

Relationship between environmental quality, hygiene, food sanitation, and food handling factors with escherichia coli germ rates at snack food centers in Jambi City

Titi Hadiyati^{1*}, Suryono², Guspianto^{3*}

^{1,2,3} Environmental Science Study Program, Master of Environmental Science, Jambi University, Jambi Indonesia

*Email korespondensi: titigandi88@gmail.com

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Abstract

Background: Food safety is a public need safe food will protect and prevent disease and health problems. Environment and food need attention if you want to live healthy and get enough nutrition. Hygiene sanitation is an effort to control the factors of people, places, equipment and food. In producing ready-to-eat food that is safe and healthy, the principles of sanitation hygiene must be implemented. Food handlers are people who have direct contact with food. The purpose of this study was to analyze the relationship between environmental quality, sanitation hygiene, handler behavior and knowledge of food handlers with the number of Escherichia coli bacteria.

Method: The research design is a quantitative method using laboratory analysis with a cross sectional research design.

Results: Research shows that there is a significant relationship between environmental quality, food sanitation hygiene, food handling behavior and knowledge of food handlers with the number of Escherichia coli germs in the Jajanan Food Center, Jambi City.

Conclusion: There is a significant relationship between environmental quality, food sanitation hygiene, food handling behavior and knowledge of food handlers with the number of Escherichia coli bacteria.

Key words: Environment, sanitation hygiene, handlers, Escherechia coli

INTRODUCTION

Food safety is a public need, because safe food will protect and prevent disease and health problems. Environment and food are two important things that need attention if you want to live healthy and get enough nutrition.

The environment is everything that surrounds us and influences human life. The environment consists of the physical, chemical and biological environment. Environment and food are two important things that need attention if you want to live healthy and get enough nutrition.

Hygiene sanitation is an effort to control people, places, equipment and food ingredients to get ready-to-eat food that is safe and healthy. Food hygiene and sanitation which consists of 6 principles, starting from the selection of food

ingredients, food storage, food processing, storage of cooked food, transportation of cooked food and serving of cooked food are important in determining the quality of food, in producing safe ready-to-eat food. and healthy, every step on the principles of sanitation hygiene must be implemented.

Food handlers are people who have direct contact with food, starting from the process of selecting food ingredients to serving cooked food. Knowledge of food handlers is influenced by work experience while the behavior practices of handlers are influenced by training or counseling about food safety so as to increase positive attitudes when handling food. Contamination in food and beverages can cause food to become a medium for disease. The presence of germ numbers in a food indicates that the food has been

contaminated. One of the germs that is an indicator of food contamination is the *Escherichia coli* bacteria which can cause infectious diseases (food borne diseases) such as diarrhea and extraordinary events (KLB) food poisoning.

The purpose of this study was to analyze the relationship between environmental quality, sanitation hygiene, handler behavior and knowledge of food handlers with *Escherichia coli* bacteria count.

METHOD

The research design is a quantitative method using laboratory analysis with a cross sectional research design.

The research location is located in one of the Snack Food Centers in Jambi City. The population in this study are food vendors who sell food at one of the Food Centers in Jambi City. The sample in this study were 53 food vendors. Data analysis used the chi-square statistical test using SPSS.

RESULTS AND DISCUSSION

For the distribution of respondents according to research variables can be seen in the table below:

Table 1
Distribution According to Research Variables at Snack Food Centers in Jambi City in 2022

Variable	Mean	Median	SD	Min	Max	95% CI
Bacteria	4,4	4	4,92	0	27	3,04 - 5,75
Environmental Quality	50,5	40,6	27,7	21,9	90,6	42,9 - 58,2
Sanitari Hygiene	60	57,3	24,2	23,2	96,3	53,3 - 66,7
Behavior	71,2	70,7	14,2	36,6	92,7	67,3 - 75,1
Knowledge	27,2	26	4,1	20	37	26,1 - 28,3

The table above shows the germ count using the MPN Index unit (most probable number) per 100 mg/ml, with an average result of 1 a median of 4.0 and a standard deviation of 4.92. Likewise, explaining the distribution of respondents regarding environmental quality, which consists of 8 (eight) assessment items consisting of location, places to eat, trash cans, handwashing and equipment as well as toilets, the average result of the respondents' environmental quality score is 50.5 % when compared to the standard (≥ 80) is still bad, with a standard deviation of 27.7%.

Hygiene sanitation (HS) consists of 6 (six) assessment principles which consist of food selection, storage, processing, storage of cooked food, transportation and serving. It was found that the average sanitation hygiene score was 60.0%, when compared to the standard (≥ 80), the average is still below the standard or not appropriate, and with a standard deviation of 24.2%. The food handler behavior assessment consists of 8

(eight) assessment items on the use of personal protective equipment (PPE), personal hygiene and food management behavior. The average handler's behavior score is 71.2%, when compared to the standard (≥ 80), the average is still below standard or not good, with a standard deviation of 14.2%.

The knowledge variable consists of 20 questions about sanitation hygiene principles, with an average score of 27.2 points for respondents' knowledge with a standard deviation of 4.1% and not normally distributed.

Food safety can be known from the presence or absence of germs in food. The number of germs is an indicator of contamination of food, because healthy food will provide benefits to the human body.

The distribution of germ numbers based on the type of merchandise can be seen in the table below:

Table 4
Relationship between Environmental Quality and Escherichia coli Germ Numbers
at the Snack Food Center in Jambi City in 2022

No	Building Location	Total Bacteria						p-Value	Odds Ratio (OR)	95% Confidence Interval	
		TMS		MS		Total				Lower	Upper
		Jml	%	Jml	%	Jml	%				
1	Bad	29	78,4	8	21,6	37	100	0,002	15,708	3,578 - 68,965	
2	Good	3	18,75	13	81,25	16	100				
Average amount		32	60,4	21	39,6	53	100				

Information: Score > 80%: Quality
 Score < 80%: No Quality

Based on the table above shows the proportion of respondents in the germ number category that does not meet the requirements (high germ count) with bad environmental quality is 29 respondents (78.4%) while good environmental quality is 3 respondents (18.75). The results of the chi-square statistical test obtained a p-value = 0.0002, so there is a difference in the proportion of germ numbers between good environmental quality and bad environmental quality, so it can be concluded that there is a significant relationship between environmental quality and germ numbers in City Snack Food Centers Jambi. From the results of the analysis, it was also obtained an OR value of 15.7 (CL 95%: 3.578 – 68.965) meaning that traders with a bad environment have a risk of 15.7 times the number of germs that do not meet health requirements (high germ numbers) compared to traders with a good environment.

This research is in line with Rahmani, (2016) who proved that there was contamination of Escherichia coli bacteria in food and beverage snacks in the Muhammadiyah Limau educational environment, South Jakarta, proving that variables had a relationship, namely sanitation facilities or environmental variables. Multivariate analysis with logistic regression proved that the strongest predictors were sanitation facilities or the

environment, meaning that poor sanitation increased the risk of Escherichia coli contamination 8.685 times (95% CI: 1.376 – 35.968).

In addition, research conducted by Suryani & Dwi A, (2019) on angkringan traders in the Malioboro area of Yogyakarta, with a total of 40 angkringan traders, showed that 29 traders had poor sanitation or environmental facilities (72.5%), 26 traders had poor hygiene (65 %) and the result is that there is a significant relationship between sanitation facilities or the environment with trader hygiene.

Based on the sanitation hygiene guidelines for food centers/canteens or the like that are safe and healthy, (2021) a building for food processing or food preparation should ideally be built and placed in an area free of unpleasant odors, smoke, dust, and away from places waste disposal. In addition, in food centers there should be trash bins made of strong, closed, easy to clean materials and lined with plastic bags. Handwashing stations must be equipped with running water and soap. Adequate water and soap must be available in the toilet.

In fulfilling good food quality, a good environment is also needed. For this reason, food center managers can take several ways to fulfill them, namely by coordinating fellow traders to be able to complete the facilities independently or independently according to

the capabilities of the traders, for example trash cans, hand washing places and cleanliness of places to eat. Apart from that, by proposing to related sectors such as the Tourism Office, Public Works Service, and

the Regional Government in fulfilling facilities and at the same time requesting training to be carried out on how to maintain these infrastructure facilities.

Table 5
Relationship between Food Sanitation Hygiene and *Escherichia coli* Bacterial Rate at the Snack Food Center in Jambi City in 2022

No	Sanitary Hygiene	Total Bacteria						p-Value	Odds Ratio	95% confidence Interval	
		TMS		MS		Total				Lower	Upper
		Jml	%	Jml	%	Jml	%				
1	In Consistent	27	77,1	8	22,9	35	100	0,0010	8,775	2,395 – 32,152	
2	Consistent	5	27,8	13	72,2	18	100				
Average amount		32	60,4	21	39,6	53	100				

Information: Score > 80%: Quality
Score < 80%: No Quality

Based on the table above shows the proportion of respondents in the germ number category that does not meet the requirements (high germ count) with food sanitation hygiene that is not appropriate is 27 respondents (77.1%) while food sanitation hygiene is appropriate as many as 5 respondents (27.8%). The results of the chi-square statistical test obtained a p-value = 0.0010, so there is a difference in the proportion of germ numbers between appropriate food sanitation hygiene and inappropriate food sanitation hygiene, so it can be concluded that there is a significant relationship between food sanitation hygiene and germ numbers in Jambi City Snack Food Center. From the analysis results also obtained an OR value of 8.8 (CL 95%: 2.4 – 32.2) meaning that traders whose food sanitation hygiene is not appropriate have a risk of 8.8 times the number of germs that do not meet health requirements compared to traders whose food sanitation hygiene it is not in accordance with.

Research conducted by Ramadhani et al., (2018) on food and beverage traders in the Muhammadiyah Limau Environment, South Jakarta proves that there is a relationship between storage of cooked food and beverages with contamination of

Escherichia coli bacteria (p-value 0.004), Odds Ratio calculation results (OR) shows that respondents whose storage of cooked food and drinks was not good had a 3.6 times chance of getting food and drinks that did not meet the requirements (95% CI 1.227 – 10.303) than those whose storage of cooked food and drinks was good.

In his research, Salma.P et.al, (2015) on food traders proved that there was a significant relationship between sanitation in food processing facilities and *Escherichia coli* contamination in food at Padang restaurants in Manado and Bitung cities with p = 0.012 and OR = 10.800 (96% CI: 1.644-70.934).

From the things mentioned above, it is necessary to find a way out or a solution, including the following:

- Increasing education by means of counseling about the importance of using facilities and infrastructure.
- Provision of subsidies or some kind of assistance to traders through the regional government or central government whose distribution can be through groups or institutions in the food center
- Increasing the role of groups or institutions in the food center through guidance by the government and non-

governmental organizations in the field of food management.

Table 6
Relationship between Food Handler Behavior and *Escherichia coli* Germ Count at the Snack Food Center in Jambi City in 2022

No	Behavior	Total Bacteria						p-Value	Odds Ratio	95% Confidence Interval	
		TMS		MS		Total				Lower	Upper
		Jml	%	Jml	%	Jml	%				
1	Not good	28	82,4	6	17,6	34	100	0,0000	17,500	4,264-	71,827
2	Good	4	21,1	15	78,9	19	100				
Average amount		32	60,4	21	39,6	53	100				

Information: Score > 80%: Quality
Score < 80%: No Quality

Based on the table above, it shows the proportion of respondents in the category of germ numbers who did not meet the requirements (high germ count) with poor food handler behavior was 28 respondents (82.4%) while good food handler behavior was 4 respondents (21.1%). The results of the chi-square statistical test obtained a p-value = 0.0000, so there is a difference in the proportion of germ numbers between the behavior of food handlers who are not good with the behavior of good food handlers, so it can be concluded that there is a significant relationship between the behavior of food handlers and the number of germs in Jambi City Snack Food Center. The analysis results also obtained an OR value of 17.5 (CL 95%: 4.26 – 71.83) meaning that traders whose food handler behavior is not good has a risk of 17.5 times the number of germs that do not meet health requirements compared to traders whose food handler behavior good.

Based on an examination by Fithria, (2022) processed beverage traders, namely Thai tea drinks, iced tea drinks and sachet packaged drinks as well as traders who pack drinks with seals on Kendari Beach from Grand Cikini to Grand Clarion Kendari prove it with the results of the Chi-Square statistical test for knowing the relationship between handler hygiene variables and the presence of *Escherichia coli* bacteria shows that p-

value = 0.023 < 0.05, so H1 is accepted and H0 is rejected, indicating that there is a relationship between processed drink handler hygiene and the presence of *Escherichia coli* bacteria in processed drinks at Kendari Beach Kota drive in 2022.

In line with research conducted by Ismail, et.al (2013) conducting research in Shah Alam Selangor Malaysia using a questionnaire distributed to 400 food handlers, the results showed that although food handlers are aware of the need for personal hygiene, they do not understand important aspects of personal hygiene such as cleanliness of nails, hair, hands, clothes, not wearing masks and aprons. To prevent foodborne illness, food owners need to access and increase personal hygiene knowledge and hygiene practices regarding food safety to consumers.

Behavior change preceded by the formation of positive new values is something that is not easy. The steps that are usually taken to change this behavior are to provide counseling to increase knowledge. With a good level of knowledge, it is hoped that a positive attitude will form so that good behavior will also be formed. Therefore, to change the behavior of handlers, integrated efforts are needed between health workers and other sector officials such as the Tourism Office and the Regional

Government in providing education but also must be supported by the participation of the handlers themselves. Guidance on handlers must be carried out cross-sectorally between

various related agencies so that it is hoped that this will further reduce the number of cases of food-borne illness..

Table 7.
Relationship between Knowledge of Food Handlers and *Escherichia coli* Germ Numbers at the Snack Food Center in Jambi City in 2022

No	Knowledge	Total Bacteria						p-Value	Odds Ratio	95% Confidence Interval	
		TMS		MS		Total				Lower	Upper
		Jml	%	Jml	%	Jml	%				
1	Low	27	79,4	7	20,6	34	100	0,0000	10,800	2,895-	40,296
2	High	5	26,32	14	73,68	19	100				
Average amount		32	60,4	21	39,6	53	100				

Information: Score > 80%: Quality
Score < 80%: No Quality

The table above shows the proportion of respondents in the category of germ scores that did not meet the requirements (high germ count) with low handler knowledge of 27 respondents (79.4%) while high handler knowledge was 5 respondents (26.32). The results of the chi-square statistical test obtained a p-value = 0.0000, so there is a difference in the proportion of germ numbers between low handlers' knowledge and high handlers' knowledge, so it can be concluded that there is a significant relationship between handlers' knowledge and germ numbers at the Snack Food Center in Jambi City. The analysis results also obtained an OR value of 10.8 (95% CL: 2.895 – 40.296) meaning that traders with low handler knowledge have a risk of 10.8 times the number of germs that do not meet health requirements compared to traders with high handler knowledge.

Based on research conducted by Rukmansyah et al., (022) on cake snack food vendors at the Traditional Market in Makassar City, it proves that good knowledge and attitudes alone do not guarantee good personal hygiene actions for food handlers, because good quality sanitation is still needed in food processing

to produce healthy and suitable food for consumption.

From the results of the study it was found that there was a significant relationship between knowledge of food safety practices for MSME actors in the Serving District which was marked with a significant value of $p = 0.048$. In univariate analysis, it was found that business actors with the lowest level of knowledge also had the lowest level of education but had worked for quite a long time (2-10 years) (Ardianto, 2022).

In accordance with the theory of Notoatmodjo, (2007) that knowledge is the result of knowing and this occurs after people have sensed a particular object, knowledge is known to have 6 levels, namely knowing (know) which can be interpreted as remembering a material that has been studied previously.

Several things need to be done in order to increase knowledge, including:

- Collaborate with cross-sectors to be able to provide ready-to-eat food safety training and food handler training to handlers, because from the results of surveys conducted and interviews it turned out that all handlers had never received training

- b. Providing education to handlers, especially material regarding food storage systems using the FIFO method, because most of them do not know.
- c. Providing education about sanitation hygiene can be carried out during supervision/examination or program monitoring.

CONCLUSION

From the results and discussion in this study, several conclusions can be put forward as follows:

1. From the descriptive analysis of the variable research results, it was found that the number of germs that did not meet the requirements (high germ count) was 60.4%, poor environmental quality was 69.8%, sanitation hygiene that was not in accordance with standards was 66.0 %, the behavior of food handlers who were not good was 64.2%, and the respondents' high knowledge was 64.2%.
2. There is a significant relationship between environmental quality, sanitation hygiene, behavior and knowledge of food handlers with the number of germs in Food and Snack Centers in the City. The worse the quality of the environment, the inappropriate implementation of sanitation hygiene, the poor behavior of handlers and low knowledge will cause the number of germs to be high or do not meet the requirements.

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