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Evaluation of Total Plate Count (TPC) on Eating Utensils of Lontong Kupang Vendors in Surabaya: A Study on Health and Hygiene

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ABSTRACT
Foodborne diseases can be influenced by many factors. One of the causes of foodborne diseases is the contact of food with utensils containing microorganisms. The total plate count on the utensils used by lontong kupang vendors in Surabaya exceeds the standard quality, due to only having one sink for washing utensils and the open storage of these utensils. The aim of this study is to determine the Total Plate Count of eating utensils used by lontong kupang vendors in Surabaya in 2024. This is a descriptive study with a cross-sectional approach. The objects used in the study are eight lontong kupang vendor stands. The research sample consists of 16 utensils, including plates and spoons, tested for Total Plate Count, and clean water tested in the laboratory for microbiological parameters, including total coliform bacteria and E. coli. Data analysis is conducted descriptively based on laboratory test results and observation/checklist sheets. The study results show that the Total Plate Count on utensils at 56% of the eight stands met the requirements. The physical quality of clean water met the standards, but microbiologically, the total coliform and E. coli parameters did not meet the standards. The washing facilities were rated as adequate (60%). The cleanliness of eating utensils at the eight lontong kupang stands was categorized as good (75%). The study concludes that the Total Plate Count of eating utensils used by lontong kupang vendors in Surabaya does not meet the requirements. It is recommended that lontong kupang vendors store their utensils in closed containers, and the management should regularly drain water tanks and check the water distribution system

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INTRODUCTION

The cleanliness of eating utensils is one of the factors that contribute to the occurrence of foodborne diseases. Foodborne illnesses can happen due to the consumption of food contaminated by pathogenic bacteria. Germs can grow and multiply on utensils that are not thoroughly cleaned. Washing utensils with running water, soap, and a clean sponge can reduce the presence of germs on them (Cholid, Darundiati, and Sulistiyani, 2022). In addition to the washing process, the quality of the water used should also be considered, as using contaminated water for washing increases the risk of germs on utensils. Water contamination may occur due to pipe leaks, causing the water used to contain coliform bacteria and E. coli (Tumiwa, Joseph, and Akili, 2020).

Eating utensils that have undergone the washing process should be dried by draining them on a sterile and rust-resistant rack. The storage process also affects the cleanliness of the utensils. If utensils are not stored in a closed container, dirt may adhere to them. According to the hygiene standards for eating utensils, based on microbial

count parameters, the standard set by the Indonesian Minister of Health Regulation No. 1096 of 2011 on Food Service Sanitation Hygiene is 0 (zero)/cm².

Food handlers are also a factor that affects the presence of microbial counts on eating utensils. Food handlers with poor personal hygiene can result in food products that contain bacteria (Nasution, 2020).

Efforts to improve personal hygiene can be made by washing hands during food preparation and after handling food. Additionally, checking the condition of fingernails is important, as long nails can lead to contamination of eating utensils (Musfirah, Rahayu, and Agustin, 2022).

Surabaya is a city known for its rich culinary tourism. This "City of Heroes" is frequently visited by tourists. One of Surabaya's signature dishes is lontong kupang, a meal that can easily be found in every corner of the city. This dish is popular due to its relatively affordable price.

According to previous research conducted by Suryani, Paslini, and Suyitno (2022), there is a correlation between personal hygiene and the storage of eating utensils with the presence of microbial counts on the utensils. Studies related to Total Plate Count (TPC) on eating utensils are still rare. Therefore, further research on Total Plate Count on eating utensils is needed.

The purpose of this study is to determine the Total Plate Count (TPC) on eating utensils, assess the quality of clean water both physically and microbiologically using Total Coliform Bacteria and E. Coli parameters, evaluate the washing facilities for eating utensils, and assess the cleanliness of eating utensils. This assessment includes several variables such as the condition of the utensils, the washing process, storage practices, and the personal hygiene of lontong kupang vendors.

RESEARCH METHOD

This study employs a descriptive research design with a cross-sectional approach. The population of this research consists of all lontong kupang vendor stalls, totaling 15 food stands. The samples selected for this study include 8 food stands chosen through purposive sampling, consisting of 16 pieces of eating utensils, including plates and spoons, along with samples of clean water.

The Total Plate Count (TPC) examination on eating utensils was conducted using the pour plate method. The agar medium will be incubated for 2 × 24 hours at a temperature of 37°C, after which colony counting will be performed on the petri dishes containing between 30 and 300 colonies.

Data analysis was conducted descriptively based on the laboratory examination results and observation sheets to describe the cleanliness of the eating utensils.

RESULT AND DISCUSSION

Table 1
Total Plate Count Examination of Eating Utensils at 8 Lontong Kupang Vendor Stalls in Surabaya, East Java, 2024

Sample Types	Result				Total	
	Meets the Requirements		Does Not Meet the Requirements			
	n	%	n	%	N	%
Plate	4	25	4	25	8	50
Spoon	5	31	3	19	8	50
Total	9	56	7	44	16	100

The results of the laboratory examination of the Total Plate Count (TPC) on eating utensils do not meet the requirements because some utensils had microbial counts greater than zero. The presence of microbial counts on utensils that exceed the acceptable limits can lead to contamination of food, potentially resulting in the transmission of foodborne diseases (Assagaf, Ohorella, and Upuolat, 2023). Based on the field observations, several factors were identified that may contribute to the presence of Total Plate Count on the eating utensils of lontong kupang vendors, including the open storage conditions of the utensils. Open storage of eating utensils can result in contamination from dust, vectors, and pests.

Based on field observations, it was also found that the eating utensils that had been washed were dried using a cloth that was used to wipe the hands of the vendors. The use of dirty, dusty, and damp cloths can contribute to the existence of Total Plate Count on the eating utensils (Yunatiasri and Irianto, 2023). Efforts to reduce the presence of bacteria on eating utensils caused by the use of such cloths include regularly replacing the cloths after use to ensure they are clean and do not cause secondary contamination on the utensils that will be used (Rochmawati, Rachmaniyah, and Rusmiati, 2021).

Table 2
Assessment of Clean Water Quality for Lontong Kupang Vendors in Surabaya, East Java, 2024

Assesment Component	**Assessment Result**
The distribution of water used is delivered through pipes/taps.	Meets the Requirements
smell of water	Meets the Requirements
color of water	Meets the Requirements

The clean water used by lontong kupang vendors is sourced from the regional water utility

company (PDAM). The water used for washing the eating utensils is odorless, colorless, and delivered through piped channels. These conditions comply with the applicable regulations, specifically the Indonesian Minister of Health Regulation No. 2 of 2023, which states that clean water quality should be odorless and colorless.

Table 3
Microbiological Testing of Clean Water Samples From Lontong Kupang Vendors In Surabaya, East Java, 2024

	Parameters	**Test Results**	**Criteria**
1.	Total Bakteri *Coliform*	30 CFU/100ml	Does Not Meet the Requirements
2.	*Escherichia Coli*	4 CFU/100 ml	Does Not Meet the Requirements

The laboratory test results indicate that the microbiological quality of the clean water exceeds the maximum levels established by the Minister of Health Regulation No. 2 of 2023, as the water used for washing contains coliform bacteria and *E. coli*. These findings are consistent with research conducted by Jirna (2022), which found that out of 15 samples of clean water, 100% met the physical quality requirements; however, the microbiological quality did not meet the standards, as 100% of the clean water samples contained coliform bacteria and 27% tested positive for *E. coli*.

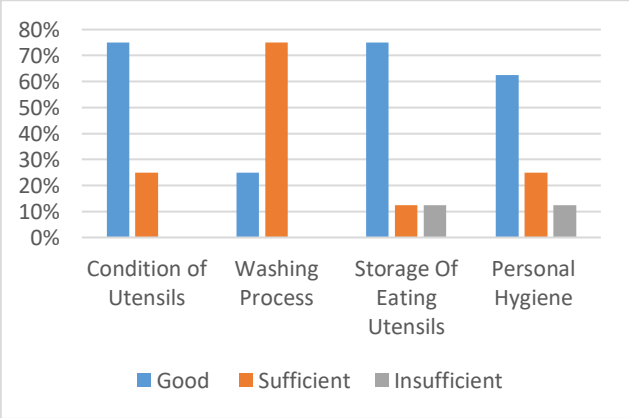
The presence of coliform bacteria in clean water indicates that the water has been contaminated by feces (Saputri and Efendy, 2020). The presence of bacteria in clean water sourced from the regional water utility (PDAM) and delivered through piped systems can occur due to pipe leaks. This can be attributed to corrosion in the piping, damage to pipes from sharp objects, or inadequate installation (Novalinda, 2020). Water is a crucial substance in the washing process for utensils and handwashing, and poor water quality can lead to health issues while serving as a carrier for the transmission of bacteria such as *E. coli* and *Salmonella spp.* (Alamgir, Khan, and Aslam, 2023).

Table 4
Results Of The Cleanliness Assessment Of Eating Utensils At 8 Lontong Kupang Vendor Stalls In Surabaya, East Java, 2024

No.	Assessment Category	Total	Percentage
1.	Baik	6	75%
2.	Cukup	2	25%
3.	Kurang	0	0
	Total	8	100%

The results of the cleanliness assessment of the eating utensils reflect the total score from the variables of equipment condition, washing process, storage practices, and personal hygiene. Overall, the lontong kupang vendors received a "good" category; however, there are still aspects that have not been met, particularly concerning the washing process variable.

Table 5
Results Of The Observation Of Cleanliness Assessment Of Eating Utensils At 8 Lontong Kupang Vendor Stalls By Variable



The washing facilities provided by the management for the cleaning of eating utensils used by the lontong kupang vendors received a "sufficient" category due to the availability of only one washing basin and the absence of hot water. According to Minister of Health Regulation No. 2 of 2023, the requirements for washing facilities consist of three basins, each serving distinct functions for rinsing, soaping, and rinsing again. Research conducted by Sakinah, Amir, and Muin (2020) found that washing utensils without utilizing three separate washing basins can lead to the presence of microbial counts on the eating utensils.

The availability of hot water for washing eating utensils serves to dissolve fats that adhere to the utensils (Suparmono, Dihansih, and Fulazzaky, 2020). The use of hot water can kill most microorganisms because bacteria have a high sensitivity to temperature and will die at temperatures above 65°C (Pratama and Rachman, 2020).

1. Condition of Utensils

The utensils used by the vendors are made from food-grade materials. The spoons used by the lontong kupang vendors are made from waterproof and rust-resistant materials, while the plates are made from ceramic. Rust-resistant eating utensils are easy to clean (Nissa et al., 2021). The physical condition of the utensils used by the lontong kupang vendors shows that 65% are in good condition, being unbroken, uncracked, and not warped. Defective utensils may not be thoroughly

cleaned, leading to the presence of bacteria on the eating utensils. This statement is supported by research conducted by Seran Tae, Sahdan, and Landi (2023), which found a significant relationship between the physical condition of utensils and the presence of bacteria on them.

2. Washing Process

The washing process of eating utensils significantly impacts the presence of microbial counts on them. Inadequate cleaning can leave food residues, grease, and various bacteria on the utensils (Christiva, Rusmiati, and Setiawan, 2020). The lontong kupang vendors wash their utensils using running water, dish soap, and sponges. However, 50% of them only perform the washing process when the stall is about to close, leading to a buildup of dirty utensils, which can attract vectors and pests. This statement aligns with research conducted by Setiana and Ulfa (2020), which found that scattered food residues can lead to a high density of flies. Food remnants should be promptly cleaned and placed in airtight containers to prevent odors that attract rodents and cockroaches (Supardin, 2021).

Approximately 75% of the vendors do not soak their utensils during the washing process. Soaking the eating utensils is intended to facilitate the cleaning of food residues from their surfaces. This statement is supported by research conducted by Rulen and Intarsih (2021), which found that soaking eating utensils makes it easier to remove dirt adhering to them.

3. Storage Of Eating Utensils

Based on field observations, some lontong kupang vendor stalls were found to store their eating utensils in an open manner. The storage of eating utensils contributes to their cleanliness. Research conducted by Maunah and Ulfa (2020) indicated that the manner of utensil storage has a tenfold impact on their cleanliness. Therefore, eating utensils should be stored in closed containers to protect them from potential contamination from various sources. Eating utensils must be placed and stored in a hygienic and dry condition (Khairi et al., 2021). The drying technique of utensils also contributes to the microbial count; thus, drying must be performed correctly to reduce moisture that can support the growth of microorganisms (Pakdel, Olsen, and Bar, 2023).

4. Personal Hygiene

The personal protective equipment used by lontong kupang vendors includes aprons. However, before the food processing, it was observed that some vendors do not wash their hands and some do not cover their mouths and noses when coughing or sneezing. Human hands can cause contamination of the eating utensils they touch. Contamination of eating utensils can occur through the hands of vendors who do not wash them properly. Vendors with long nails are 2.3 times more likely to be infected with parasites than those with short nails (Lette et al., 2022). To minimize the risk of contamination of food utensils due to the transfer of germs from the vendors' hands, it is essential to wash hands with soap and running water (Nakoe, Ayini, and Mohamad, 2020).

Another effort to minimize the contamination of eating utensils caused by food vendors is to enhance their knowledge and attitudes. This is crucial because vendors significantly influence the cleanliness of eating utensils, as they are directly involved in the food processing activities.

According to Kadam, Ingale, and Shinde (2022), one way to enhance knowledge about food safety and hygiene practices is by providing booklets containing information related to food safety and hygiene practices. In addition to distributing booklets, there are further efforts, such as implementing food safety training programs for vendors to improve the safety of the food they produce and minimize health issues for consumers (Ahmed et al., 2024).

CONCLUSION

Based on the research findings, it can be concluded that the total plate count on the plates and spoons does not meet the required standards. The physical quality of the drinking water meets the standards, while the microbiological quality of the drinking water exceeds the maximum quality threshold. The washing facilities for the eating utensils received a "good" category, and 6 out of 8 lontong kupang vendor stalls were categorized as "good."

RECOMMENDATIONS

It is recommended that vendors store their eating utensils in closed containers and avoid cleaning the washed utensils with towels. The management is advised to regularly drain the water reservoir and check the water distribution system. Other researchers are encouraged to conduct studies related to the quality of drinking water using parameters that have not yet been investigated, such as chemical parameters. Relevant authorities are advised to carry out monitoring and evaluation through routine sampling.

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