relatively advantage Janjati. With respect to work experience, 14.9% of respondents had less than 1 year of work experience, 49.4% had 1-5 years of experience, 23% had 6-10 years of experience. With respect to monthly income, 25.3% in range of 16000-20000. With respect to the educational level, 14(16.09%) were illiterate, 13(14.94%) were literate, 21(24.14%) had educational status of primary level, 32(36.78%) had secondary level and 7(8.05%) had educational status of higher secondary and above level. None of the respondents i.e. 100% had taken training regarding food safety. Only half i.e. 47.1% of the respondents had heard about food safety.

In relation to source of information regarding food safety, 35.6% respondent's source was media and 11.5% respondent's source was health worker.

Table 2.a: Knowledge of respondents regarding meaning and component of food safety, personal hygiene practices

n=87

Characteristics	Correct Response	
	Frequency	Percent (%)
Meaning of food safety (Process of handling, preparation, and storage of food in ways that prevent foodborne illness.)	42	48.3
Components of food safety *		
Food storage practices.	**56**	**64.4**
Personal hygiene practices.	46	52.9
Food preparation practices.	54	62.1
Cleaning procedures.	47	54.0
Component of personal hygiene practice that should be followed during handling the food are, *		
Keep long hair tied back or covered.	**87**	**100**
Wear gloves before touching food.	52	59.8

Cuts or sore on hands should be covered with brightly colored dressing.	85	97.7
Wear a clean apron.	52	59.8
Use handkerchief or tissue when coughing.	81	93.1
Do not handle the money while you are handling the food.	46	52.9
While handling foods, hands should be washed *		
After visiting the toilet.	**87**	**100**
After blowing your nose or sneezing into your hand.	**87**	**100**
After handling garbage.	**87**	**100**
After touching animals.	**87**	**100**
After smoking.	44	50.6
Before touching the food.	85	97.7
After touching your hair.	48	55.2
After handling money.	42	48.3
Basic steps for washing hands (Apply soap, wash thoroughly, rinse and use towel.)	**74**	**85.1**

***= multiple response question**

Table 2 shows that only half of the respondents i.e. 48.3% knew that food safety is the process of handling, preparation, and storage of food in ways that prevent foodborne illness. About two third (64.4%) of respondent said food storage practices is the component of food safety and 47(54%) of respondent said cleaning procedure is the component of food safety. All (100%) of respondent knew keeping long hair tied back or covered is the component of personal hygiene practice, 59.8% of respondent knew wearing gloves before touching food is the component of personal hygiene practice, 97.7% knew covering cuts or sore on hands with brightly colored dressing is the component of personal hygiene practice, 59.8% knew wearing a clean apron is the component of personal hygiene practice, 93.1% knew using handkerchief or tissue while coughing is the component of personal hygiene practice and 52.9% knew not handling money while handling money is the component of personal hygiene practice.

Most of the (97.7%) said hands should be washed before touching the food, all (100%) of respondent said hands should be washed after visiting toilet, after blowing nose or sneezing into hand, after handling garbage and after touching animals respectively.

Most (85.1%) of respondents knew that applying soap, washing thoroughly, rinsing and using towel are the basic steps for washing hands.

Table 2.b: Knowledge of respondents regarding personal hygiene practices

n=87

Characteristics	Correct Response	
	Frequency	Percent (%)
Reason for drying hands after washing them (because germs and bacteria are more easily spread with wet hands)	51	58.6
If you have a runny nose and a sore throat, the best thing to do is (take some medicine before going to work)	67	77.0
People suffering from infectious disease (should not work with food)	85	97.7

Table 2 shows 58.6% of respondents knew that hands should be dried after washing them because germs and bacteria are more easily spread with wet hands. Most (77%) of the respondent knew that taking some medicine before going to work is the best thing to do while having runny nose or a sore throat. Most (97.7%) of respondent knew that people should not work with food if they are suffering from infectious disease.

Table 3: Knowledge of respondents regarding food preparation practices

n=87

Characteristics	Correct Response	
	Frequency	Percent (%)
Elements of food preparation *		
Temperature control.	24	27.6
Prevention of cross-contamination.	7	8.0
Cleanliness.	39	55.2
Food should be cooked at **(medium temperature)**	80	92.0
Fridge is necessary in hotels **(yes)**	87	100
It is necessary to cover foods inside the fridge **(yes)**	76	87.4
To handle cooked and raw foods **(different spoon should be used)**	80	92.0
Leftovers can be reheated **(only once)**	47	54.0
The food should be reheated for **(5 minutes)**	45	51.7
While preparing food we should not *		
Smoke **(yes)**	77	88.5
Eat chewing gum **(yes)**	77	88.5
Use phone **(yes)**	62	71.3

***= multiple response question**

In table 3, among 87 respondents, 55.2% of the respondents said cleanliness is the element of food preparation. 92% of respondent knew food should be cooked at medium temperature, 100% of respondent said fridge is necessary in hotels, 92% knew different spoon should be used to handle cooked and raw foods, 54% of respondent knew leftovers can be reheated only once and 51.7% knew the food should be reheated for 5 minutes. 88.5 % of respondent said while preparing food we should not smoke and eat chewing gum.

Table 4: Knowledge of respondents regarding cross-contamination

n=87

Characteristics	Correct Response	
	Frequency	Percent (%)
Meaning of cross-contamination (transfer of germs from raw foods onto cooked foods)	15	17.2
Precautions that should be taken while preparing food *		
The area for food preparation should be kept clean.	87	100
Keep animals out of food preparation area.	85	97.7
Use separate chopping boards and utensils for raw and cooked foods.	79	90.8
Use separate areas to prepare raw and cooked foods.		
If separate areas are not available, then the benches should be washed	42	48.3
with hot soapy water and sanitizer.	47	54.0
To prevent cross contamination *		
Avoid handling food with bare hands.	87	100
Wear disposable gloves while handling foods.	69	79.3
Always put on new gloves between handling raw foods and ready-to-eat foods.	52	59.8
Remove gloves when handling money or non-food objects.	42	48.3

***= multiple response question**

Table 4 shows that only 17.2% of respondent knew the meaning of cross-contamination. All (100%) of respondent knew that keeping food preparation area clean is the precaution that should be taken while preparing food. Similarly, to prevent cross contamination, all (100%) of respondent said to avoid handling food with bare hands, 79.3% of respondent said to wear disposable gloves while handling foods, 59.8% of respondent said always to put on new gloves between handling raw foods and ready-to-eat foods and 48.3% of respondent said remove gloves when handling money or non-food object.

Table 5: Knowledge of respondents regarding food storage practices, cleaning procedures and food poisoning

Characteristics	Correct Response	
	Frequency	Percent (%)
In fridge, **(Raw foods are kept at the bottom)**	52	59.8
(Cooked foods are kept at the top)	52	59.8
While cleaning utensils, **(we should use soap and water)**	87	100
If food safety is not maintained, **(it can cause food poisoning)**	33	37.9
Food poisoning means **(illness caused by bacteria or other toxins in food)**	63	72.4
Symptoms of food poisoning are **(stomach cramps, diarrhea, vomiting)**	51	58.6
how can you tell if food has enough bacteria to cause food poisoning **(you cannot, it will appear normal)**	40	46.0
All food service workers are required to understand and apply food safety knowledge to **(prevent the spread of illness through food)**	49	56.3

Table 5 shows that 59.8% of respondent knew in fridge raw foods are kept at the bottom and cooked foods are kept at the top. 100% of respondent knew soap and water should be used while cleaning utensils, 37.9% of respondent knew food poisoning can be caused if food safety is not maintained, 72.4% of respondent knew the meaning of food poisoning, 58.6% of respondent knew the symptoms of food poisoning, 46% of respondent knew that we cannot tell if the food has enough bacteria to cause food poisoning and 56.3% of respondent knew all the food service workers are required to understand and apply food safety knowledge to prevent the spread of illness through food.

Table 6: Mean Knowledge Score of Respondents

	Total attainable value	Minimum	Maximum	Mean score ± S.D.	Mean %
Knowledge score	55	25	53	38.54±7.20	70.0

Table 6 shows that; total knowledge score was 55. The minimum score was 25 whereas maximum score was 53, mean score was 38.54 and standard deviation score was 7.20. And mean percentage was 70%.

Table 7: Distribution of respondents according to level of knowledge score

Level of knowledge	Category	Frequency	Percent (%)
Inadequate	≤60.00	22	25.3
Moderate	60.1 –78.18	49	56.3
Adequate	≥78.19	16	18.4
Mean score ± SD	**38.54 ± 7.20**		
Mean percentage ± SD	**70.07 ± 13.10**		

Table no. 7 depicts the level of knowledge regarding food safety, majority of the respondents 56.3% had moderate knowledge, 25.3% had inadequate knowledge and only 18.4% had adequate knowledge regarding food safety. The mean knowledge score ± SD is 38.54 ± 7.20 and mean percentage ± SD is 70.07 ± 13.10.

Table 8: Association of knowledge score of respondents with their selected socio-demographic variables

n= 87

Socio-demographic variables	frequency	Mean ±SD	t/F	df	P value
Age in years			F=3.040	3,83	0.033* **S**
15 – 24	18	66.56 ± 15.27			
25 - 34	36	73.63 ± 9.91			
35 – 44	25	70.61 ± 13.23			
45 - 54	8	60.22 ± 15.53			
Sex			t =1.675	85	0.098 **NS**
Male	45	72.32 ± 11.57			
Female	42	67.66 ± 14.31			
Marital status			t=1.339	85	0.184 **NS**
Married	66	71.12 ± 13.15			
Unmarried	21	66.75 ± 12.65			
Educational level			F=2.625	4,82	0.040* **S**
Illiterate	14	66.88 ± 17.94			
Literate	13	65.17 ± 15.10			
Primary level	21	69.00 ± 9.20			
Secondary Level	32	71.36 ± 11.25			
Higher secondary and above	7	82.85 ± 9.49			
Ethnicity			F=1.187	2,84	0.310 **NS**
Upper high caste	25	70.90 ±12.21			
Relatively advanced Janjati	44	71.32 ± 11.79			
Non-advanced Janjati and others	18	65.85 ± 16.78			
Residence			t =1.099	85	0.275 **NS**
Urban	79	70.56 ± 13.52			
Rural	8	65.22 ± 6.40			
Work experience			F=4.463	3,83	0.006 * **S**
Less than 1 year	13	60.00 ± 10.70			
1-5 year	43	72.09 ± 13.41			
6-10 year	20	74.45 ± 10.49			
More than 10 years	11	66.11 ± 12.96			
Monthly income			F=8.437	5,81	0.000 * **S**
1000 – 5000	16	62.38 ± 14.64			
6000 – 10000	26	63.84 ± 9.72			
11000 – 15000	18	71.81± 10.75			
16000 – 20000	22	81.07 ± 8.79			
21000 – 25000	3	65.45 ± 15.74			
26000 - 30000	2	82.72 ± 6.42			

Heard about food safety			t = 8.306	80.031	0.000 * **S**
Yes	41	79.20 ± 7.83			
No	46	61.93 ± 11.39			

KEY:
S= significant (P<0.05)
NS= Not significant (P>0.05)
t= independent t-test
F= One-way ANOVA test
df= degree of freedom
S. D= Standard Deviation

The obtained one-way ANOVA test and independent t-test shows that there is significant association between knowledge score with age (P=0.033), educational level (P=0.040), work experience (P=0.006), monthly income (P=0.000) and heard about food safety (P=0.000). And t-test and one-way ANOVA test show no association between knowledge score with sex, marital status, ethnicity and residence (P>0.05).

DISCUSSION

Food safety is of great concern in the current situation. A major risk of food contamination lies with the food handlers.(Takalkar, AA. Kumavat, 2011) Improper practices and lack of knowledge by food handlers are contributing factors for the spread of foodborne outbreaks.(Sharif, Obaidat, & Al-Dalalah, 2013) Food handlers may also carry some human specific food- borne pathogens such as Hepatitis A, noroviruses, ty-phoidal Salmonella, Staphylococcus aureus and Shigella sp in their hands, cuts or sores, mouth, skin and hair. Food handlers may also shed foodborne pathogens, such as E. coli O157:H7 and non-typhoidal Salmonella during the infectiousness period or less important during recovery period of a gastrointestinal sickness.(Sharif et al., 2013)

The statistical analysis of present study highlighted that among 87 respondents, only 41 respondents had heard about food safety. The study also revealed that majority of the respondents i.e. 56.3% had moderate knowledge, 25.3% had inadequate knowledge and 18.4% had adequate knowledge regarding food safety. Above finding was supported by a study done among food handlers at residential colleges and canteen in the main campus of University Kebangsaan Malaysia, where it was found that the respondents' knowledge was moderate with mean point of 57.8%.(NEE SO, 2011) Another study findings conducted in university campus in Trinidad and Tobago had contradicts with present study, as that found a total of 63.5% of the respondents had limited knowledge, 79% were well-informed about hygiene practices.(Webb & Morancie, 2015).

Mean percentage score for knowledge, of present study was 70.07% ± 13.10%, another study that was conducted in Military Hospital, Jordan showed means percentage scores for the knowledge, was 84.82% ± 11.71%.(Sharif et al., 2013), which was quite high, it may be strict implementation of food regulation.
Present study found that, most of the respondents (97.7%) said, hands should be washed before touching the food, all (100%) of respondent said hands should be washed after visiting toilet, after blowing nose or sneezing into hand, after handling garbage and after touching animals respectively. Above study findings was supported by another study conducted in Government Medical College and Hospital, Solapur, India, showed almost all food handlers were aware about importance of hand washing before serving and after defecation in prevention of food borne diseases (96.4% and 100% respectively).(Takalkar, AA. Kumavat, 2011) This study found that respondents had good knowledge (85.1%) on steps of hand washing that applying soap, washing thoroughly, rinsing and using towel are the basic steps for washing hands.
The statistical analysis of present study shows that age, educational level, work experience and monthly income of respondents were significant with knowledge score of maintenance Above finding was supported by a study done in Malaysia found that there is significant association between knowledge of respondent with their working experience (p=0.008) at the p <0.05 level of significance.(NEE SO, 2011)

In Nepal, food safety and quality management lie under the jurisdiction of Ministry of Agriculture and Cooperatives. Department of Food Technology and Quality Control (DFTQC) under Ministry of Agriculture and Cooperatives is the major government institution responsible for food safety and quality management. Other ministry and governmental institution has also supportive role for this. Enforcement of food act 1966 is the major regulatory activity of the DFTQC.(Bajagai YS, 2016)(DFTQC, 2011) From the very beginning, DFTQC has devoted its efforts for ensuring the availability of safe, quality and nutritious food to Nepalese people through a number of activities in the area of food quality control, development and dissemination of food processing technologies as well as food and nutrition programs.(DFTQC, 2011) It is also responsible to regulate food in the market and ready to eat food as well as improve the knowledge, attitude and practice of consumers on food safety, quality and nutrition(DFTQC, 2011). But poor Act implementation and lack of coordination among different government institutions is the reason for unmanaged food business of present condition.(Bajagai YS, 2016)

CONCLUSION

This study concludes that knowledge about maintenance of food safety among food handlers was moderate. Few had good knowledge. The study showed that there is association of knowledge score of maintenance of food safety by respondent's age, educational level, work experience and monthly income.

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