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Islamic Boarding Schools' Food Handlers' Awareness Of Food Safety Issues And Their Actions In Relation To e. Coli Contamination Of Food

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ABSTRACT

Background: *E. coli can grow due to foodborne illnesses, and according to Islamic law, the food consumed is not tayyib. Food handlers, including those in Islamic boarding schools, must know about food safety to prevent foodborne illnesses.*

Research Methods: *At the Boarding School in East Java, a food production facility was used for the research. This study has a cross-sectional design and is quantitative. The sample used a total sampling method with a total of 38 samples. The gathered information was evaluated using the Spearman test. E. coli testing at the Islamic boarding school using the MPN technique on six food samples and water sources.*

Research Result: *25 food handlers are between 18 and 35, while 13 others are between 36 and 55. Higher-educated food handlers are on par with less-educated ones. Most people who handled food did so with a solid awareness of the characteristics of food safety behavior and knowledge. It is also believed that food workers' safety conduct is good because of their generally positive or good demeanor. Two food samples, S1 with an MPN value of 6.1/g and S2 with an MPN value of 7.2/g contained E. coli. The link had a value of 0.67 and a Spearman's correlation value of 0.070, indicating a positive relationship with weak correlation strength. The findings showed that awareness of food safety was not related to the prevalence of E. coli, with p>0.05 and 0.123.*

Conclusion: *There was a positive correlation of 0,070 and a value of 0,067, indicating no link between food safety knowledge and behavior. The existence of E. coli did not correlate with knowledge of food safety, with a value of 0,13 and a negative correlation of -0,255.*

BACKGROUND

Foodborne illness is a global public health problem. Adults with poor eating habits can form eating patterns that affect the future and well-being of their children (Ferk, 2016). Data from WHO (2015), every year, foodborne illness causes almost one in ten people to fall ill. 33 million healthy people die annually due to foodborne illnesses that can be deadly, especially in children aged less than five years. There are 420.000 deaths of children, a third caused by foodborne illness. According to the national poisoning information center from BPOM, poisoning incidents in 2016 by a group of causes were mainly caused by food, with as many as 135 incidents. In East Java, there was 64.116 Food Production (FP). The number of FPs that fulfilled the requirements of sanitation hygiene was 41,714, and those who did not meet the requirements were 20.717 (Kementerian Kesehatan, 2018). Food handlers must understand food safety in order to prevent foodborne illnesses.

Islamic boarding schools have the traits of a solid religious understanding. The Islamic food laws, which require people to eat tayyib food, align with food safety. It is not necessarily in conformity with current quality requirements, but food handlers in Islamic boarding schools need more understanding regarding food safety. Alwi et al. (2019) researched many Islamic boarding schools in Yogyakarta. Obtaining statistical analysis results that do not demonstrate a significant correlation between food safety knowledge and food safety scores ($p>0,05$; $r=0,200$). Along with the correlation between awareness of food safety and germ rates ($p>0,05$; $r=0,000$).

According to Prasetyo's (2015) research, there is a correlation between awareness of personal hygiene and personal hygiene. This demonstrates how the respondent's high level of knowledge affects their hygiene. According to Sari's research from 2017 on the conduct of school food vendors, the knowledge and attitudes that food vendors had regarding food security had an impact on such behavior. According to the chi-square test results, there was a correlation between snack food merchants' actions, their attitudes toward food safety ($p = 0.036$), and their knowledge of food safety ($p = 0.025$). Muthaharoh's latest research (2018) According to the study's findings, there was no correlation between sanitation hygiene awareness and E. coli in food, with a p-value of 0.13. With a p-value of 0.19, there was no association between sanitary hygiene practices and the presence of E. coli in food. According to Jamilatur et al. (2018) investigation, E. coli was found in 71.43% of the snack samples tested at the University of Muhammadiyah Sidoarjo canteen. The report suggests improving and maintaining the sanitation of campus canteens and advising food handlers to practice strict personal and environmental hygiene.

At food production facilities in Islamic boarding schools, research on food handlers and E. coli testing on samples of potentially contaminated food or drink and the water supply used to prepare the food will be conducted. Employees from outside the Islamic Boarding School who live nearby and employees made up of students work as food handlers. Location of research at boarding school. It is crucial to do a study on this subject since there is a lack of understanding regarding food safety knowledge related to the behavior of food handlers and the presence of E. coli germs.

MATERIAL AND METHODS

This research is quantitative research with a cross-sectional design. The research was conducted at a food production site at the Boarding School in East Java. The time of the study was from July until November 2020. Food samples, drinks, and water sources were researched from food production sites at the Microbiology Laboratory under the integrated laboratory.

The study population was all food handlers at the Boarding School. Validity and reliability tests were performed on the questionnaires used in the study before it was conducted. The sample used in this study was a total sampling method with 38 sample food handlers. All participants in the study were informed about the purpose and methods of the research before being given questionnaires to complete. Food handlers were then given time to complete the surveys. A score was assigned to each response after looking at the respondents' responses and conducting a questionnaire analysis. The Spearman test was used to assess the collected data. The University of Muhammadiyah Surakarta completed an ethical validity evaluation on the study, including these respondents under 3070/B1/KEPK-FKUMS/XI/2020.

E. coli testing using the MPN method with six food samples and water sources in the Islamic boarding school. Sampling using sterile bottles and bunsen. The sample is taken from a bottle and weighed as much as 5 g. The sample was then crushed with 45 ml of sterile distilled water in a blender until homogeneous. Samples that have been destroyed are ready to use. Samples homogenized with 45 ml of sterile distilled water are diluted by entering the sample in the first test tube (10-1) of 10 ml. In the first test tube (10-1), 10 ml is taken and then put in the second test tube (10-2), which has been given sterile distilled water as much as 45 ml. In the second test tube, 10 ml is taken and then put into the third test tube (10-3), given 45 ml of sterile distilled water. In the third test tube, 10 ml is taken and then put into the fourth test tube (10-4), which has been given sterile distilled water as much as 45 ml. In the fourth test tube, 10 ml is taken and then put into the fifth test tube (10-5), given 45 ml of sterile distilled water.

In the estimated test, 9 test tubes (series 3-3-3) were prepared for multilevel dilution. Nine test tubes were prepared, each containing 9 ml of Lauryl Tryptose Broth (LB). In the first three series tubes (10-4), 10 ml of food sample dissolved in sterile distilled water was put into the fourth bottle (10-4). In 3-second

series tubes (10-4), 1 ml of food sample, which was dissolved with sterile distilled water, was put into the fourth bottle (10-4). In 3 third series tubes (10-4), 0.1 ml of food sample dissolved with sterile distilled water was put into the fourth bottle (10-4). This step is repeated for samples with a 10-5 dilution. Eighteen tubes filled with samples were incubated for 24 hours at 37oC and observed. Positive estimation tests are marked by the gas formation in each tube and proceed to the affirmation test. LB media is used as a medium to detect the presence of coliform in water and food.

Positive sample results on the estimated test can be continued by inserting positive samples into the BGLB (Brilliant et al.) medium for the E. coli bacteria test. The E.coli test is planted 1-3 ose of a positive culture of gas into a tube containing 10 ml of BGLB in which there is an inverted Durham tube. Samples were incubated for 24-48 hours at 37oC, and the tube in which there is gas was observed.

Positive results on BGLB media were then grown on Eosin Methylene Blue Agar (EMBA) media. EMBA media are selective and differential media that isolate gram-negative bacteria from clinical and non-clinical specimens. Complementary tests are carried out by planting 1-3 ose positive BGLB results into the EMBA media. The sample was incubated for 18-24 hours at 37oC. Positive results on EMBA media were marked by the appearance of metallic green in the cup.

RESULTS

The food handlers at the Islamic Boarding School are available in 3 kitchens and various ages ranging from late adolescence to early elderly. Food handlers in the kitchen had varying degrees of education. Based on the univariate test results, most food handlers are in the late teens category because of the staff from female students who help run the kitchen. Food handler education is balanced between lower and higher education.

Tabel 1. Characteristic of Food Handlers

Variable	n=38	%	Median±SD
Age			
17-35	25	65.8 %	25±10.605
36-55	13	34.2 %	
Education			
≥Junior High School	19	50 %	2.00±0.944
≤Senior High School	19	50%	

The majority of those who handled food did so with a strong understanding of the traits of food safety knowledge and behavior. Because food handlers' overall behavior is positive or good behavior, it is also considered that their safety behavior is good.

Table 2. The Features of Food Safety Understanding and Conduct of Food Handlers

Variable	Min	Max	Median±SD
Food Safety Knowledge	3	10	8.00±1.492
Food Safety Behavior	27	38	33.50±2.908

Every kitchen at the Islamic boarding school underwent the exam. Six samples were collected, 3 of which came from the water sources in each kitchen, one beverage, and two soup ingredients. In 2 samples (sour soup and sautéed green beans). If the sample tests positive for E. coli bacteria in the microbiology lab, it signifies that it contains the bacteria.

Table 3. E.coli Test Using MPN Three Series

Sample	0.10 g	0.01 g	0.001 g	MPN/g
W1	0	0	0	0
W2	0	0	0	0
W3	0	0	0	0
B	0	0	0	0
S1	0	1	1	6.1
S2	1	0	1	7.2

Information: W = water sourse, B = Beverage, S = Soup

Knowledge of food safety and behavior are unrelated, as seen in Table 4. Indicating a positive connection with weak correlation strength, the link had a p-value of 0.67 and a Spearman's correlation value of 0.070. With a p>0.05 and a 0.123, the results demonstrated that knowledge of food safety was not associated with the presence of E. coli.

Table 4 Food Safety and E. coli Presence and Behavior of Food Handlers

Food Safety Behavior	Food Safety Knowledge
n=38	38
%	100
r	0.070
p	0.67
E. coli Presence	
n=38	38
%	100
r	-0.255
p	0.123

DISCUSSION

This study aimed to determine the correlation between halal awareness, food handler behavior, and food safety, as well as the prevalence of E. coli bacteria in food and water sources at one of the Islamic boarding schools in East Java. In Islamic boarding schools, the management structure for managing the meals starts with female students serving as staff, followed by ustadzah serving as mentors, and ustadz serving as the person in charge. The individual in charge of the kitchen chooses the staff members.

Food preparation is designed to maximize consumer pleasure using several metrics, including taste, appearance, portion size, punctuality, and cleanliness (Pudjirahayu, 2018). The kitchen at Islamic boarding schools is one example of how to organize food because it serves students and needs special care to ensure that customers or students are happy. Food poisoning is one of the harmful effects of a poorly managed kitchen. These cleanliness indicators need to be addressed so that customers feel more at ease and confident to make purchases. Kitchen cleanliness must also be considered because a clean kitchen can affect consumer satisfaction.

Late adolescents to early seniors make up the age range of food handlers. The age range of food handlers ranges from 18 to 55 years old. Age impacts a person's comprehension and thinking, claims Pasanda (2016). Your attitude will become more refined as you age. Your understanding and perspective will grow as you age, improving the quality of the knowledge you acquire.

Education impacts learning; the more educated a person is, the easier it is for them to absorb information. Most food handlers in Islamic boarding school kitchens are pursuing tertiary education, consistent with their excellent knowledge and behavior scores. This is so that most food handlers with university degrees can learn from various sources. More understanding about health is learned when more data are gathered. Education and knowledge are strongly associated, and someone with a more excellent education is expected to have a broader knowledge base. According to the study's findings and the education level of the respondents, primarily from tertiary institutions, knowledge can also be acquired through informal learning, experience, information, or the media (Pasanda, 2016).

According to Table 1, 33 out of 38 food handlers, or 86.8%, strongly understand food safety. Students serve as staff members, and residents at the Islamic boarding school make up the food handlers here. According to the scores all food handlers received, which are >50%, food handlers exhibit positive food safety behavior. According to the observations obtained during the distribution of questionnaires to every kitchen at the Islamic boarding school, most food handlers now wash their hands with soap and use aprons as personal protection equipment.

In this investigation, the Microbiology Laboratory in the Integrated Laboratory performed microbiological tests on samples of water sources, drinks, and food in the form of vegetables. We are

beginning with collecting samples using bottles for water sources and plastic for produce. With three tests—estimation, confirmation, and complement—the MPN (Most Probable Number) approach is applied.

The estimation step is a pilot test for the MPN method that determines whether coliform bacteria are present in the test sample. The test sample was diluted three times and cultured on LB media. The test sample was positive if gas was produced in the Durham tube due to the breakdown of lactose by bacterial enzymes from the coliform group. Bacteria employ a carbon source from lactose in sulfate compounds to ferment. The E. coli bacteria will grow more quickly and produce more gas due to this LB medium's high phosphate and nutrients. Because some non-coliform bacteria do not hydrolyze lactose, the lauryl sulfate substance included in LB media prevents non-coliform microorganisms' growth. These benefits increase the recommendation of LB media for coli testing (Jamilatur, 2018).

Table 3 shows that two samples had E. coli in a detectable amount precisely, the sample of S1 and S2. The complimentary test's EMBA agar medium was incubated for 24 hours at 37 degrees and developed a metallic green hue. The media will be pink with mucus if no E. coli bacteria exist.

Foodborne diseases are illnesses that affect people and are spread by eating things with pathogenic bacteria in them and then ingested orally or through the digestive system. Diarrhea brought on by foodborne Coliform bacteria contamination is the most prevalent foodborne illness (Suriaman, 2017).

A kind of intestinal bacteria known as coliform bacteria inhabits the human digestive system. The presence of coliform bacteria is a sign of additional harmful microorganisms. More specifically, fecal coliform bacteria serve as markers for the presence of pathogenic bacteria. The presence of harmful bacteria has a positive association with the number of colonies, measuring fecal coliform as an indicator of contamination. Coliform detection is also significantly quicker, cheaper, and more accessible than harmful bacteria. E. Coli is a type of coliform bacteria. Water, food, and beverage quality improves when coliform levels decrease. E. Coli can harm health if it reaches the digestive tract in large quantities. Despite being a typical component of microbial digestion, it is now known that some strains of E. coli can cause moderate to severe gastroenteritis in humans and animals (Usman, 2015).

Plant parts such as leaves, stems, roots, tubers, and flowers are included in the category of vegetables. Vegetables often have high carbohydrate content and a pH range of 5-7, ideal for bacterial growth. Sources of bacteria on vegetables include soil, water, air, animals, insects, and equipment. The type of vegetables has a significant impact on the type and quantity. Microorganisms in leafy vegetables may originate from the air, but those in tubers come from the earth. Vegetables often have 103-5 or 104-7 germs per cm2 or gram. Vegetables may carry germs if the water and cooking tools are contaminated with human or animal waste (Lestari et al., 2018).

The paucity of facilities and infrastructure available to food handlers in Islamic boarding school kitchens may be why there is no correlation between knowledge and food safety behavior. According to the poll done when the questionnaire was handed out, the lack of gloves and masks for food handlers led to their not maintaining their hygiene, which could contaminate the food being cooked. This is consistent with research by Sari (2017), which demonstrates that good behavior among street food vendors at elementary schools in the Watukumpul sub-district is only sometimes accompanied by good knowledge about food safety. Understanding how food is processed has little bearing on how people behave regarding food safety. This is because, in addition to knowledge, other factors may have a more significant impact. Examples include food vendor practices, such as not paying attention to sanitation when processing food, an unsupportive workplace, and a food vendor experience that still needs to be improved. Knowledge and practice are not necessarily related, according to Patah et al. (2011). Even when it is believed that knowledge is enough or good, physical infrastructure might still operate as a hindrance in the way of providing effective food safety measures.

This investigation's findings demonstrated no correlation between awareness of food safety and the presence of E. coli germs. This is consistent with research was done by Alwi et al. (2019), which connected the quality of food safety in Islamic boarding schools and the germ count test to the safety awareness of food handlers. The Spearman correlation test was utilized in statistical analysis. The findings indicated that 93.5% of food handlers firmly understood food safety. However, the statistical analysis failed to find a significant

correlation between food safety knowledge and either the food safety score (p >0.05; r=0.200) or the germ count (p >0.05; r=0.000). This can be the result of inadequate infrastructure and facility maintenance. Food can also become contaminated by oil-slick floors and dusty walls. E. coli germs can also be present in food and beverages because of equipment stored anywhere.

CONCLUSIONS

The Islamic boarding school employs 38 people who handle meals. Food handlers range in age from 18 to 55; 50% are considered late teenagers. Currently, 17 food handlers, or 44.7%, are giving lectures at the institution. Most people know food safety and handling, and food handlers behave well. Two food samples have been known to contain E. coli. There was a positive correlation of 0,070 and a value of 0,067, indicating no link between food safety knowledge and behavior. The existence of E. coli did not correlate with knowledge of food safety, with a value of 0,13 and a negative correlation of -0,255.

RECOMMENDATION

Microbial testing on food samples protected by food handlers in the study's good and bad safety knowledge groups was not performed. Research after that looks at additional elements, such as cooking utensils, that can affect the presence of E. coli in food. In order to identify the variables causing the presence of E. coli in food at Islamic boarding schools, it is essential to identify the source of E. coli contamination.

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