

ISSN 2597- 6052DOI: <https://doi.org/10.56338/mppki.v7i7.5325>**MPPKI****Media Publikasi Promosi Kesehatan Indonesia**
*The Indonesian Journal of Health Promotion***Review Articles****Open Access****Factors Associated with the Presence of E.coli in Food: Literature Review****Sri Mulyati^{1*}, Mursid Raharjo², Nurjazuli³**¹Magister Kesehatan Lingkungan, Universitas Diponegoro | mulyati.bagas@gmail.com²Magister Kesehatan Lingkungan, Universitas Diponegoro | mursidraharjo@gmail.com³Magister Kesehatan Lingkungan, Universitas Diponegoro | nurjzl_fkmundip@yahoo.co.id*Author Correspondence : mulyati.bagas@gmail.com**Abstract**

Background: Escherichia coli is a gram-negative bacterium of normal flora of the human and animal digestive tracts, and is important in human digestion. These bacteria can live in the stool, and can cause health problems, such as: diarrhea, vomiting, and other digestive problems. E coli bacteria can be pathogenic if the number of bacteria in the digestive tract increases or is outside the intestine. Food Sanitation Efforts include supervision, protection, and improvement of hygiene and sanitation quality specifically for Ready-to-Eat Processed Foods. Food hygiene and sanitation quality supervision is carried out through: surveillance, laboratory tests, risk analysis, and/or follow-up recommendations. Protection of food hygiene and sanitation quality is carried out through: communication, information, and education; health checks of food handlers; use of personal protective equipment; and/or the development of appropriate technology. Improving the quality of food hygiene and sanitation is carried out through: communication, information, and education; and/or food processing technology engineering

Objective: The purpose of this literature review is to find out the factors related to the presence of E.coli in food

Method: The research method used is a literature study with a search method in a literature review, which searches for literature that is in accordance with relevant social media such as google scholar, garuda, e-journal in the field of diarrhea incidence. Search the literature as a reference from 2014-2024 and get 10 articles or journals that are relevant in the last 10 years.

Results: The results of this literature review explain that factors related to the presence of e.coli in food in public places include: personal hygiene of food handlers, how to wash cutlery, PPE of food handlers are not paid attention to, poor food sanitation, food handlers do not pay attention to controlling environmental conditions from the handling of raw materials to the distribution process, the storage place of cutlery is not considered, and improper serving of food.

Conclusion: The conclusion of this literature review article is that there are many factors related to the presence of e.coli in food in public places. And recommend to environmental health workers the need to socialize and supervise the hygiene and sanitation of traders in particular. To the general public to pay attention to the cleanliness of what will be consumed.

Keywords: E.coli; Food; Public Places

INTRODUCTION

Escherichia coli is a gram-negative bacterium of the normal flora of the digestive tract of humans and animals, and is important in human digestion. These bacteria can live in the stool, and can cause health problems, such as: diarrhea, vomiting, and other digestive problems (1). The pathogenic *Escherichia coli* bacteria can interfere with health. The presence of bacteria makes snacks unsafe for consumption (2). An important factor that must be considered for the body is the cleanliness of food or drinks. If you consume unhygienic and unhealthy foods and drinks, it can cause various diseases, namely mild diseases, infectious diseases, and death. Unhealthy food or drinks can cause diseases such as infection (contamination of microorganisms or pathogens after consumption) and intoxication (something that contains toxins after eating or drinking). If ignored, it can worsen to the point of causing death, even if it is just food or drink (3). Food is everything that comes from biological sources of agricultural, plantation, forestry, fishery, livestock, waters, and water products, both processed and unprocessed, intended as food or beverages for human consumption, including food additives, food raw materials, and other materials used in the process of preparation, processing, and/or making food or beverages(4). *E coli* bacteria can be pathogenic if the number of bacteria in the digestive tract increases or is outside the intestine (5).

Food Sanitation Efforts include supervision, protection, and improvement of hygiene and sanitation quality specifically for Ready-to-Eat Processed Foods. Food hygiene and sanitation quality supervision is carried out through: surveillance, laboratory tests, risk analysis, and/or follow-up recommendations. Protection of food hygiene and sanitation quality is carried out through: communication, information, and education; health checks of food handlers; use of personal protective equipment; and/or the development of appropriate technology. Improving the quality of food hygiene and sanitation is carried out through: communication, information, and education; and/or food processing technology engineering (4). Foodborne disease is a disease caused by the presence of living microorganisms that

Foodborne disease is a disease caused by the presence of live microorganisms that enter with food. Food products that do not meet the requirements of quality, safety and contamination of pathogenic bacteria can result in foodborne diseases. The incidence of foodborne diseases in the world continues to increase and outbreaks occur. The first position is diarrhea and gastroenteritis due to certain infections, the second position is typhoid fever and paratyphoid fever occupy the third position. The results of Health Research stated that the national prevalence rate for diarrhea was 3.5%. Where Central Java province is one of the provinces with a clinical diarrhea prevalence of >9% and ranks third in the estimated number of diarrhea cases. Bacteria are very closely related to hygiene conditions, even the existence of sanitation indicator bacteria (Fardiaz, 2000) One of the bacteria that is often used as an indicator of food contamination is Koliform. Sanitation indicator bacteria are generally bacteria that commonly live in the human intestine. *Salmonella* is a bacterial indicator of food safety. This is because all known *Salmonella* serotypes in the world are pathogenic. Children in elementary school are among the age groups that are susceptible to the occurrence of diseases, so it is necessary to pay attention to the intake that is included in the child. If the quality of snack food is poor, it will affect the teaching and learning process and have an impact on children's learning achievement at school. In addition, elementary school children are still in the period of growth and development (6).

METHOD

The research is included in descriptive research using a literature review method from several scientific journals on the topic of factors related to the presence of *e.coli* in food. Literature studies are carried out using google scholar related to the topic. The criteria for the selected article are research that has been conducted previously with a span of 2014-2024. After the literature is collected, then the literature is summarized and analyzed according to the desired topic.

Data collection is carried out qualitatively using the documentation method, namely facts obtained through scientific journals. The results obtained will be processed so that the research looks more perfect. This data analysis is carried out to help others better understand and interpret the results of the research. The journal is then re-selected by considering the suitability of the title and abstract. Based on the analysis carried out, several quantitative and qualitative data were found and processed from various perspectives using descriptive methods, it can be said that journals that have been collected mean that they have met the criteria. The journals obtained are selected based on the appropriate title and abstract. The selection of journals in this study is only in the form of journals that have similar sub-discussions, therefore not all journals are in accordance with the selected criteria.

RESULT

The results of the search for journals with the inculcation criteria used in this article review are variables related to food contamination with an observational analytical approach. The research journals used amounted to 10 journals that were used as a subject for the analysis of Coliform and *E. coli* bacteria contamination in foods that are often consumed, especially food and beverages. The following is a table of journal identification and synthesis:

Table 1. Journal Identification and Synthesis

It	Writer	Purpose	Design	Sample	Result
1	Rukmansyah (7)	To find out the relationship between knowledge and attitudes of food handlers towards personal hygiene actions in the processing of pastry snacks in the Traditional Market of Makassar City	Cross sectional	Sampling was carried out by purposive sampling, namely 30 cake handlers. There were 10 types of cake samples taken.	The attitude variable was not related to the personal hygiene actions of the toucher ($p=0.550>0.05$). And there were 3 out of 10 samples that had positive results containing escherichia coli bacteria. Sampling was carried out by purposive sampling, namely 30 cake handlers. Samples of cakes taken were 10 types
2	Hanifah (8)	To detect Escherichia coli contamination in tableware at Warung Lesehan around Nologaten Yogyakarta	Cross sectional	The sample in this study is cutlery in the form of plates which is determined using the accidental sampling technique as many as 14 plate samples	There were 4 (28.6%) positive samples contaminated with Escherichia coli and 10 (71.4%) negative samples contaminated with Escherichia coli. There was contamination of Escherichia coli in 4 tableware at Warung Lesehan around Nologaten Yogyakarta
3	Ros (9)	To see the picture of personal hygiene of street vendors with E.coli bacteria contamination in mixed ice snacks in West Mambo Village and Mambo Induk, North Palu District	Descriptive	The total sampling with the number of samples is 6 samples	The personal hygiene of mixed ice traders was mostly qualified, namely 5 people (83.3%) were categorized as good, and 1 person (16.7%) was categorized as adequate. E.coli bacteria contamination in mixed ice, there were 4 samples that did not meet the requirements and exceeded the maximum limit of colonies, which was 10 colonies/g. Overview of personal hygiene of street vendors with E.coli bacteria contamination in mixed ice snacks is still mostly qualified and samples are mostly unqualified and contain E.coli bacteria
4	Ardini (2)	To analyze the relationship between traders' personal hygiene practices and the presence of Escherichia coli bacteria in layer cake snacks.	Cross sectional.	29 layer cake snack vendors at the Surabaya City Flower Market	Traders wash their hands before touching food (96.6%), keep their fingernails clean and short (86.2%) and do not smoke when touching food (82.8%). All traders used clean clothes (100%) but spoke when touching food (100%), did not use aprons and assistive devices when touching food (100%). Escherichia coli bacteria were found in 44.8% of the layer cakes tested.
5	Errina (5)	To identify whether there is Escherichia coli bacteria contamination in fried snacks along Jalan Tlogosari Raya, Semarang	Cross sectional	7 Fried Snacks Along Jalan Tlogosari Raya Semarang	Of the 7 samples examined, 1 sample (14.29%) was contaminated with Escherichia coli bacteria, and the other 6 samples (75%) were not

It	Writer	Purpose	Design	Sample	Result
					contaminated with <i>Escherichia coli</i> bacteria. One sample is not in accordance with the Regulation of the Minister of Health of the Republic of Indonesia No. 1096/Menkes/Per/VI/2011 because it contains <i>Escherichia coli</i> bacteria > 0/gram of food sample. From the observation results, 1 sample (14.29%) of fried food traders were obtained who had good hygiene and sanitation criteria. Meanwhile, the other 6 samples (85.71%) had criteria for moderate hygiene and sanitation levels.
6	Ronaldo (10)	To determine sanitary hygiene and the presence of <i>Escherichia coli</i> bacteria on tableware (plates) in Lesehan stalls in the Babarsari area	Descriptive	15 respondents using the simple random sampling method	In line with the laboratory results, the most <i>Escherichia coli</i> bacteria in the respondents was 4.3x CFU/cm ²
7	Nita (11)	To find out the relationship between canteen sanitation hygiene and the level of fly density with the presence of <i>E.coli</i> in snacks in elementary school canteens in Gunungpati District	Cross sectional	30 schools selected using stratified random sampling technique	The storage conditions of finished food (p=0.011), the location of the canteen (p=0.045), and the hygiene of the handler (p=0.024) were related to the presence of <i>E. coli</i> in snacks. Meanwhile, the condition of hand washing stations (p= 0.314), equipment washing stations (p=0.749), foodstuff storage places (p=1,000), equipment storage (p=1,000), and fly density levels (p=0.094) were not related to the presence of <i>E. coli</i> . The conclusion of this study is that there is a relationship between the storage of finished food, the location of the canteen and the hygiene of the handler and the presence of <i>E.coli</i> .
8	Librilliana (12)	To find out whether or not there is a relationship between personal hygiene and food sanitation with the content of <i>E. Coli</i> in the chili sauce provided by the canteen of Semarang State University in 2012	Cross sectional	The sample is 21 canteens	There was a relationship between the practice of washing hands using soap (p = 0.008), washing raw materials (p = 0.011), sanitation of equipment (p = 0.028) and the content of <i>E. coli</i> in the chili sauce provided, and there was no relationship between the personal hygiene of the handler (p = 0.063), and the use of tools when taking food (p = 1,000) and the <i>E. coli</i> content in the chili sauce provided. The advice given to workers in the canteen is to conduct a series of trainings, courses, or the installation of posters, writings and pictures by managers in the

It	Writer	Purpose	Design	Sample	Result
					work environment so that personal hygiene and food sanitation can be applied continuously
9	I Nengah (13)	To find out the content of Escherichia coli in food and the condition of sanitation facilities where food management is handled at Mutiara Sis Al Jufri Airport, Palu	Descriptive analytics	The number of samples is 30 samples	The content of Escherichia coli bacteria in food at the Food Processing Station (TPM) located at Mutiara Sis Al Jufri Airport, Palu is mostly free of Escherichia coli bacteria and the condition of the facilities where the food is processed mostly meets health requirements. This study suggests that regular inspections and monitoring of food management places and applying the principles of sanitary hygiene of food management places at airports
10	Nur Syach (14)	To find out how to identify bacteriological hazards in foodstuffs with the principle of Hazard Analysis Critical Control Point (HACCP) at the Padang restaurant, Makassar City.	Observational descriptive	Foodstuffs, namely meat and vegetables in 5 Padang restaurants in several sub-districts Makassar City.	At the research location, namely 5 Padang restaurants, there was a content of bacteria such as escherhichia coli in the ingredients food based on laboratory tests. Then from the results of hazard identification, the source of biological hazards comes from the personal hygiene of food handlers and poor restaurant sanitation. Critical points are found in several stages of the food processing process. As well as taking corrective action on every hazard in food as well as the stages of the process. Handlers are expected to remember the importance of food handlers to maintain personal hygiene and sanitation of the restaurant so that food is not easily contaminated by bacteria.

DISCUSSION

Good knowledge and attitude alone do not guarantee the occurrence of good personal hygiene actions for food handlers, because good sanitary quality is still needed in food processing to produce healthy and suitable food for consumption (7). The wrong way of washing can increase microorganisms can multiply. The presence of E. coli in cutlery can come from water sources that have been contaminated with E. coli, the habit of washing hands without using running water and soap, the habit of wearing rings when cooking and the habit of using hands to take food directly (8). According to BPOM No.13 of 2019 concerning the maximum limit of microbial contamination. Contamination by Escherichia coli bacteria is caused by the fact that there are still some unqualified hygienists because there are still hygienists who do not wear masks, use headgear, use handscoons, and do not use tissues after washing their hands (9).

Poor food sanitation and a less clean environment have the potential to be a medium of spread because Escherichia coli bacteria contaminate food through water and unclean environments. Snacks that are in direct contact with water or a polluted environment if Escherichia coli bacteria are found through laboratory tests, then it is indicated that the snack has been contaminated with human feces(2). Hygiene in traders has a great influence on food safety so that food is not polluted. Meanwhile, the sanitation of the place of sale is carried out to control environmental

conditions from the handling of raw materials to the distribution process. The role of sanitation is very important as an effort to prevent the possible growth and development of spoilage microbes and pathogens in food, beverages, equipment, and buildings that can spoil food and harm humans (5).

The storage area for tableware is also not considered for cleanliness and hygiene because all traders do not use storage areas that avoid the danger of pollution, traders only use plastic shelves and tables as containers or bases from the storage of tableware and are left open (10). Traders who do not wash before touching food, this is considered a hassle by traders because traders have to serve many students when the break arrives. Traders receive money and serve buyers alternately in a crowded state so that it is not always the time to wash their hands. For nail hygiene, 80% of traders are good. The nails are not long and do not use nails. For the use of jewelry, only 43% of traders use jewelry in the form of bracelets and engraved rings. Hands are an important medium for the transmission of a disease because they can be a gathering place for microorganisms on the skin and nails, including E.coli bacteria(11).

The food production process is carried out through a series of activities that include food preparation, processing, and serving. Therefore, sanitation in the food processing process is carried out from the process of handling raw materials until the food product is ready for consumption. In more detail, sanitation includes quality control of raw materials, storage of materials, good water supply, prevention of food contamination from the environment, equipment, and workers, at all stages of the process. So it can be concluded that the washing of raw materials has something to do with the content of E. coli in the chili sauce provided(12). Improper serving of food, so it can cause food to be contaminated. In order for the condition of the food to be healthy, the food must be free from contamination. Contaminated food will cause foodborne illness. In order to keep food safe and healthy, several ways are needed which include storage, prevention of contamination, and eradication of organisms and toxins (13). Based on laboratory tests, it was found that ecoli bacteria exceeded the maximum threshold value of microbial contamination in the food sample, this is because based on observations that have been made during the procurement of raw materials at the Padang RB restaurant, meat that has been purchased from the market, is not rechecked by the food handler so that it is possible for the meat chosen to be meat that is no longer fresh and has been contaminated with bacteria, while for vegetables in RM. RB obtained from distributors is not directly washed and used by food handlers but is stored first to cook later after a few hours without being put in the refrigerator so that the food ingredients become wilted or microbes have begun to develop(14).

CONCLUSION

This study concluded that factors related to the presence of e.coli in food in public places include: personal hygiene of food handlers, how to wash cutlery, PPE food handlers are not paid attention to, poor food sanitation, food handlers do not pay attention to controlling environmental conditions from the handling of raw materials to the distribution process, the storage place of cutlery is not considered, and improper food serving.

SUGGESTION

This study recommends to environmental health workers the need to socialize and supervise the hygiene and sanitation of traders in particular. To the general public to pay attention to the cleanliness of what will be consumed.

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