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RESEARCH

Escherichia coli Contamination on Cutlery (Glass) in Malioboro Tourism Area Yogyakarta

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ABSTRACT

Angkringan is one of the favorite food stalls in the Malioboro area of Yogyakarta. Poor hygiene in food can cause food contamination. One of them is contamination caused by unclean cutlery and resulting in disease due to bacterial contamination. The purpose of this study was to determine the factors associated with *Escherichia coli* contamination on cutlery (glass) at the angkringan Malioboro Tourism area, Yogyakarta. This study used a cross sectional study. The research subjects were angkringan which numbered 40 angkringan, the object of the research was 40 sample of cutlery and clean water. The research instrument is a questionnaire and checklist. Data analysis with univariate and bivariate analysis. The results of bivariate analysis revealed the positive association between personal hygiene and sanitation facilities and *E. coli* contamination (p value = 0.046, p value = 0.037, respectively). Additionally, it also found without association between knowledge, attitude, management of cutlery and the presence of *E. coli* in clean water with contamination of *E. coli.* Personal hygiene and sanitation are the determinants of *E. coli* contamination on cutlery (glass) in Malioboro Tourism Area in Yogyakarta. The management and monitoring regarding food assessment is needed to prevent the communicable disease caused *E. coli.*

Keywords: *E. coli*, Cutlery, Hygiene sanitation, Angkringan

INTRODUCTION

Food is the needs important in human life, besides animals and plants because without food life cannot be occur. Food contamination can be a medium of transmission of disease to people who consume these foods regardless of age, gender, race and so on.(1) Contamination of food, one of which is caused by the presence of food equipment that is not clean and will cause disease due to bacterial contamination in the used tableware, the contamination can cause a disease known as food borne disease, where food or drinks consumed are contaminated by microorganisms or poisons resulting in unwanted contamination into the body. *E. coli* is a bacterium that is often found to contaminate food, in the microbiological requirements. It was chosen as an indicator of water or food contamination by human feces.(2) *E. coli* is a bacterium that causes food borne disease, which is diarrhea. In developing countries, the pathogenic *E. coli* causes approximately a quarter of all diarrheal events. One group of pathogenic *E. coli* namely *Entero Toxigenic E. Coli* (ETEC) is a pathogenic *E. coli* which is the main cause of acute diarrhea with dehydration in children and adults. (3) The incidence of diarrhea in Indonesia remains high. The morbidity survey conducted by the diarrhea sub-directory, Ministry of Health in 2012 to 2015 shows the tendency of incidences to increase in diarrhea cases. While in 2015 there were 18 outbreaks (Extraordinary Events) of diarrhea spread in 11 provinces, 18 districts or cities, with a total of 1,213 people and 30 deaths (CFR 2.47%).(4)

Prevalence of diarrhea in Yogyakarta Province have always been the most top 10 cases. Based on regular reports of the Disease Control Section that the number of cases of diarrhea in 2017 was 48,556 cases (63%) of the total target of screening. Whereas based on STP (Integrated Disease Surveillance) Community Health Care for new cases of diarrhea of 15,256 cases. Based on STP inpatient hospitals in 2017 cases of diarrhea were 4,472 and 18,963 for outpatient hospitals.(5) Transmission of diarrhea is usually through fecal-oral means through contaminated food and drink. In addition, the transmission of diarrhea can also be through hands or tools such as bottles, nipples, thermometers and cutlery contaminated by feces. Poor eating utensils have a very important role in the growth and spread of germs and poisoning. For this reason, tableware must be kept clean in order to avoid pathogen contamination, including *Escherichia coli.*(6)

Yogyakarta City is a very special city which has many attractions that can be visited. One of the attractions in Yogyakarta that is in great demand is the Malioboro tourist area. Yogyakarta Malioboro area is a tourist-intensive area, this opens business opportunities for local residents and migrants to establish a food stall business. One of the most popular food stalls is angkringan stalls located in the tourist area of Malioboro. Based on preliminary observations conducted by researchers on March 12, 2019 at the Malioboro tourist area in Yogyakarta, after laboratory tests found 2 samples of glass cutlery that did not meet the specified cutlery requirements, namely the requirement for the number of germs on eating and drinking utensils, should be 0

(zero) colony / cm^2 surface and did not contain *Escherichia coli*. The results of interviews conducted with angkringan traders during initial observation showed a lack of knowledge and attitude of angkringan traders related to sanitation hygiene in the management of cutlery, such as angkringan traders still do not know the importance of washing utensils with running water and drying techniques which should not be dried using cloth. In addition, there are still behaviors of handlers in angkringan, especially men who have the habit of smoking while making drinks, those who have long nails, and do not wash their hands before contact with food, and sanitation facilities such as clean running water are not available and trash cans are still available. It has not met health requirements such as uncovered and not waterproof bins. Based on the above results, the researcher is interested in conducting research related to the factors associated with *Escherichia Coli* contamination in cutlery, especially glass in the Malioboro tourist area, Yogyakarta.

METHODS

This study was an observational analytic design with laboratory tests and cross-sectional study designs. The subjects in this study were 40 angkringan in Yogyakarta tourist area Malioboro and the object of the study was 40 samples of glassware and 40 samples of clean water. The research instrument used was a questionnaire (knowledge and attitude) and checklist (observation of personal hygiene, sanitation facilities, and management of cutlery). The existence of *Escherichia coli* in clean water is carried out qualitatively in the Health Laboratory Center (BLK) using EC Broth media. Data analysis with univariate analysis and bivariate analysis with Fisher's exact test statistic.

RESULTS

General Description of Research Locations

Malioboro area is one area that consists of 3 (three) streets in the city of Yogyakarta which stretches from the Yogyakarta Monument to the Yogyakarta Post Office intersection. Based on the Decree of the Governor of DIY 3 (three) roads consist of Jalan Margo Utomo, Jalan Malioboro and Jalan Margo Mulyo.[7] This road is the axis of the Imaginary Line (the imaginary line which is the reference) of the Sultan's Palace. The Malioboro area is managed by the Technical Implementation Unit (UPT) of the Malioboro Area from the Yogyakarta Tourism and Culture Office.[8] Malioboro tourism area is in a strategic location, close to the government and urban center of Yogyakarta. Malioboro is also close to other tourist attractions such as the Yogyakarta Palace, Beringharjo Market, Vredeburg Fort, Senisono Building, Sono Budoyo Museum, Taman Sari, and other attractions. Culinary tourism is also widely available in the Malioboro area, many found sellers who sell special foods from Yogyakarta such as warm, bakpia, penyetan, angkringan, round, and others. Various kinds of culinary in Malioboro tourist area are an attraction for tourists.[8]

Characteristics of Respondents

Table 1. Distribution of respondent characteristics in malioboro tourism area, Yogyakarta City

Variables	Frequency	Percentage
Sex		
Male	33	82.5
Female	7	17.5
Age		
Adolescent	4	10
Adult	22	55
Elderly	14	35
Level of education		
No formal education	3	7.5
Elementary/ junior high school	29	72.5
Senior high school/university	8	20
Duration of selling		
≥ 5 years	24	60
< 5 years	16	40
Training of hygiene sanitation		
Never	30	75
Ever	10	25

Regarding sex, majority of them were male (82.5%). Around a half of them were adult (55%) and almost three fourth of them graduated from elementary/ junior high school (72.5%). According to duration of selling, more than a half of them have been sold ≥ 5 years which by 24 people (60%). From 40 respondents, 30 of them had never attended the food sanitation hygiene training.

Descriptive Analysis

In table 2, based on the level of knowledge in the management of cutlery showed more than a half of respondents had good knowledge. Regarding the attitude in management of cutlery showed most of the respondents had good attitudes. In personal hygiene showed majority of respondents had good personal hygiene. In term of sanitation facilities showed that more than a half of respondents were those who had good sanitation facilities. Based on the management of cutlery shows that the highest respondents are those who had good equipment management of 21 people. Based on the presence of *E.coli* in clean water and cutlery, it can be seen that the results of laboratory tests indicated the negative result in majority of samples.

Table 2. Results of descriptive analysis of attitudes, personal hygiene, sanitation facilities, management of cutlery, the presence of *E. coli* in clean water and glassware.

Variables		Frequency	Percentage
Knowledge			
	Not good	16	40
	Good	24	60
Attitude			
	Not good	13	32.5
	Good	27	67.5
Personal Hygiene			
	Not good	15	37.5
	Good	25	62.5
Sanitation facility			
	Not good	14	35
	Good	26	65
Management of cutlery			
	Not good	19	47.5
	Good	21	52.5
Presence of *E. coli* in clean water			
	Positive	6	15
	Negative	34	85
Presence of *E. coli* in cutlery (glass)			
	Positive	3	7.5
	Negative	37	92.5

Bivariate Analysis

The statistical test used was the Fisher test. The confidence level (CI) used was 95% with a significance level of p-value <0.05 to know the relationship used Ratio Prevention (RP).

Table 3. Analysis of Relationships between level of knowledge, attitude, personal hygiene, sanitation facilities, management of cutlery and the presence of *E. coli* in clean water and *E. coli* contamination in glassware

Independent variables	RP	CI (95%)	P Value
Knowledge about cutlery's management	3.000	0.296-30.393	0.553
Attitude about cutlery's management	1.038	0.103-10.435	1.000
Hygiene Personal	0.800	0.621-1.030	0.046
Sanitation Facility	0.786	0.598-1.033	0.037
Management of cutlery	2.211	0.217-22.468	0.596
Presence *E.coli* in clean water	0.687	0.389-1.213	0.054

Based on table 3, there was no relationship between the level of knowledge in the management of cutlery with *E. coli* contamination in cutlery (glass) p value = 0.553 (p> 0.05). There was no relationship between attitude in the management of cutlery with *E. coli* contamination in the cutlery (glass) value of p = 1.00 (p> 0.05). It was found a relationship between personal hygiene with *E. coli* contamination in the cutlery (glass) value of p = 0.046 (p <0.05). There revealed a relationship between sanitation facilities with *E. coli* contamination in cutlery (glass) value p = 0.037 (p <0.05). There was no relationship between management of cutlery with *E. coli* contamination in cutlery (glass) p value = 0.596 (p> 0.05), there is no relationship between the presence of *E. coli* in clean water with *E. coli* contamination in cutlery (glass) p value = 0.054 (p> 0.05).

DISCUSSION

Relationship of Knowledge Level in Management of Cutlery with Contamination of *E. coli* in Cutlery (Glass)

In this study, of all 40 angkringan traders showed 16 angkringan traders had poor, 2 of them were contaminated by *E. coli* and the rest were not. However, from 24 angkringan traders who had good knowledge management of cutlery, there are 1 angkringan that was contaminated with *E. coli* in cutlery (glass) and 23 angkringan that were not contaminated with E. coli in cutlery (glass). Bivariate analysis results show that knowledge in the management of cutlery had no relationship with *E. coli* contamination in cutlery (glass). This can be caused because there is still *E. coli* contamination in cutlery (glass) even though the level of knowledge of the handler has been said to be good. The knowledge about good management of cutlery is not reflected in the cleanliness of cutlery from bacterial contamination. According to previous research, people who have good knowledge do not guarantee to be able to maintain the cleanliness of food and cutlery when applied.[9] This is also supported by other research which states that there was no relationship between the level of knowledge and the practice of food sanitation hygiene in food handlers in the Yogyakarta City elementary school canteen.[10]

Factors that can affect contamination of cutlery are hygiene and sanitation in the management of tableware, how to wash equipment and water used.[11] The majority angkringan traders know that washing tableware should use running water or using a washing basin of at least 3, but in reality, when observed there are still many angkringan traders who do not use running water when washing and use washing tubs which are still less than 3 tubs. This knowledge of food handlers is only at the level of understanding. Knowledge has six levels namely know, understand, application, analysis, synthesis and evaluation.[12] Knowledge that only reaches this level of understanding will certainly provide an obstacle in hygiene and sanitation efforts. Therefore, it is necessary to increase knowledge not only to the stage of knowing and understanding so that the handler can improve behavior in hygiene management of tableware management.

Based on biological significance obtained RP value of 3,000 (RR> 1) and Confident Interval (CI) that is 0,296-30,393. These results indicate that knowledge in the management of cutlery is not necessarily a risk factor for *E. coli* contamination. Statistical significance in this study obtained p value = 0.553> α = 0.05, meaning that there is no relationship between knowledge in the management of cutlery with *E. coli* contamination in cutlery (glass). This is consistent with the results of previous studies which state that knowledge in the management of cutlery has nothing to do with the presence of *E. coli* in tableware at the Kyai Ageng Orphanage House in Majapahit.[13]

Relationship between Attitudes in Management of Cutlery with Contamination of *E. coli* in Cutlery (Glass)

In this study, from 40 angkringan traders, showed that of 13 angkringan traders who had poor an attitude in the management of cutlery. 1 of that 13 samples were contaminated with *E. coli* in cutlery (glass) and 12 angkringan that were not contaminated with E. coli in cutlery (glass). However, from 27 angkringan traders who had good attitude in managing cutlery, there are 2 angkringan that are contaminated with *E. coli* in cutlery (glass) and the rest were not. A good attitude can affect the risk of bacterial contamination.[14] However, it was not shown in this study which was explained earlier that the good attitude of angkringan traders in the management of cutlery still contained *E. coli* contamination in cutlery (glass). One of the factors that caused this to happen is that angkringan traders who have good attitudes do not necessarily apply good behavior in the management of cutlery.

Based on the results of observations, there are still many angkringan traders who did not apply hygiene and sanitation in the management of eating utensils, whereas when viewed from the univariate test results, most of the angkringan traders have a good attitude in managing eating utensils. Almost all traders agree that washing

utensils must use large amounts of water and are always replaced, angkringan traders also agree that eating utensils should be placed in closed cupboards. But at the time of observation there were still many angkringan traders who did not replace the washing water and there were still many who stored the cutlery in an open place. Good attitude does not affect the behavior of hygiene and sanitation in the handlers. [15] That is, angkringan traders who have a good attitude in the management of cutlery do not necessarily apply good sanitary hygiene behavior also in the management of cutlery. In addition, attitude measurement can be influenced by education, experience gained, the usual culture, and available facilities. If good attitudes are not supported by adequate sanitation facilities, it can lead to bad hygiene practices.[16]

Based on biological significance, the RP value is 1.038 (RR> 1) and the Confident Interval (CI) is 0.103-10.435. These results indicate that the attitude in the management of cutlery is not necessarily a risk factor for *E. coli* contamination. Statistical significance in this study obtained p value = 1,000> α = 0.05, meaning that there is no relationship between attitude in the management of cutlery with *E. coli* contamination in cutlery (glass). This result is supported by previous research which states there is no relationship between operator attitude with *E. coli* contamination in refill drinking water.[17]

Relationship of Hygiene Traders of Angkringan with *E. Coli* Contamination in Tableware (Glass)

In this study, of all 40 angkringan traders studied, showed that out of 15 angkringan traders who had poor personal hygiene, there were 3 angkringan that were contaminated with *E. coli* in cutlery (glass) and 12 angkringan that were not. Whereas of the 25 angkringan traders who had good personal hygiene, all were not. Based on observations made known personal hygiene from 15 angkringan traders were still not good. These results indicate if there are still many angkringan traders who pay less attention to their cleanliness in food processing and eating utensils. One of the bad personal hygiene could be supported by the sex of angkringan traders, the majority of whom are male as many as 33 people. Based on previous research, respondents with male gender were more often found to have bad personal hygiene when compared to female respondents. [18] Personal hygiene of respondents when related to the characteristics of respondents based on age, most angkringan sellers are adults (35 to 45 years) and elderly (46 to 65 years). As a person ages, there will be changes in behavior and as someone ages, it will be difficult to receive information.[19] So, they ignore hygiene and sanitation behavior which is actually one of the keys to maintaining health. Almost all angkringan traders do not wear head covers / hats and aprons, smoke when they are near the food serving area, use jewelry such as rings, and do not wash their hands after touching objects such as money and dirty equipment.

Officers who had poor personal hygiene are possible due to lack of information or counseling from the Health Office or related offices, the results of interviews conducted with angkringan traders, out of 40 traders only 10 angkringan traders have received information about hygiene and sanitation. Counseling obtained by angkringan traders, can make angkringan traders get information, knowledge and awareness of the importance of maintaining personal hygiene. This is consistent with the theory that the educational approach is more appropriate in the context of fostering and improving public health behaviors. It can be concluded that the health promotion education approach is a form of intervention or effort aimed at behavior, so that the behavior is conducive to health.[20]

Based on the analysis using Fisher's exact test, p value = 0.046 <α = 0.05, meaning that there was a relationship between personal hygiene of angkringan traders and *E. coli* contamination in cutlery (glass). This is consistent with previous research which shows that the most dominant variable influencing the contamination of *Escherichia coli* in food at Manado and Bitung City Restaurants is personal food handler hygiene.[21]

Relationship of Angkringan Sanitation Facility with E. Coli Contamination in Tableware (Glass)

In this study, of all 40 angkringan examined, showed that out of 14 angkringan that had poor sanitation facilities, there were 3 angkringan that were contaminated with *E. coli* in cutlery (glass) and 11 angkringan that were not contaminated with *E. coli* in cutlery (glass). While of the 26 angkringan that had good sanitation facilities, all were not contaminated with *E. coli* in cutlery (glass). Angkringan sanitation facilities in the tourist area of Malioboro, Yogyakarta, are still found angkringan that do not yet have a source of clean running water, the washing utensils of food utensils do not yet consist of 3 washing basins and do not have sewerage. Basically, all angkringan already have garbage bins, but there are still some that are not closed and not waterproof. Poor condition of sanitation facilities, for example in waste management, can lead to contamination of microorganisms in food and eating utensils. This is consistent with research conducted by previous researchers which stated that there is a relationship between sanitation in waste management and contamination of E. coli in food in the City of Manado and Bitung City.[21]

Poor sanitation facilities can be caused by inadequate angkringan facilities and infrastructure, this is because angkringan traders sell only using carts and selling locations that are also located on the side of the road, causing sanitation facilities to be inadequate. In addition, respondents who had poor sanitation facilities may be caused by lack of information obtained, this lack of information can cause respondents to have poor sanitation facilities. This is consistent with the theory which states that information media is one of the medias that helps improve health education, which will help enforce the knowledge acquired, so that knowledge will be stored in memory.[20] Based on the results of the analysis using the Fisher test, p value = 0.037 <α = 0.05, which means there is a relationship between sanitation facilities and *E. coli* contamination in cutlery (glass) in the angkringan Yogyakarta tourist area Malioboro Yogyakarta. A positive attitude is an important factor in turning knowledge into practice by food handlers. This proves that the importance of training that focuses on attitude and theoretical and practical knowledge, to ensure better implementation of theoretical principles. The owner also has an important role to play in building a food safety culture especially in the provision of sanitation facilities and setting conditions that cause behavioral changes.[22]

Relationship of Tableware Management with *E. coli* Contamination in Tableware (Glass)

In this study, out of 40 angkringan traders examined, out of 19 angkringan traders who had poor management of cutlery. 2 of those angkringan were contaminated with *E. coli* in cutlery (glass) and 17 others were not. While from 21 angkringan traders (52.5%) who have good management of cutlery, there are 1 angkringan that is contaminated with *E. coli* in cutlery (glass) and 20 angkringan that is not contaminated by *E. coli* in cutlery (glass).

Based on observations made, most angkringan traders have washed equipment properly, namely by using detergents or similar soap to remove stains. It's just that when flushing the equipment does not use running water and the water used in the water basin is not replaced regularly. Previous research also showed that washing utensils that do not use running water can increase cross-contamination of dirty water in the washing basin with cutlery to be washed.[23] This is also supported by other research which states that washing media with running water is better than washing with soaking media.[24]

The angkringan traders in the Yogyakarta Malioboro tourist area from the results of the study showed that the traders dried the cutlery after being washed and when it was going to be used in the presentation process using cloth. In the storage of cutlery, angkringan traders in the Malioboro area have kept the glass in an upside-down position, but cutlery is still stored in an open place. Cutlery that has been washed and dried should be stored directly in a tool cabinet that is protected from dust, closed and easily accessible when used. Storage cabinets are placed far from sources of pollution and do not allow pollution to the process of pollution in the process of transporting cutlery to be ready for use in serving food. This is intended to prevent food contamination by the equipment used. Based on biological significance, the RP value is 2.211 (RR> 1) and the Confident Interval (CI) is 0.217-22.468. These results indicate that the management of cutlery is not necessarily a risk factor for *E. coli* contamination. Statistical significance in this study obtained p value = 0.596> α = 0.05, meaning that there is no relationship between the management of cutlery with E. coli contamination in cutlery (glass).

Relationship of the Existence of *E. coli* in Clean Water with *E. coli* Contamination in Cutlery (Glass)

In this study, from a total of 40 clean water samples taken from angkringan, it was shown that from 6 samples of clean water in angkringan that were positive contained *E. coli*, there were 2 angkringan that were contaminated with E. coli in cutlery (glass) and 4 angkringan that were not. While from 34 samples of clean water in angkringan that were negative or did not contain *E. coli*, there were 1 angkringan that had E. coli contamination in cutlery (glass) and 33 angkringan that did not have E. coli contamination in cutlery (glass).

Provision of clean water in the Malioboro tourist area of Yogyakarta, most use clean water sources from wells and PDAMs, and most meet physical requirements, namely odorless, colorless and tasteless, and based on laboratory examinations, clean water at angkringan more did not contain *E. coli* in clean water as much as 85% or totaling 34 angkringan. This can be due to the fact that most of the clean water used in the Malioboro tourist area in Yogyakarta comes from clean water sources found in hotels around the Malioboro tourist area, which basically already have clean water standard.

Bivariate analysis results show if there is no relationship between the presence of *E. coli* in clean water with *E. coli* contamination in cutlery (glass) in angkringan. This can be caused by angkringan traders washing tableware or rinsing not by using clean running water directly, but by using a washing bath. This makes it possible for E. coli bacteria to originate from the use of water media, which is water that is collected in a tub.

Based on the results of observations that have been made, almost all angkringan traders use washing tubs that contain water that is already turbid or dirty. The water in the tub used for washing tableware should only be used once and use a maximum of two times. If the water is not replaced regularly it can cause accumulation of bacteria in the water and can contaminate the eating utensils that will be used. Based on biological significance obtained RP value of 0.687 (RR <1) and Confident Interval (CI) that is 0.389-1.213. These results indicate the presence of E. coli in clean water is not necessarily a protective factor for E. coli contamination. Statistical significance in this study obtained p value = 0.054> α = 0.05, meaning that there is no relationship between the presence of E. coli in clean water with E. coli contamination in cutlery (glass). This result is in line with previous research conducted by researchers who stated that there was no significant relationship between water supply and Escherichia coli contamination in food.[21]

CONCLUSION

There was no relationship between the level of knowledge in the management of cutlery, attitudes in the management of cutlery, management of cutlery and the presence of *E. coli* in clean water with *E. coli* contamination in cutlery (glass) and there was a relationship between personal hygiene and sanitation facilities with *E. coli* contamination in cutlery (glass).

The Health Department is expected to organize good food sanitation hygiene courses for food handlers and to conduct good and continuous counseling about sanitation hygiene to Angkringan traders in the Yogyakarta Malioboro Tourism area. The angkringan traders need to pay more attention to personal hygiene and sanitation facilities contained in angkringan. They also must pay more attention to the techniques of good management of cutlery and how to store tableware after washing so that the equipment is protected from pollution.

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