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Original Article

Relationship between Waste Management and the Level of Fly Density at Kadompe Restaurants in Luwuk City

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ABSTRACT

The existence of waste can have an impact on public health because it becomes a means and source of transmission of various disease agents. The indirect effect of waste on health can be due to vector-borne disease agents that multiply in the waste. Buried waste can be used by flies as a breeding ground. This study aims to analyze the relationship between waste management and the level of fly density at Kadompe Restaurants in Luwuk City. This was an analytic survey with a cross-sectional design, namely by analyzing the relationship between waste management and the level of fly density at Kadompe Restaurants. The study population was all Kadompe Restaurants located on Maahas Coast in Luwuk City, Central Sulawesi Province as many as 33 restaurants. The study samples involved 26 restaurants which were selected using purposive sampling based on certain consideration, namely restaurants that were still active. The instrument for measuring Fly Density was a fly grill by referring to the Regulation of the Minister of Health of the Republic of Indonesia No. 50 of 2017. Data on waste management included sorting, container, transportation that were collected by direct observation at the Food Stall based on the observation sheet provided in accordance with Law no. 18 of 2008 concerning Waste Management. Data were analyzed using chi-square test with $\alpha \leq 0.05$. The results of the study statistically showed the values regarding waste sorting (p=0.382; RP= 1.071; 95% CI=0.936-1.227), waste container (p=0.713; RP=1.045; 95% CI=0.958-1.141), and waste transportation (p=0.234; RP=0.909; 95% CI=0.754-1.096). Based on the results of the study, it can be concluded that there was no relationship between waste sorting, container and transportation with the level of fly density at Kadompe Restaurants in Luwuk City. The Agency for the Environment (DLH) should be able to transport waste every day from Kadompe Restaurants located on Maahas coast in Luwuk City.

Keywords : Waste Management, Fly Density, Restaurant.

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INTRODUCTION

Kadompe Restaurants which arep located on the coast of Maahas Beach are a favorite sites for the people of Luwuk City and tourists visiting Luwuk City because of their affordable price. Based on the results of initial observations made at 26 Kadompe Restaurants, there is still a lot of waste piled up due to the activities carried out at the restaurants. Piles of waste with unpleasant smell is a good place for vectors of disease agents to breed, such as flies. Flies like places with high humidity condition and this will affect fly density. Waste is liked by flies and is a breeding ground for flies because the trash can is damp, smelly and dirty[1].

Flies are endophilic synanthropic insects that are closely related to humans and live in human dwellings [2]. Flies from the genus Musca, Chrysomya, and Sarchophaga, members of their species, live around humans[3]. House flies (Musca domestica L.) and green

flies (Chrysomya megachepala L.) are the two most common types of flies found around residential areas, trash cans, hospitals and other dirty areas in the tropics[4]. Flies play a role in decomposition, as predators, parasites, and some act as carriers of disease agents.

Flies are considered quite dangerous for humans and other animals because one fly can carry more than 100 pathogens[5]. Flies can transmit diarrheal disease agent of Escherichia coli[6,7]. In addition, flies can also transmit cholera, typhus, dysentery, and other disease agents[8,9]. Flies transmit disease agents by perching on food and contaminating food through feces, saliva, and vomit[10]. Foodstuffs that are sold are very susceptible to the presence of flies which can affect the quality of food ingredients.

The presence of flies in a certain place indicates its quality standard so that high fly density must be controlled immediately. It is impossible to completely eradicate flies, but to control them to a non-harmful population. Standards for Environmental Health Quality for vectors and disease-carrying animals consist of species, density and breeding habitat. Breeding habitat is the site where vectors and disease-carrying animals develop in their immature period. The quality standard value for fly vector is <2 flies to create a healthy environment[11]. A good measurement of fly density should be made by using a light yellow fly grill[12]. Measuring fly density using a fly grill is based on the nature of the flies which tend to land on edges or places with sharp angles[8].

Flies are often found around restaurants due to piles of waste. Restaurants are one source of waste, both food waste and non-food waste. In the food service sector, waste generation can originate from the consumption stage, which is food leftovers from consumers or other waste. Everyone involved in the management of household waste and household-like waste is obliged to reduce and manage waste in an environmentally sound manner. There are several poor waste management carried out by restaurant managers that are not in accordance with Law no. 18 of 2008 concerning Waste Management, namely regarding waste sorting, waste container and waste transportation[13].

A study conducted by Kasiono, et.al. (2016) at a restaurant located in the Tuminting Market, Manado City, showed that there was a relationship between waste management and the level of fly density. Fly density is closely related to poor environmental sanitation[14]. Based on the study conducted by Wardaningrum (2019), it was revealed that there was a relationship between the condition of the trash can and fly density at the canteen of State SHS with RP=9.5;CI95%=1.014-88.966)[15]. Meanwhile, the result of a study conducted at Kadompe Restaurant in Luwuk City showed no relationship between waste management and the level of fly density.

This study aims to analyze the relationship between waste management and the level of fly density at Kadompe Restaurants located on Maahas Coast.

METHOD

This was an analytical survey with a cross-sectional design to determine the relationship between waste management and the level of fly density at Kadompe Restaurants. The study sites were the Kadompe Restaurants located on Maahas coast in Luwuk City. The study was conducted in May-July 2022. The study population involved all Kadompe Restaurants located on Maahas coast in Luwuk City, totaling 33 restaurants. 26 restaurants as study samples were selected using purposive sampling technique according to certain consideration namely restaurants that were still active. The instrument used to assess fly density was a fly grill placed in a trash can, the number of flies that perched was counted for 30 seconds. Each trash can was assessed 10 times every 30 seconds. Out of 10 calculations, the 5 highest calculations were taken and averaged by referring to the Regulation of the Minister of Health of the Republic of Indonesia No. 50 of 2017 concerning vector control[11]. Fly density was considered to be high if the number of flies perched on the fly grill did not meet the quality standard of <2 flies. Waste management which included waste sorting, container, and transportation was conducted thorugh direct observation at Kadompe Food Stalls based on the observation sheet provided in accordance with Law no. 18 of 2008 concerning waste management[13]. Waste sorting was considered Eligible if organic waste and inorganic waste were separated. The waste container was considered eligible if the container was made of water-resistant material, did not corrode easily, had a lid and was tightly closed. Waste

transportation was considered eligible if it was carried out no more than 24 hours and all the waste was transported based direct observation by enumerators. Data were analyzed using univariate statistical test, which were further continued with bivariate test using chi-square test with the significance value of $p \leq 0.05$ [16].

RESULTS

Table 1. Relationship between Waste Sorting and Fly Density.

Sorting	Fly Density				N	%	p-value	RP (95%CI)
	High		Low					
	N	%	N	%				
NE	14	53.8	1	3.9	15	57.7	0.382	0.936-1.227
E	11	42.3	0	0	11	42.3		
Total	25	96.1	1	3.9	26	100		

Information: *NE: Non-eliaible. E: Eliaible*

Statistically, the chi square test showed no relationship between waste sorting and fly density with p=0.382. The result of the risk calculation obtained RP=1.071 (95% CI 0.936-1.227) which indicated that non-eligible waste sorting had a risk of 1.071 times resulting in a high fly density compared to eligible waste sorting. Although there was no statistical relationship, the bivariate analysis table (Table 1) revealed that non-eligible waste sorting had a higher number of fly density compared to eligible waste sorting.

Table 2. Relationship between Waste Containers and Fly Density.

Container	fly density				N	%	p-value	RP (95%CI)
	High		Low					
	N	%	N	%				
NE	22	84.6	1	3.9	23	88.5	0.713	0.958-1.141
E	3	22.5	0	0	3	11.5		
Total	**25**	**96.1**	**1**	**3.9**	**26**	**100**		

Information: *NE: Non-eligible, E: Eligible*

Statistically, the chi square test showed no relationship between waste container and fly density with p=0.713. The result of the risk calculation obtained RP=1.045 (95% CI 0.958-1.141) which indicated that non-eligible waste container had a risk of 1.045 times resulting in a high fly density compared to eligible waste container. Although there was no statistical relationship, the bivariate analysis table (Table 2) revealed that non-eligible waste container had a higher number of fly density compared to eligible waste container.

Table 3. Relationship between Waste Transportation and Fly Density.

Transportation	Fly Density				N	%	p-value	RP (95%CI)
	High		Low					
	N	%	N	%				
NE	15	57.7	0	0	15	57.7	0.234	0.754 -1.096
E	10	38.4	1	3.9	11	42.3		
Total	**25**	**96.1**	**1**	**3.9**	**26**	**100**		

Information: *NE: Non-eligible, E: Eligible*

Statistically, the chi square test showed no relationship between waste transportation and fly density with p=0.234. The result of the risk calculation obtained RP=0.909 (95% CI 0.754-1.096) which indicated that non-eligible waste transportation had a risk of 1.909 times resulting in a high fly density, Although there was no statistical relationship the bivariate analysis table (Table 3) revealed that non-eligible waste transportation had a higher number of fly density compared to eligible waste transportation.

DISCUSSION

Waste that is not managed properly causes environmental and health problems in humans, such as aesthetic problems, environmental pollution, and an increase in vector-borne diseases such as those transmitted through flies. There should be proper waste management which includes waste sorting, container and transportation so that it does not become a breeding ground for flies. The high density of flies in restaurants is not only caused by improper waste management, but it can also be caused by various types of food processed, such as fish-based dishes. Types of food such as grilled fish, fish sauce, and others which have fishy smell can invite flies to perch on the food. In addition, food processing places such as kitchens must be kept clean, so as not to cause high fly density.

Relationship between Waste Sorting and Fly Density at Kadompe Restaurants. The Waste sorting referred to in this study was separation of organic and inorganic waste at Kadompe Restaurants. According to Law no. 18 of 2008 concerning waste management, waste management activities involve waste sorting through separation of organic waste and inorganic waste. Organic waste refers to waste in the form of food scraps, vegetables and fruits. Meanwhile, inorganic waste refers to waste in the form of plastic, drink bottles, cans and others[13].

Based on the result of a study conducted at Kadompe Restaurants on Maahas Coast in Luwuk City, it was found that 14 restaurants (53.8%) had non-eligible waste sorting with a high level of fly density. This was due to some restaurant owners did not separate organic and inorganic waste

Waste in the form of leftover vegetables, leftover food, and fish bones was usually separated and then thrown into the sea, while waste consisting of plastic food, drink bottles, unused leftover food ingredients and dry leaves was wrapped in plastic to make it easier for restaurant managers to throw it in the trash before being transported by waste collectors. There were other restaurants that did not perform waste sorting, where organic and inorganic waste were combined. This led to waste mixing and decomposition which further invited flies to look for food in that place. Based on the Regulation of the Minister of Public Works Number 03/PRT/M/2013, waste may not be mixed again after waste sorting and collection because this can be a means of breeding for vectors such as flies[17].

The study finding is in line with a study conducted by Octavianingsih (2022) concerning the Relationship between Waste Management and fly density at Pasar Kebayoran Lama Food Stalls, South Jakarta, which showed that there was no relationship between waste sorting and fly density with a p-value of 0.394[18]. Furthermore, a study conducted by Syahputro (2018) concerning the relationship between waste management and fly density in the temporary shelters (TPS) of Madiun City, found that the high density of flies could be due to waste management that tended to have less awareness to waste sorting[19].

Relationship between Waste Containers and Fly Density at Kadompe Restaurants. Waste container referred to in this study was the waste container provided by the managers of Kadompe Restaurants. According to Law no. 18 of 2008 concerning waste management, waste management activities involve waste containers, trash containers which should be made of waterproof material, not easily corroded, have a cover, and be tightly closed. Trash cans that are not covered can make it easier for insect vectors such as flies to come and become a breeding ground for them[13].

Based on the results of the study, it was shown that there was no relationship between waste container and the level of fly density at Kadompe Restaurants. According to observations regarding waste containers, some restaurant managers used plastic trash cans, plastic bags, used paint buckets, cardboard boxes, used fish boxes, and rubber bins, some of which had covers and were tightly closed. However, most of trash cans had no covers and were not covered, thus triggering the presence of flies in such sites. According to the Decree of the Minister of Health of the Republic of Indonesia Number (1098/Menkes/SK/VII/2003), trash cans must be made of water-resistant materials, not easily corroded, have a cover and leftovers of fast-decaying food should use sepcific plastic bags[20].

Based on the results of observation, the high density of flies was caused by the use of non eligible trash containers by the Kadompe Restaurant managers. Most of trash containers used did not have a cover and were not closed, which is one of the triggers for the presence of

flies in such sites. In contrast, eligible waste containers had a low fly density because the restaurant managers put proper waste containers that were watertight, not easily corroded, had a closed lid and were tightly closed.

The study finding is not in line with a study conducted by Octavianingsih (2022) on the Relationship between Waste Management and Fly Density at Pasar Kebayoran Lama Food Stalls, South Jakarta, which showed that there was a relationship between waste containers and fly density with a p-value of 0.033[18]. Furthermore, a study conducted by Afrilia (2017) on relationship between house conditions and fly density around the land showed that waste disposal facilities that were not watertight and not closed could result in a high density of flies[21]. A study conducted by Putri and Dewi (2017) further revealed that 12 pecel tumpang food stalls in Kediri City had a poor trash condition because the trash cans owned by sellers did not have lids, there was no separation of types of waste, and some used plastic bags for waste storage. Open trash can will make it easier for flies and other insects to infest it, besides that it will also cause an unpleasant smell that disturbs the humans live around[22].

A study conducted by Novitry et.al. (2021) showed that there was a significant relationship between trash cans and the level of fly density with a p value of 0.03. The trash cans in several food stalls did not meet the health requirements, since they were not watertight, not covered, dry and wet waste were not separated, and were full of flies because the waste had decomposed. There were also food stalls that didn't have trash cans or the trash was placed in plastic and placed in a certain place continually until there were piles of waste[23].

Relationship between Waste Transportation and fly density at Kadompe Restaurants. The Waste transportation referred to in this study was the transportation of waste at Kadompe Restaurant location carried out by the Environmental Service. According to Law no. 18 of 2008 concerning waste management, waste transportation must be carried out every day or no more than 24 hours and all waste must be removed so that there are no scattered piles of waste that can invite the presence of flies[13].

Based on the results of the study, there was no relationship between waste transportation and the level of fly density at Kadompe Restaurants. According to the results of observations, most restaurants did not transport waste every day and sometimes waste was not completely collected or there was still some left over. Waste transportation schedule was not appropriate for only 3 times a week, and sometimes was late. This situation caused a lot of accumulation of organic waste from the restaurants which can cause unpleasant smell, resulting in a high level of fly density.

CONCLUSION

Based on the results of the study it can be concluded that there was no relationship between waste sorting, container and transportation of with the level of fly density at Kadompe Restaurants on Mahaas Coast. DLH (Environmental Service) agencies should transport waste every day at Kadompe Restaurants located on Maahas coast in Luwuk City.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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