

Knowledge on Food Safety after a Year of COVID-19 Pandemic in Indonesia

Evi Nurhidayati, BSc,¹ Grace Wangge, PhD,² Amanda Safiera Ameline, BSc,¹ Annisa Melati Putri, BSc,¹ Ayu Kristiningrum, BSc,¹ Dian Novrianti, BSc¹ and Evi Ermayani, M. Nut²

¹Department of Nutrition Science, Faculty of Medicine, Universitas Indonesia – Dr. Cipto Mangunkusumo Hospital, Jakarta, Indonesia

²Southeast Asian Ministers of Education Organization Regional Centre for Food and Nutrition (SEAMEO RECFON), Jakarta, Indonesia

ABSTRACT

Objective. This study aimed to determine the level of food safety knowledge, and its determinant factors during eating out settings, among Indonesian adults after one year of the COVID-19 pandemic.

Methods. A cross-sectional survey was carried out from April 19 to April 26, 2021, using an online questionnaire. Participants' socio-demographic characteristics, exposure to information, as well as knowledge towards food safety during the COVID-19 pandemic were obtained using a convenience sampling technique. Data collected were subjected to descriptive statistics, chi-square analysis, and logistic regression analysis.

Results. From a total of 551 completed responses, the majority of respondents were female (76.8%), between the ages of 18-25 years (41.2%), had a college (bachelor) degree (65.2%), and lived in Java Island (74.0%). About 45.4% were exposed to food safety information 1-2 times per week and more than half (56.8%) claimed to get trusted sources of food safety information from social media. After adjusting with other variables, the most dominant factor associated with the food safety knowledge during eating out were age (26-32 years) (OR=1.7, 95% CI 1.0-2.7) and gender (female) (OR=1.5, 95% CI 1.0-2.4).

Conclusion. After one-year of COVID-19 pandemic, the most dominant factors related to food safety knowledge are age and gender. Food safety knowledge has no significant association with attitude and practice.

Keywords: food safety knowledge, food safety attitude and practice, COVID-19

INTRODUCTION

One year after the COVID-19 pandemic, the Indonesian government has permitted dine-in services with strict health protocols such as hand hygiene practices, limited number of visitors per restaurant, use of face masks, providing adequate handwashing facilities, and applying the highest standard of food safety practice.¹

The consistency of proper food handling practices can be influenced by positive attitudes and knowledge. Along with knowledge and food safety regulations, attitude plays an important role in reducing the incidence of foodborne diseases.² A cross-sectional study conducted in 2018 from 72 food handlers in North Jakarta showed a significant correlation between the level of knowledge about food safety and the attitude of food handlers ($p=0.01$), and attitude scores were significantly higher among food handlers who reported attending a previous food safety training course ($p=0.002$) with ($r=0.302$).²

Likewise, the foodborne infection cases may be reduced if at-risk populations obtain food safety information

Corresponding author: Grace Wangge, PhD
Southeast Asian Ministers of Education Organization
Regional Centre for Food and Nutrition (SEAMEO RECFON)
Jl. Utan Kayu Utara No.1, Jakarta 13410, Indonesia
Email: gwangge@gmail.com

sufficiently from appropriately trained and credible healthcare professionals such as dietitians.³ Knowledge gained from food safety training or education leads to improved attitudes and better food handling practices.² Farkas et al. reported that people with more knowledge and experience are more aware of food safety risks.⁴ Given that people who are aware of the issue of foodborne diseases may be more motivated to take preventive measures.⁵

Previous research conducted in Indonesia during the early stages of the COVID-19 pandemic discovered a strong correlation between food safety awareness and attitude ($r=0.786$).⁶ However, there was a weak correlation between food safety knowledge and attitude ($r=0.285$), as well as knowledge and practice ($r=0.214$).⁶ Positive attitudes and higher food safety practice scores that people had before the pandemic will also contribute to better food safety practices during the pandemic ($r=0.775$).⁶ This study aims to follow up the result by describing the food safety knowledge among the adult population one year after the pandemic, primarily related to eating out, along with its associated factors.

MATERIALS AND METHODS

Study Design

This study was a cross-sectional study conducted among 551 adult participants in Indonesia between April 19 to 26, 2021. This study used an online questionnaire to assess food safety knowledge alongside the associated factors including socio-demographic characteristic, exposure to food safety information, and their attitude and practice in the last 3 months (January to March 2021) during the COVID-19 pandemic.

Selection of Participants and Sampling

The population in this study was Indonesian citizens aged ≥ 18 years old, has access to internet, and living in Indonesia since March 2020. People who were in the middle of a certain diet or treatment were excluded from this study. The minimum sample size was calculated using α of 1.96, 5% margin of error, and proportion of 0.5 (maximal estimation) and 12% non-response rate, resulting in the final sample size of 430 adults.⁷

The convenience sampling method was used. This is an open, voluntary-based survey with no prior list of respondents. Data was collected using an online survey platform (LimeSurvey). The links of the survey were disseminated either through institutional website and social media platform, and personal contacts.

On the first page of the online survey questionnaire, general information about the study (i.e., purpose and procedures), participants' rights, and the researcher's contact details were provided. It also stated non-disclosure of information to ensure confidentiality and anonymity of the participants, and the data from the questionnaire would be used for academic purposes only. Participants who agreed

to participate in the study checked the informed consent box and moved on to the next page.

Data Collection Procedure

This study used a questionnaire that were developed by the investigator based on inputs from experts on food safety and public health. The questionnaire consists of several questions that measure knowledge, attitude, and self-reported practices toward food safety during eating out using seven constructs (1) personal hygiene (hand washing when dining out); (2) social distancing; (3) face mask use; (4) use of disinfectant (cutlery); (6) selection of safe external dining environment; (6) virus transmission via fomites; and (7) lessening contact during eating out. Construct items were included based on basic content taught in the WHO five keys to safer food manual.

The survey had a total of 28 questions and took an average of less than 20 minutes to complete. Each domain on knowledge, attitude, and practice has 8 questions and were scored with different method. For each item on food safety knowledge, participants were asked to choose "true" or "false". A score of 4 points was given for each correct answer, while a score of 0 point was given for the incorrect answer. For attitudes, four-level Likert scale questions were used. The lowest point (1 point) was given to "strongly disagree" and the highest (4 points) for "strongly agree" Self-reported practices, were scored from the lowest (1 point) for "never" to the highest (4 points) for "always". For each domain, we calculated the total score and the level of knowledge, attitude, and practice based on each domain total score. The total score for each domain is then categorized into "Poor" and "Good" using median of each domain total scores as its cut-off point.

Questionnaire Validity and Reliability

The online questionnaire has been pre-tested with 30 adult respondents who were later excluded from the survey. Those respondents were selected from family members and colleagues who match the inclusion criteria. Cronbach Alpha was used as a statistical tool to examine the instrument's reliability. A reliability coefficient index of 0.805 was obtained, indicating that the instrument is sufficiently reliable. Experts on food safety and public health were invited again to give suggestions on the instrument's clarity, format, and content. All of the experts' suggestions and comments, which emphasized mostly on question ordering, using simple and correct wording, grammar, and formatting, were integrated into the updated instrument.

After the final data collection, the reliability check was also reconducted with the 0.670 score of Cronbach's Alpha. The language of the instrument was Bahasa. According to Azlan et al., a Cronbach alpha range of 0.6 to 0.7 is adequate and reliable.⁸ Therefore, the items used to assess knowledge, attitude, and practice towards food safety of eating out were considered acceptable.

Data Analysis

In this study, univariate analysis was used to describe the characteristics of socio-demographic situations, exposure to food safety information during the COVID-19 pandemic, food safety knowledge, food safety attitude, and food safety practice during eating out. Bivariate analysis was used to assess the determinant factors (sociodemographic characteristics and food safety information exposure) that influence the level of food safety knowledge. It was also used to assess the association between the level of food safety knowledge and food safety attitude, and the association between the level of food safety attitude and food safety practice.

The analyses were performed using SPSS statistical software package version 22 (SPSS Inc., an IBM Company, Chicago, IL, USA).

Ethical Considerations

Ethical clearance was obtained from the Ethics Commission of the Faculty of Medicine, Universitas Indonesia, number ET.517/UN2.F1/ETIK/PPM.00.02/2020. All participants signed an informed consent form before the data collection, noting that their involvement in completing the survey was voluntary, and all their responses would be treated confidentially.

RESULTS

There were 1,363 participants who clicked the link of the survey. However, only 555 participants responded completely to the online questionnaire. We excluded four participants due to duplicate data and other issues, including participants who said they were not on a diet but stated in their comments that they were limiting their carbohydrate intake. Thus, the final data set in this study was 551 participants, giving a response rate of 40.7% (551 out of 1363) (Figure 1).

General Characteristics of Respondents

General characteristics of the respondents were summarized in Table 1 with 41.2% of participants were aged between 18 and 25 years old. The majority of the participants

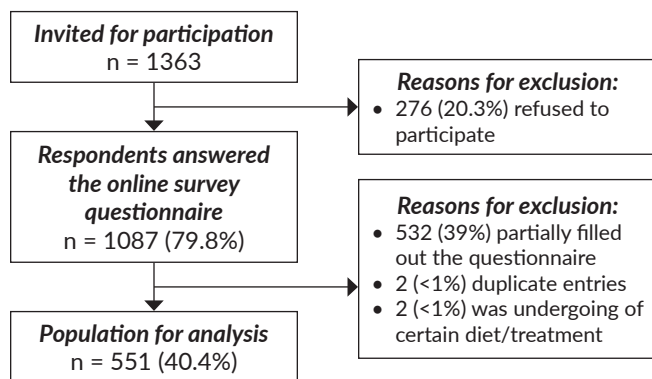


Figure 1. Flow-chart of study participants.

were females 423 (76.8%) and more than half (65.2%) of the participants have a bachelor's degree. During the pandemic, the distribution of participants' income was similar across all groups of income including participants who did not have any income. Majority of the participants came from Java Island (74.0%). Table 1 showed the exposure to food safety information was still low with more than half of the participants still got information exposure below three times per week (never and 1-2 times per week 25.8% and 45.4%, respectively). The median scores for food safety knowledge, attitudes, and practices were 20.0, 26.0, and 25.0, respectively.

Food Safety Knowledge during Eating Out

As summarized in Table 2, a key outcome of the study was that the majority of participants have a good knowledge of food safety during eating out, with an 82.7% average score

Table 1. Characteristics of Study Participants (N=551)

Characteristics	n	%
Age (years)		
18-25	227	41.20
26-32	181	32.85
33-40	64	11.62
41 and above	79	14.34
Gender		
Female	423	76.77
Education		
Elementary - Middle School	1	0.18
High School	66	11.98
Diploma	54	9.80
Bachelor	359	65.15
Master	66	11.98
Doctoral	5	0.91
Occupation		
Unemployed and Retired	46	8.35
College Student	91	16.52
Housewife	40	7.26
Civil Servant	109	19.78
Private Employee	155	28.13
Entrepreneur	30	5.44
Farmer	3	0.54
Other	77	13.97
Level of Income		
≤IDR1.800.000	179	32.49
>IDR1.800.000-3.000.000	90	16.33
>IDR3.000.000-4.800.000	98	17.79
>IDR4.800.000-7.200.000	97	17.60
>IDR7.200.000	87	15.79
Province origin		
Sumatera	100	18.15
Jawa	408	74.05
Bali and Nusa Tenggara	22	3.99
Kalimantan	9	1.63
Sulawesi and Maluku	10	1.81
Papua	2	0.36
Frequency of Food Safety Information Exposure		
Never	142	25.77
1-2 times/week	250	45.37
3-5 times/week	52	9.44
Everyday	107	19.42

Table 2. The Proportion of Food Safety Knowledge during Eating Out (N=551)

Statements	Correct n (%)
1. Washing hands with soap and running water minimum for 20 seconds before and after eating helps reduce the risk of coronavirus transmission (True)	5420 (98.4)
2. Crowded places to eat (restaurant, cafe, etc) without physical distancing increases the risk of coronavirus transmission (True)	540 (98.0)
3. Wearing masks when buying food from the outside (at a restaurant, cafe, etc) helps to reduce the risks of transmission of coronavirus (True)	546 (99.1)
4. When eating outside the home, cutlery and table surfaces are cleaned using a disinfectant to kill the coronavirus (True)	526 (95.5)
5. Being in a closed dining room (restaurant, cafe, restaurant, etc.) with poor air circulation, at most 15-20 minutes can help prevent the spread of the coronavirus (False)	168 (30.5)
6. Coronavirus has the potential to be transmitted through food and food packaging (False)	113 (20.5)
7. Food handlers (e.g., chefs, waiters) who do not have symptoms of COVID-19 cannot transmit COVID-19 to staff and customers (False)	336 (61.0)

~ Correct answers indicated in the bracket.
The overall mean knowledge index score is 82.7% correct.

of correct answer on the 7-item knowledge index, implying that 6 of the 7 questions were answered correctly. The finding was close to the total score that most of them (71%) had a satisfactory food safety knowledge level (Figure 2).

Food Safety Attitude during Eating Out

Table 3 shows that the vast majority of participants (80.9%) strongly agreed with the idea of washing hands with running water and soap before and after eating outside the home (restaurant, cafe, etc.). Moreover, 82.4% strongly agreed with the idea of the importance of using a mask when eating out to protect themselves from the risk of coronavirus transmission. More than half of the participants agreed with the idea of using the application (i.e. non-direct payment method) to order food in restaurants to minimize contact with other people (e.g. delivery order, drive-thru, pick-up, etc).

Food Safety Practice during Eating Out

As shown in Table 4, most participants (82%) always wash their hands with water and soap and/or hand sanitizer, 66.2% adhere to the physical distancing rules (at the restaurant, cafes, etc), and 65.9% wear face masks when dining out. More than 52% always choose a restaurant that has good air circulation or has an open space that follows physical distancing rules. About 53.7% claimed that they never share utensils (e.g., spoons, forks, cups, drinking bottles, etc.), particularly when eating with others. Approximately 66.8%

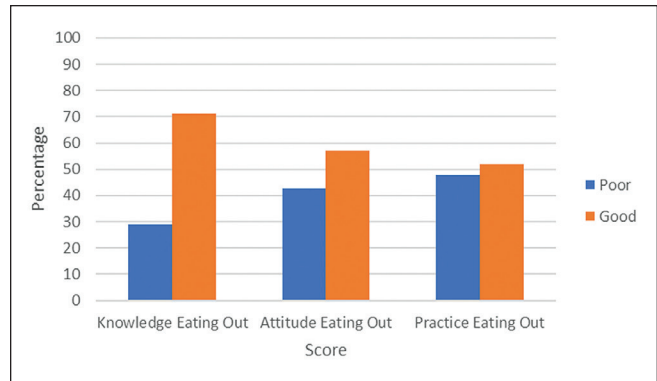


Figure 2. Food Safety Knowledge, Attitude, and Practice during Eating Out.

Note: median cut-off scores are used to categorize the level of knowledge, attitude, and practice. If the score was lower than the median, it was classified as poor or inadequate; and if the score was equal to or higher than the median, it was classified as good or adequate

said they frequently pay for food with non-cash money (e.g., electronic money, debit card, credit card, etc.) rather than a direct payment method.

The Score of Food Safety Knowledge, Attitude, and Practice during Eating Out

Based on our results as shown in Figure 2, approximately more than half of the participants have good KAP during eating out. In the range score of 0 – 100, the score of good knowledge for eating out was 71 and 29 for the poor one. For attitude, the good one was 57.2 while the poor one was 42.8. The good practice score for eating out was 52.1 and the poor one was 47.9. This showed that number of participants who have good KAP score during eating out was higher than the participants who have poor KAP scores.

The Food Safety Knowledge during Eating Out and its Factors

Table 5 shows the association between socio-demographic characteristics and the categorization of food safety knowledge during eating out after one year of the COVID-19 pandemic. The results of the analysis stated that none of the socio-demographic factors, such as age, gender, education level, occupation, and income level, had a significant relationship with eating out food safety knowledge. However, the proportion of good eating out food safety knowledge remained higher for all characteristics.

Out of 551 respondents, 409 participants were analyzed in the source of trusted food safety information variables. Based on the frequency of information exposure, there were 142 participants who were never exposed to the food safety information, thus, they cannot be included in the analysis for source of information.

Related to the exposure of the participants, it was revealed that there was a statistically significant association between

Table 3. The Proportion of Food Safety Attitude during Eating Out (N=551)

Statements	Strongly Disagree n (%)	Disagree n (%)	Agree n (%)	Strongly Agree n (%)
1. I choose to wash my hands with running water and soap before and after eating outside the home (restaurant, cafe, etc.)	3 (0.5)	3 (0.5)	99 (18.0)	446 (80.9)
2. If possible, I will use the app to order food in restaurants to minimize contact with other people. (example: delivery order, drive-thru, pick-up, etc.)	1 (0.2)	31 (5.6)	277 (50.3)	242 (43.9)
3. Using a mask is important to protect yourself from the risk of coronavirus transmission when eating out (in a restaurant, cafe, etc)	0 (0.0)	1 (0.2)	96 (17.4)	454 (82.4)
4. When eating out (in restaurant, cafe, etc.), it is important to clean tables and cutlery before use	0 (0.0)	2 (0.4)	175 (31.8)	374 (67.9)
5. Limiting the time when eating out (restaurant, cafe, etc.), especially when inside a closed room	0 (0.0)	9 (1.6)	177 (32.1)	365 (66.2)
6. Removing all food packaging purchased from the outside properly and replace it with clean container	0 (0.0)	23 (4.2)	232 (42.1)	296 (53.7)
7. Avoiding crowded eating places, minimizing eating events outside the home (restaurant, cafe, etc.), and preferring to eat at home	1 (0.2)	10 (1.8)	173 (31.4)	367 (66.6)

Table 4. The Proportion of Food Safety Practice during Eating Out (N=551)

Statements	Never n (%)	Rarely n (%)	Often n (%)	Always n (%)
1. I wash my hands with soap and running water or use a hand sanitizer when eating out (in a restaurant, cafe, etc.)	0 (0.0)	13 (2.4)	88 (16.0)	450 (81.7)
2. I follow the rules of physical distancing when buying or eating out (at a restaurant, cafe, etc.)	1 (0.2)	20 (3.6)	165 (29.9)	365 (66.2)
3. When eating out, I avoid talking to other people and keep my mask on when I am not eating	2 (0.4)	23 (4.2)	163 (29.6)	363 (65.9)
4. I clean cutlery and table surfaces when I am eating out (at a restaurant, cafe, etc.)	15 (2.7)	74 (13.4)	192 (34.8)	270 (49.0)
5. If I'm eating out (at a restaurant, cafe, etc.), I will choose a restaurant that has good air circulation or has an open space that follows physical distancing rules	3 (0.5)	49 (8.9)	210 (38.1)	289 (52.5)
6. I don't share the same utensils (spoons, forks, cups, drinking bottles, etc.), especially when eating with other people	8 (1.5)	25 (4.5)	135 (24.5)	383 (69.5)
7. I prefer to pay for food with non-cash money (example: electronic money, debit card, credit card, etc.) rather than cash	48 (8.7)	197 (35.8)	203 (36.8)	103 (18.7)

Table 5. Association between Socio-demographic Factors with the Food Safety Knowledge during Eating Out (N=551)

Variables	Eating Out Food Safety Knowledge		OR (95 % CI)
	Poor, n (%)	Good, n (%)	
Age (years)			
18 - 32	121 (22.0)	287 (52.1)	1.12 (0.74, 1.72)
33 and above	39 (7.1)	104 (18.9)	
Gender			
Male	45 (8.2)	83 (15.1)	1.45 (0.95, 2.21)
Female	115 (20.9)	308 (55.9)	
Education Level			
Secondary to Diploma	38 (6.9)	83 (15.1)	1.16 (0.75, 1.79)
Bachelor to Postgraduate	122 (22.1)	308 (55.9)	
Occupation			
Not working	111 (20.1)	263 (47.7)	1.10 (0.74, 1.64)
Working	49 (8.9)	128 (23.2)	
Income level			
No income - Low Income	84 (15.2)	185 (33.6)	1.23 (0.85, 1.78)
Middle - High Income	76 (13.8)	206 (37.4)	

exposure to food safety information sources with eating out food safety knowledge, particularly for institutional websites, school/educational institutions, and social media (Table 6). Participants who get exposure to institutional websites (OR 1.6; 95% CI 1.0 to 2.5) and social media (cOR 1.6; 95% CI 1.0 to 2.6) are more likely to have a higher level of good knowledge about food safety during eating out rather than participants who were not exposed. Meanwhile, participants who get exposure from school/educational institutions are more likely to have a higher level of good knowledge (cOR 2.3; 95% CI 1.1 to 4.6) about food safety during eating out rather than participants who were not exposed.

Furthermore, there was a significant association between food safety knowledge and the age group 26-32 years old (OR 1.7; 95% CI 1.0 to 2.7). In this study, we also found that food safety knowledge had a significant association with gender, particularly among females (OR 1.5; 95% CI 1.0 to 2.4).

Likewise, when we associate the knowledge variable (as an independent variable) with food safety attitude as well as food safety practice (as shown in Table 7), the results showed that there was no significant association between eating out food safety knowledge and attitude (OR 1.31, 95% CI 0.90 to 1.89).

Meanwhile, the relationship between eating out attitude and practice variables was found to be significant, implying

that a good attitude would result in 8.50 times (95% CI 5.76 to 12.53) good food safety practice during eating out settings compared with the participants who have poor attitude.

DISCUSSION

In this study, we discovered that a year after the COVID-19 pandemic in Indonesia, the most dominant factors related to food safety knowledge are age and gender. There was no significant association between the food safety knowledge with attitude and practice.

Based on our findings, almost three-quarters of study participants (71%) are knowledgeable about food safety when eating out. This was consistent with some cross-sectional studies conducted among adult populations in Indonesia, food handlers in Sri Lanka, and mothers in Ethiopia, which found that the proportion of participants with good knowledge on food safety were 85.9%, 81%, and 75.9%, respectively.^{6,9,10} On the other hand, Haryanti et al.¹¹ conducted a cross-sectional study during the COVID-19 pandemic in Indonesia to investigate food handlers' knowledge and practices regarding hygiene and sanitation during food processing and serving. Nearly half of the respondents (47.4%) had insufficient knowledge, and more than 73% had poor hygiene and sanitation practices.¹¹

Table 6. Association between Exposure to Food Safety Information with the Food Safety Knowledge during Eating Out

Variables	Eating Out Food Safety Knowledge		OR (95% CI)
	Poor, n (%)	Good, n (%)	
Frequency of Information Exposure (n = 551)			
Never	40 (28.2)	102 (71.8)	0.99 (0.83-1.18)
1-2 times/week	70 (28.0)	180 (72.0)	
3-5 times/week	23 (44.2)	29 (55.8)	
Everyday	27 (25.2)	80 (74.8)	
Source of Information (n=409)			
Family	28 (27.7)	73 (72.3)	1.1 (0.6-1.8)
Friends/Peers	19 (25.7)	55 (74.3)	1.2 (0.7-2.2)
Electronic Media	50 (27.6)	131 (72.4)	1.1 (0.7-1.7)
Press Media	15 (27.8)	39 (72.2)	1.0 (0.5-2.0)
Institutional Website	34 (23.1)	113 (76.9)	1.6 (1.0-2.5)
School/Education Institution	11 (16.7)	55 (83.3)	2.3 (1.1-4.6)
Social Media	84 (26.8)	229 (73.2)	1.6 (1.0-2.6)

Note: Source of information were only responded by 409 subjects who were exposed to the food safety information

Table 7. Association between Food Safety Knowledge, Attitude, and Practice during Eating Out (N=551)

Variables	Attitude Level			Practice Level		
	Poor, n (%)	Good, n (%)	OR (95% CI)	Poor, n (%)	Good, n (%)	OR (95% CI)
Knowledge						
Poor	76 (47.5)	84 (52.5)	1.31 (0.90 - 1.89)	78 (48.8)	82 (51.3)	1.05 (0.73 - 1.52)
Good	160 (40.9)	231 (59.1)		186 (47.6)	205 (52.4)	
Attitude						
Poor	N/A	N/A		179 (75.8)	57 (24.2)	8.5 (5.76 -12.53)
Good	N/A	N/A		85 (27.0)	230 (73.0)	

Note: N/A = not applicable

Furthermore, we found that there was a significant association between food safety knowledge during eating out and age. The participants aged 26 to 32 years old had a 1.7 times chance of having good knowledge on food safety when eating out, compared to the younger participants aged 18 to 25 years old. This finding is similar to the result of a study by Hamed and Nesreen about food safety knowledge, attitude, and self-reported practices among food handlers in Egypt, which showed that age is significantly associated with food safety knowledge (OR: 1.01; 95% CI: 1.001 – 1.03).¹²

The result of this study is aligned with a study by Illés et al. and Soon et al., which showed food handlers aged 26 to 35 years were more knowledgeable about food transmission diseases, compared to other age categories.¹³ It concluded that knowledge decreased with an increase in age. The older the food handlers are, the less knowledgeable they are about food safety.¹³ This phenomenon could be explained by the fact that participants who frequently sought information from internet were younger, whereas older participants tended to seek information through conventional media.¹⁴ Therefore, this practice could increase levels of awareness and knowledge of COVID-19-related issues, including food safety during pandemics.¹⁵

In contrast, Sanlier et al. (revealed that young consumers (14 to 19 years) have lower scores on food safety knowledge than adult consumers due to being less knowledgeable on how to prepare, cook and store perishable foods (e.g. milk, canned foods, meat, chicken, etc).¹⁶ Moreover, they are unaware of pathogenic bacteria and do not pay attention to personal hygiene or the hygiene of their environment while preparing food. Young consumers are more likely to experience a lack of information and perception than older adults.¹⁶

The majority of participants in this study are females between the ages of 18 and 25. A study by Fasoro et al.¹⁷ showed that females are more interested than males in obtaining information about many aspects of food safety and health. They are also more inclined to prepare and cook meals at home. According to the 2020 Indonesia Statistic Report, 30.2% of social media users are aged 18 to 24 years old.¹⁸ In addition, our study also found that gender, particularly female, was significantly associated with eating out food safety knowledge (OR=1.5, 95% CI: 1.0 - 2.4). Similarly, a large study in China reported the evaluation of food safety education on KAP. The result showed that gender (female) was significantly associated with food safety knowledge (OR=1.43, 95% CI: 1.1 – 1.84).¹⁹ A study by Isoni Auad et al. explained that female Brazilian food handlers were more knowledgeable (8.25) compared to their male counterparts (6.97).²⁰ The plausible explanation is that women are more concerned about health-related information and are more likely to seek information than men.¹⁶ Men are significantly less likely than women to have good knowledge, positive attitudes, and appropriate or safe practices (i.e., preventive and protective measures) in response to COVID-19.²¹

We found that exposure to food safety information (i.e., via institutional websites, school or educational institutions, and social media) was significantly associated with food safety knowledge during eating out. Participants who were exposed to food safety information from institutional websites and social media had a 1.6 times chance of having a good knowledge level of food safety during eating out than participants who had never been exposed. Meanwhile, the participants who were exposed to food safety information from the school or educational institutions had a 2.3 times chance of having a good knowledge level of food safety during eating out than participants who had never been exposed.

Our study found that social media (56.8%), electronic media (32.8%), and institutional websites (26.7%) were chosen as the most trusted source of food safety information. This study's finding is similar to the result of the research by Abdulsalam that assessed the use of social media in food safety in Saudi Arabia.²² It showed that social media was ranked 2nd after the internet, in general, to locate information about food safety and foodborne illness during a crisis. Digital media enables individuals to receive food safety information within seconds, a major advantage, particularly during a major health crisis such as the COVID-19 pandemic. This can be considered as the reason why the participants choose them and only 9.8% of participants obtain information from press media like newspapers.

Regardless of the amount of food safety information disseminated during the pandemic, information uptake and application into daily life are also determined by interest, firmly held beliefs, and information-processing capabilities.²³ Kuroda et al. discovered that users who obtain food safety information through the internet or by word of mouth might have a lower sense of safety than those who obtain it from the official local government.²⁴ If providers can communicate information intelligibly and users can distinguish the good from the bad and link it to self-determination, the internet can play a positive and effective role in health communication.²⁴

The study's major limitations are the representativeness of study population, which is overrepresented by women and young adults who live in Java Island, implying that our findings may not represent a true population of Indonesia. However, as the nature of the study is online, it is understandable that most of our respondents came from Java, where internet access is better than the rest of Indonesia. The topic of the questionnaire may have also attracted more female respondents who had more concerns on food safety issues. Minor limitation is consumers self-report their practices from purchase to consumption while eating out, hence inappropriate actual practices may not be captured or reported in this study. Despite these limitations, our findings are useful because they contribute to the recent emerging issues about consumers' food safety KAP since the COVID-19 pandemic first arose in Indonesia.

CONCLUSION AND RECOMMENDATION

This study discovered that a year after the COVID-19 pandemic in Indonesia, the most dominant factors related to food safety knowledge are age and gender. Exposure to food safety information via media that suits the specific age group is necessary to raise awareness on food safety in any situation.

Acknowledgments

We would like to express special thanks to all study participants for their valuable contributions to the study.

Statement of Authorship

EN, ASA, AMP, AK, and DN contributed in the collection and analysis of data, drafting and revising the report, and final approval of the version to be published; GW and EE contributed in the conceptualization of the study, supervision of data collection, analysis and reporting, and final approval of the version to be published.

Author Disclosure

All authors declared no conflicts of interest.

Funding Source

This publication was funded by the Southeast Asian Ministers of Education Organization Regional Centre for Food and Nutrition (SEAMEO RECFON) and the Indonesian Occupational Medicine Association (IOMA).

REFERENCES

1. Soon JM, Vanany I, Abdul Wahab IR, Hamdan RH, Jamaludin MH. Food safety and evaluation of intention to practice safe eating out measures during COVID-19: Cross sectional study in Indonesia and Malaysia. *Food Control*. 2021 Jul;125:107920. doi: 10.1016/j.foodcont.2021.107920.
2. Putri MS, Susanna D. Food safety knowledge, attitudes, and practices of food handlers at kitchen premises in the Port "X" area, North Jakarta, Indonesia 2018. *Ital J Food Saf*. 2021 Nov;10(4):9215. doi: 10.4081/ijfs.2021.9215.
3. Evans EW, Redmond EC, Alwan N, Ilic S. Awareness and attitudes of student dietitians in Lebanon, UK and USA towards Food Safety. *Foods*. 2021 Aug;10(8):1875. doi: 10.3390/foods10081875.
4. Farkas K, Green E, Rigby D, Cross P, Tyrrel S, Malham SK, et al. Investigating awareness, fear and control associated with norovirus and other pathogens and pollutants using best-worst scaling. *Sci Rep*. 2021 May;11(1):11194. doi: 10.1038/s41598-021-90704-7.
5. Mekonnen SA, Gezehagn A, Berju A, Haile B, Dejene H, Nigatu S, et al. Health and economic burden of foodborne zoonotic diseases in Amhara region, Ethiopia. *PLoS One*. 2021 Dec;16(12):e0262032. doi: 10.1371/journal.pone.0262032.
6. Bafani U, Fikha II, Faza F, and Alfitri KN. Assessing Awareness, Knowledge, Attitude and Practice of Food Safety and Associated Factors Toward Food Safety Practice During COVID-19 Pandemic in Indonesia. Jakarta; 2020.
7. Addis SG, Nega AD, Miretu DG. Knowledge, attitude and practice of patients with chronic diseases towards COVID-19 pandemic in Dessie town hospitals, Northeast Ethiopia. *Diabetes Metab Syndr*. 2021 May-Jun;15(3):847-56. doi: 10.1016/j.dsx.2021.03.033.
8. Azlan AA, Hamzah MR, Sern TJ, Ayub SH, Mohamad E. Public knowledge, attitudes and practices towards COVID-19: A cross-sectional study in Malaysia. *PLoS One*. 2020 May;15(5):e0233668. doi: 10.1371/journal.pone.0233668.
9. Galgamuwa LS, Iddawela D, Dharmaratne SD. Knowledge and practices of food hygiene among food handlers in plantation sector, Sri Lanka. *Int J Sci Rep*. 2016 Dec;2(12):304-311. doi: 10.18203/issn.2454-2156.IntJSciRep20164307
10. Belayneh Z, Mekuriaw B. Knowledge and menstrual hygiene practice among adolescent school girls in Southern Ethiopia: A cross-sectional study. *BMC Public Health*. 2019 Nov;19(1):1595. doi: 10.1186/s12889-019-7973-9.
11. Haryanti DY, Suryaningsih Y. Food safety knowledge of food sanitation hygiene practices in the era of pandemic COVID-19. *Indones J Health Sci*. 2021 Jun;13(1):25-34. doi:10.32528/ijhs.v13i1.5292
12. Hamed A, Mohammed N. Food safety knowledge, attitude and self-reported practices among food handlers in Sohag Governorate, Egypt. *East Mediterr Health J*. 2020 Apr;26(4):374-381. doi: 10.26719/emhj.19.047.
13. Illés CB, Dunay A, Serrem C, Atubukha B, Serrem K. Food safety and sanitation implementation impasse on adolescents in Kenyan high schools. *Int J Environ Res Public Health*. 2021 Feb;18(3):1304. doi: 10.3390/ijerph18031304.
14. Ho HY, Chen YL, Yen CF. Different impacts of COVID-19-related information sources on public worry: an online survey through social Media. *Internet Interv*. 2020 Dec;22:100350. doi: 10.1016/j.invent.2020.100350.
15. Al-Rasheedi M, Alhazmi Y, Mateq Ali Al, AlRajhi M, Alharbi NS, Alsuhaibani S, et al. Public and healthcare providers awareness of Coronavirus (COVID-19) in Qassim Region, Saudi Arabia. *Saudi J Biol Sci*. 2021 Jan;28(1):90-8. doi: 10.1016/j.sjbs.2020.08.035.
16. Sanlier N, Konaklioglu E. Food safety knowledge, attitude and food handling practices of students. *Br Food J*. 2012;114(4):469-80. doi:10.1108/00070701211219504
17. Fasoro AA, Faeji CO, Oni OI, Oluwadare T. Assessment of food safety practices in a rural community in Southwest Nigeria. *Food Public Health*. 2016;6(3):59-64. doi: 10.5923/j.fph.20160603.01
18. BPS-Statistics Indonesia. *Statistical Yearbook of Indonesia 2020*. Jakarta: BPS-Statistics Indonesia; 2020.
19. Jinfeng Sun J, Changfeng Liu C, Yacong Bo Y, Jianxiang Shi J, Pengfei Wang P, Jun Zhang J, et al. Evaluation of a food safety education on knowledge, attitude and practice among 1300 college students of Henan province, China. In: *Proceedings of the 2015 International Conference on Mechanical Science and Engineering*. 2016.
20. Auad LI, Ginani VC, Stedefeldt E, Nakano EY, Santos Nunes AC, Zandonadi RP. Food safety knowledge, attitudes, and practices of Brazilian food truck food handlers. *Nutrients*. 2019 Aug;11(8):1784. doi: 10.3390/nu11081784.
21. Al-Hanawi MK, Angawi K, Alshareef N, Qattan AMN, Helmy HZ, Abudawood Y, et al. Knowledge, attitude and practice toward COVID-19 among the public in The Kingdom of Saudi Arabia: A cross-sectional study. *Front Public Health*. 2020 May;8:217. doi: 10.3389/fpubh.2020.00217.
22. Abdulsalam NM, Bakarman MA. Use of social media in food safety in Saudi Arabia—A preliminary study. *Aims Public Health*. 2021 Mar;8(2):322-332. doi: 10.3934/publichealth.2021025.
23. McCormack LA, Squiers L, Frasier AM, Lynch M, Bann CM, MacDonald PDM. Gaps in Knowledge About Covid-19 among US Residents Early in The Outbreak. *Public Health Rep*. 2021 Jan/Feb;136(1):107-116. doi: 10.1177/0033354920970182.
24. Kuroda Y, Goto A, Terauchi H, Suzuki S. Change in sense of food safety associated with social connectedness and information sources—a 10-year longitudinal survey before and after the Fukushima Nuclear Power Plant accident. *Public Health*. 2021 May;194:156-162. doi: 10.1016/j.puhe.2021.03.004.