http://heanoti.com/index.php/hn

RESEARCH ARTICLE

URL of this article: http://heanoti.com/index.php/hn/article/view/hn21201

Contamination of *Escherichia coli* in Orange Juice in Angkringan Tourism Area, Malioboro Area, Yogyakarta

Dyah Suryani[1], Wibowo[2(CA)]

[1]Faculty of Public Health, Ahmad Dahlan University, Yogyakarta, Indonesia

[2(CA)]Research and Development Center for Health Resources and Services, Ministry of Health, Indonesia; wibowo869@yahoo.co.id (Corresponding Author)

ABSTRACT

Background: Orange juice is a popular drink in terms of taste, aroma, and price. However, if the behavior of the drink handler and environmental hygiene sanitation does not meet the requirements, it will allow the beverage to be contaminated with *E. coli* bacteria which can cause health problems. This study aimed to examine the relationship between behavior and angkringan sanitation with the existence of *E. coli* bacteria on orange juice in angkringan around Malioboro area of Yogyakarta City. **Methods:** This was observational analytic study with cross sectional time frame. The research samples were the angkringan reseller in Malioboro Region, amounting to 40 samples, 40 samples of orange juice and 40 samples of ice cubes. Data analysis used univariate analysis and bivariate analysis with *Fisher* statistical test. **Results:** The results of univariate analysis showed the good behavior of drink handler by 60%, good sanitation angkringan as much as 52.5%, 75% of ice cubes and 80% of the qualified or was found negative based on laboratory test in orange juice. The result of bivariate analysis, there was a relationship between the behavior of the drink handler with the presence of *E. coli* p = 0.042. There was no relationship between sanitation angkringan with the presence of *E. coli* p = 0.442. There was no relationship between the presence of *E. coli* on ice cubes and *E. coli* in orange ice p-value = 0.089. **Conclusion**: There was no correlation between sanitation of angkringan and the presence of *E. coli* on ice cubes and *E. coli* on orange juice. There was a relationship between the behavior of the beverage processor and the presence of *E. coli* on orange juice.

Keywords: *E. coli*, Behavior, Sanitation of *angkringan*

INTRODUCTION

Drinks is the basic needs in human life. It must be nutritious, attractive and free of harmful substances form (chemical, microbial and other contaminants). The process of microbial contamination can be caused due to the hygiene conditions of sanitation, food and beverage processing environment that does not meet the standards.(1) Food borne disease that occurs after consuming food, commonly referred to as poisoning. The drink can be toxic because it has been contaminated by pathogenic bacteria which can grow and multiply during storage, so that it is able to produce toxins.(2) In 2016, the National Poisoning Information Center (BPOM) stated that the number of food and beverage cases in Indonesia in 2016 reached 976 cases of food poisoning and 1147 beverage poisoning. According to these data also mentioned the cause of poisoning including 2426 cases caused by animals poisoning, 765 cases of chemical poisoning and 625 cases of pesticide poisoning.(3)

Water is one of the medias in the process of infection to the human body. *E. coli* can be used as a microbiological indicator of contamination of water or food sources by human feces. In the microbiological requirements, *E. coli* is chosen as an indicator of water or food pollution due to the its presence. *E. coli* shows a sign of poor sanitation practices because *E. coli* can move by hand to mouth activity or by passive transfer

through food, water, milk and other products.[4] One of the diseases related to health status is diarrhea. Diarrhea is one of the main causes of morbidity and mortality in developing countries with poor environmental sanitation, inadequate water supplies, poverty and limited education. As a developing country, Indonesia is a endemic of diarrheal diseases. Data of diarrheal cases in 2011, the number of morbidity due to diarrhea was 0.40% and the number of diarrhea morbidity increased in 2016 to 3.04%.[5]

Food and beverage sanitation inspection is an attempt to see and integrate directly on the spot and assess the state of actions or activities carried out and provide instructions or suggestions for improvement. Supervision and monitoring of food and beverage sanitation in food stalls must be carried out continuously and gradually over the development of sanitation hygiene measures / activities requirements.[6] Based on Minister of Health's Regulation No. 1096 in 2011, in the technical requirements of sanitation, the Jasaboga Institution's sanitation must have a place / building, sanitation facilities (hand washing facilities, clean water, and rubbish bins), equipment and food handlers who meet all aspects of sanitary hygiene.[7] Sanitation hygiene is a health effort to reduce or eliminate the factors that cause pollution of drinking water and the facilities used for the processing, storage and distribution of drinking water. The goal of sanitation hygiene is to protect the community from the potential bad transmission of infectious diseases through water mediators, which result from consuming water contaminated with *E. coli* bacteria.[8]

According to the Regulation of the Minister of Health of the Republic of Indonesia Number 492 in 2010 which concerning Drinking Water Quality Requirements stipulates that the maximum limit of *Escherichia coli* bacteria allowed in drinking water is 0/100 ml water.[1] *Escherichia coli* is a gram-negative, not encapsulated and is a normal flora in the digestive tract of animals and humans that easily pollutes water. The presence of *Escherichia coli* in water or food is also considered to have a high correlation with the discovery of germs (pathogens) in food. [9] Angkringan is one form of variation of the sidewalk. Street vendors who use wooden wheelbarrows with charcoal stoves on top of which have a large kettle as the main tool to serve drinks.[10] One of the drinks served at angkringan is orange juice. It is a kind of natural beverage dish made from freshly squeezed orange juice with mix water, sugar, and ice cubes as a supplementary ingredient. Orange juice is a favorite drink in terms of taste, aroma, and portion. This drink contains a lot of vitamins, nutrients, limonin and naringin.[6]

Based on observations of angkringan handlers and sanitation behavior in the Malioboro area, angkringan traders still have the behavior of not washing their hands before processing drinks even after handling cigarettes, conversing when processing drinks, and there are still traders who do not use assistive devices when take an ice cube. The condition of the angkringan sanitation, there are still garbage bins that are not given a lid until the garbage is scattered about, the bucket of washing equipment uses only 2 buckets and the lack of availability of running water is used to wash the equipment. This can be a factor in *E. coli* contamination to drinks due to the behavior of the beverage handlers and poor sanitation.

METHODS

This research is a quantitative study with a cross-sectional research design. This research was conducted in the Malioboro area of Yogyakarta. The samples in this study were orange juice and beverage handlers at the Malioboro area in Yogyakarta City. This study uses a total sampling technique by taking 40 respondents as angkringan traders.

RESULTS

Characteristics of Respondents

The frequency distribution of characteristics of angkringan traders in the Malioboro area based on sex, age, length of time of selling, sanitation hygiene training can be seen in table 1.

Based on table 1, it shows that the majority of respondents were male (87.5%) and the rest were female (12.5%). From 40 respondents, more than a half of them were elderly (57.5%) and only 17 of them were adult. In terms of duration of selling orange juice, most of them have been selling it for more than 5 years (90%) and just a few of them have been selling it for less than 5 years. From 40 respondents, majority of them never attended the food sanitation training (92.5%) and the rest have attended.

Table 1. Distribution of characteristics of *angkringan* traders in Malioboro

Characteristics	Frequency	Percentage
Sex		
• Male	35	87.5
• Female	5	12.5
Age		
• Elderly	23	57.5
• Adult	17	42.5
Duration of selling		
• >5 years	36	90
• <5 years	4	10
Involved in training		
• Never	37	92.5
• Ever	3	7.5

Descriptive Analysis

The descriptive analysis in this study have been explained by behavior, sanitation, and the presence of *E. coli* in ice cubes and orange juice.

Table 2. Distribution of beverage processing behavior, *angkringan* sanitation, *E. coli* on ice cubes, *E. coli* on orange ice at *angkringan* in Malioboro

Variable	Frequency	Percentage
Behavior		
• Not good	16	40
• Good	24	60
Sanitation		
• Not Good	19	47.5
• Good	21	52.5
E. coli in ice cubes		
• Positive	10	25
• Negative	30	75
E. coli in orange juice		
• Positive	8	20
• Negative	32	80

Based on table 2, it can be seen that the behavior of the handlers of 40 angkringan traders, from the results of research observations there are 16 traders (40%) who have bad food handler's behavior and 24 traders (60%) who have good food handler's behavior. According to sanitation, the results showed 21 angkringan (52.2%) had good sanitation and 19 angkringan (47.5%) had poor sanitation. The laboratory test revealed that 75% of the angkringan were eligible and the rest were not. The contamination of *E. coli* in orange juice was found the negative result for 32 samples and the positive result for 8 samples.

Bivariate Analysis

Statistics test results of the relationship between behavior and sanitation angkringan with the presence of *Escherichia coli* bacteria in orange juice in Angkringan Malioboro Area can be seen in table 3.

Table 3. Relationship between *angkringan* behavior and sanitation with the presence of *Escherichia coli* bacteria in orange ice at *angkringan* in Malioboro

Variables	*E.coli* in Orange juice						p-value	RP (CI 95%)
	Positive	%	Negative	%	Total	%		
Behavior								
Not good	6	37.5	10	62.5	16	100	0.042	4.500 (1.035-19.571)
Good	2	8.3	22	91.7	24	100		
Sanitation of *angkringan*								
Not good	5	26.3	14	73.7	19	100	0.442	
Good	3	14.3	18	85.7	21	100		
E. coli in ice cube								
Positive	4	40.0	6	60.0	10	100	0.089	
Negative	4	13.3	26	86.7	30	100		

The Relationship between Beverage Hygiene Behavior and the Existence of *E. coli* on Orange Juice

Based on table 3, it can be seen that the proportion of *E. coli* in orange ice is based on the behavior of the beverage handlers. The most result is the beverage handlers who have good hygiene behavior with the negative *E. coli* on the orange juice which by 22 samples (91.7%). The results of the analysis of the Fisher's exact test obtained p-value = 0.042 <α = 0.05, meaning that there was a relationship between the behavior of the beverage handler with the presence of *E. coli* in orange juice. Prevalence Ratio (RP) = 4.500 (with 95% CI = 1.035-19.571) which means that angkringan traders who have bad drink handlers have a 4.500 times greater chance than angkringan traders who have good beverage handler's behavior.

The Relationship between Angkringan Sanitation and The Presence of *E. coli* on Orange juice

The proportion of *E. coli* in orange juice is based on angkringan sanitation, the most is angkringan that has good sanitation with negative *E. coli* in orange juice, which by 18 samples (85.7%). The results of the analysis of the Fisher's exact test obtained p-value = 0.442 <α = 0.05, meaning that there was no relationship between angkringan sanitation and the presence of *E. coli* in orange ice.

The Relationship between the Existence of *E. coli* in Ice Cubes and the Presence of *E. coli* in Orange Juice

The proportion of the presence of *E. coli* in orange ice based on the presence of *E. coli* on ice cubes is the most that is ice cubes that are negative for *E. coli* bacteria with orange ice which is also negative for *E. coli* bacteria, by 26 samples (86.7%). It means that there is no relationship between the presences of *E. coli* on ice cubes with the presence of *E. coli* in orange juice ice.

DISCUSSION

The Relationship between Beverage Hygiene Behavior and the Existence of *E. coli* on Orange Ice

Based on the results in table 3, it can be seen that there is a relationship between the behavior of the handlers with the presence of *E. coli* in orange ice in the angkringan Malioboro area. The results of this study are in line with previous studies that there is a personal relationship between the hygiene of the beverage handlers and the presence of coliform bacteria in the orange juice in Tembalang Village food stall.[(6)] This research can be related because there are still many food handlers who have not carried out food hygiene training, with the existence of hygiene training sanitation, then it can train the beverage handlers to understand the requirements of the proper drink handler's behavior to be further applied in beverage processing services in Angkrigan.

In this study there were 6 angkringan that had bad drink handler's behavior with the result of *E. coli* contamination in orange juice. This can be seen from 40 drink handlers; 33 drink handlers do not apply hand washing behavior before processing drinks. Hand washing behavior is one of the most important factors for the handler of the drink, especially after the hand holds the money which is then used to squeeze the oranges. It can

be seen that there are 37 drink handlers who do not wash their hands after handling money. Dirty or contaminated hands can move pathogenic bacteria or viruses from the body, feces or other sources into drinks.[11] In addition, the handler's habit of not changing the washing water of equipment more than 2 times is also one of the factors causing contamination in drinks. Safety of the availability of water for washing food and beverage equipment is one of the efforts to prevent the spread of *E. coli* bacteria.[12] There is still an angkringan with poor drink hygiene behavior due to lack or lack of sanitation hygiene training for the handlers about maintaining personal hygiene when managing drinks and inadequate facilities for beverage handlers. This study is in line with previous research which states there is a relationship between personal hygiene with the presence of *E. coli* bacteria (p-value = 0.035).[13]

The Relationship between *Angkringan* Sanitation and the Presence of *E. coli* in Orange Ice

Angkringan sanitation is a risk factor for the presence of *Escherichia coli* in orange ice. Observations of angkringan sanitation that were observed were equipment sanitation, water sanitation, and place sanitation. Based on the results of sanitation research in Malioboro angkringan, there are 21 angkringan that already have good angkringan sanitation. This showed that some angkringan in Malioboro area already have good angkringan sanitation. However, good angkringan sanitation also does not guarantee the drinks served are free from *E. coli* bacterial contamination.

One of the results of angkringan sanitation is that drinking water sanitation in Malioboro area, in part angkringan traders still use refill water, well water, and PDAM (The Water Company by Government). Clean water is stored in a closed director general to avoid cross contamination. The water used for the process of making drinks has been cooked until cooked and has met the physical requirements, namely odorless, colorless, and tasteless. Water that has been cooked properly or until it boils can kill the bacteria in it, especially *E. coli* bacteria

Other results of angkringan sanitation, namely sanitation equipment in the Malioboro area angkringan is quite good. Equipment such as cups and spoons are stored in a dry and not damp place. Equipment for cooking water or kettles also does not rust. Knives used for cutting grapefruit are not rusty either. At the laundromat, traders use buckets. The average number of buckets used is 3 buckets each used for soaking soap, rinse water, clean water for hand washing. The basic principle of washing food and drinking utensils is the most important is the availability of means of washing equipment by having three parts, namely the washing, cleaning / rinsing and disinfection.

Some observations of the sanitation location of the angkringan in the Malioboro area are partly quite clean from rubbish and pollutants and there is no unpleasant odor. The condition of the angkringan building is also quite safe. The condition of some angkringan wagons is still suitable to be used. As a whole, angkringan in Malioboro area has available sanitation facilities, but there are still many trash bins provided on the premises that are not covered. This research is in line with the previous one which states that there is no relationship between sanitary hygiene conditions with the presence of *E. coli* bacteria p-value = 0.670.[15]

The Relationship of the Existence of *E. coli* on Ice Cubes and the Presence of *E. coli* on Orange Juice

E. coli contamination in ice cubes is a risk factor for Escherichia coli in orange ice. Testing of *E. coli* in ice cubes aims to obtain microbiological quality data and an estimate of the number of bacteria in ice cubes so that it can be known how much the potential danger and safety of products suspected of being contaminated with *E. coli* bacteria. The results of the laboratory test of ice cubes using the MPN method showed that there were 10 samples of ice cubes that were positive for *E. coli* bacteria with 6 samples of orange ice that were negative for *E. coli* bacteria and 4 samples of positive orange ice for *E. coli* bacteria. Whereas from 30 ice cube samples with negative results, there were 4 samples of orange ice with positive results of *E. coli* bacteria and 26 samples of negative orange juice. The results above show that ice cubes with positive results of *E. coli* bacteria do not affect the presence of *E. coli* bacteria in orange juice. This condition occurs because the process of cooking hot water is done so that it can kill all bacteria. *E. coli* can grow at temperatures between 10-40 ° C with an optimal temperature of 37 ° C and die at 60°.[16] *E. coli* bacteria are relatively very sensitive to heat and can be activated at pasteurization temperatures below 100 ° during cooking food and drinks. Warming up at the temperature of the pasteurizer is intended to kill some of the bacteria present in the food and drink. Factors that influence the occurrence of *E. coli* contamination in ice cubes are the water used in its manufacture using raw water which is likely already contaminated with *E. coli* bacteria. Ice cubes have a low temperature so that the activity of pathogenic bacteria can decrease or stop. Another factor that makes the contamination of orange ice in this study is the behavior of the handlers of the drink. This is in line with previous studies that examined the

relationship of the handler's Hygiene drink with the presence of *E. coli* bacteria in fruit ice snacks, which states there is a significant relationship between the conditions of the handlers' Hygiene existence of *E. coli* bacteria on fruit ice snacks p-value = 0.024.17

CONCLUSION

Based on the results and discussion above it can be concluded that there was no relationship between angkringan sanitation and the presence of *E. coli* on ice cubes with the presence of *E. coli* on orange juice. Additionally, there was a relationship between beverage processing behavior with the presence of E. coli on orange ice.

Supervision of angkringan traders and promotion efforts need to implement the good sanitation hygiene behavior for angkringan traders.

REFERENCES

1. MoH-RI. The Regulation of Minister of Health Indonesia No. 492 in 2010 about the Requirements of Water Consumption's Requirements (Peraturan Menteri Kesehatan Republik Indonesia No 492/MENKES/PER/IV/2010 Tentang Persyaratan Kualitas Air Minum, Kementrian Kesehatan). Jakarta: MoH-RI; 2010.
2. BPOM-RI. Food Microbiology Test, Directory of Surveillance and The Promotion of Safety Food and Agency of Drugs and Food Monitoring (Pengujian Mikrobiologi Pangan, Direktorat Survailans dan Penyuluhan Keamanan Pangan dan Bahan Berbahaya, Badan Pengawasan Obat dan Makanan). Jakarta: BPOM-RI; 2008.
3. BPOM-RI. The National Centre of Poisoning Information (Sentra Informasi Keracunan Nasional). Jakarta: BPOM-RI; 2017.
4. MoH-RI. Health Profile of Indonesia in 2016 (Profil Kesehatan Indonesia Tahun 2016). Jakarta: MoH-RI; 2017.
5. MoH-RI. The Regulation of Minister of Health Indonesia No. 942 in 2003 About the Guidelines of Hygiene Sanitation of Street Food. Jakarta: MoH-RI; 2003.
6. Isnawati. The Association of Hygiene Sanitation Presence of Coliform Bacteria in Orange Juice at Food Shop, Tembalang Villlage, Semarang (Hubungan Higiene Sanitasi Keberadaan Bakteri Coliform Dalam Es Jeruk di Warung Makan Kelurahan Tembalang Semarang). Jurnal Kesehatan Masyarakat. 2012;1(2).
7. MoH-RI. Regulation of the Minister of Health of the Republic of Indonesia No. 1096 / Menkes / PER / VI / 2011 About Jasaboga Sanitation Hygiene (Peraturan Menteri Kesehatan Republik Indonesia No. 1096/Menkes/PER/VI/2011 Tentang Hygiene Sanitasi Jasaboga). Jakarta: MoH-RI; 2011.
8. Sofiyanto HO, et al. Relationship of Environmental Sanitation, Personal Hygiene with the Number of Escherichia coli Bacteria in Damiu in Diponegoro University Area, Tembalang (Hubungan Sanitasi lingkungan, Personal Higiene dengan Jumlah Bakteri *Escherichia coli* pada Damiu di Kawasan Universitas Diponegoro Tembalang). Jurnal Kesehatan. 2016.
9. Praditina A, Yusniar HD, Hanan LD. The Relationship of Sanitation Hygiene with *Escherichia coli* Contamination in Street Food Snackers in Pendrikan Lor Elementary School Semarang (Hubungan Hygiene Sanitasi dengan Kontaminasi *Esherichia coli* pada Jajanan Pedagang Kaki Lima di Sekolah Dasar Kelurahan Pendrikan Lor Semarang). Jurnal Kesehatan Masyarakat. 2017;5(5).
10. Arbany NA. *Angkringan*: Democracy Arena of Urban Communities with Javanese Symbolism [Case Study: Three Angkrigan in Jakarta] (Angkringan: Arena Demokrasi Masyarakat Perkotaan dengan Simbolisme Kejawaan [Studi Kasus : Tiga Angkrigan di Jakarta]) Undergraduate Thesis. Jakarta; 2013.
11. Cahyaningsih CT, Kushadiwijaya H, Tholib A. Relationship of Sanitary Hygiene and Behavior of Food Handlers with Bacteriological Quality of Food Equipment in Food Stalls (Hubungan Higiene Sanitasi dan Perilaku Penjamah Makanan dengan Kualitas Bakteriologis Peralatan Makanan di Warung Makan). Berita Kedokteran Masyarakat. 2009;25(4):180-188.
12. Notoatmodjo S. Health Behavioral Sciences (Ilmu Perilaku Kesehatan). Jakarta: Rineka Cipta; 2014.
13. Hadi B, Elizabeth B, Rima S. Household Ice Bacteriological Test used by Beverage Sellers in Lubuk Buaya Market, Padang City (Uji Bakteriologis Es Batu Rumah Tangga yang digunakan Penjual Minuman di Pasar Lubuk Buaya Kota Padang). Jurnal Kesehatan Andalas. 014;3(2).
14. Budiman I. Washing Practices Washing Practices with the Number of Germs in Cutlery at Rames Rice Stalls on Jalan Ngesrep Timur and Jalan Prof. Soedarto SH Semarang (Praktek Pencucian Praktek Pencucian dengan Jumlah Kuman pada Alat Makan di Warung Makan Nasi Rames di Jalan Ngesrep Timur dan Jalan Prof Soedarto SH Semarang). Jurnal Kesehatan Masyarakat. 2010;2(1):50-60.

15. Kurniadi Y, Saam Z, Afandi D. *E.coli* Bacteria Contamination Factors in Snack Foods in the Area of Elementary School Canteen, Bangkinang District (Faktor Kontaminasi Bakteri *E.coli* pada Makanan Jajanan di Lingkungan Kantin Sekolah Dasar Wilayah Kecamatan Bangkinang). Jurnal Ilmu Lingkungan. 2013;7(1):28-29.
16. Wisnu L, Kawiji, Atmaka W. Effect of Temperature and Pasteurization Time on Changes in Total Phenol Levels in the Field of Ready to Drink and Kinetics of Changes in Total Phenol Levels During Storage (Pengaruh Suhu dan Waktu Pasteurisasi terhadap Perubahan Kadar Total Fenol pada Wedang Uwuh *Ready to Drink* dan Kinetika Perubahan Kadar Total Fenol Selama Penyimpanan). Jurnal Teknologi Hasil Pertanian. 2015;VIII(2):71-74.
17. Atmiati WD. Factors Related to the Existence of *Escherichia coli* Bacteria in Fruit Ice Snacks for Sale Around the Center of Temanggung City Center (Faktor-faktor yang Berhubungan dengan Keberadaan Bakteri *Escherichia coli* pada Jajanan Es Buah yang Dijual di Sekitar Pusat Kota Temanggung). Jurnal Kesehatan Masyarakat. 2012;1(2): 1-7.