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Regional Case Study

The Relationship Between Food Waste Management and Fly Density Level at Padang Restaurants in Tembalang District, Semarang City

Sekar Sandya Paramitha[1], Sulistiyani[1*], Nikie Astorina Yunita Dewanti[1], Suhartono[1]

[1] Faculty of Public Health, Diponegoro University, Jl. Prof. Soedarto, SH, Semarang, Indonesia 50275
* Corresponding Author, email: sulistiyani@live.undip.ac.id

Abstract

Padang restaurants have become one of the favorite places for residents of Tembalang District because of the distinctive taste of the food they serve. However, many Padang restaurants have not managed their waste properly. This study aimed to determine the relationship between waste management and fly density levels at Padang restaurants in the Tembalang District. This was an analytical study with a cross-sectional design. The study was conducted from October to December 2023. The research sample consisted of 45 Padang restaurants selected using total sampling technique. The results show that most food waste comes from customer plate waste (60%) with rice being the most wasted food type (37.8%). The majority of restaurants have a relatively poor waste sorting category (68.9%) but mostly the waste containers meets the requirements (75.6%). Fly density levels in Padang restaurants mostly are still categorized as high (53.5%). Waste containers is associated with fly density levels (p=0.030), while waste sorting is not associated with fly density levels (p=0.057). It could be concluded that waste containers without lids with insufficient capacity are associated with fly density levels at Padang restaurants in Tembalang District.

Keywords: Fly density; food waste; restaurant; vector; waste management.

1. Introduction

Padang restaurants have become one of the leading businesses in the food sector because they serve dishes with a distinctive taste from various authentic Padang spices that are not easily replicated by other types of food (Andriyanty et al., 2020). Padang restaurants are known for the variety of food choices available. Typically, Padang restaurants offer at least ten types of side dishes that can be chosen by customers (Kamelia et al., 2023). The abundance of these choices may lead to an increase in food waste, whether it's from unused food ingredients or food that can no longer be consumed again. Food waste has become one of the environmental and social problems experienced today. The Indonesian Ministry of Environment and Forestry stated in 2018 that 44% of the total waste in Indonesia is food waste (Bappenas, 2021). Data from the National Waste Management Information System (SIPSN) in 2022 shows that Semarang City has the highest annual waste generation in Central Java Province, amounting to 431,085.22 tons. It was also found that food waste is the most commonly discarded type of waste, accounting for 60.79% (Sistem Informasi Pengelolaan Sampah Nasional, 2020). Food waste has the characteristic of rapid

decomposition due to the presence of organic matter. This decomposition process can lead to the emission of unpleasant odors and moisture around the food waste storage areas. Research conducted by Andriani (2021) found a significant relationship between waste disposal facilities and fly density (p=0.0001). Improper waste disposal sites tend to have high fly densities, as the scattered waste around this locations serves as a magnet for flies to come. This condition is influenced by the tendency of flies to choose habitat locations with a high concentration of decomposing organic matter.

Research conducted by Andriani (2021) stated a significant relationship between waste disposal facilities and fly density in restaurants (p=0.0001). The decomposition of food waste generates odor and moisture, which tend to attract flies. This condition can lead to an increase of fly populations as the decomposing food becomes a food source and suitable environment for flies to breed (Trianto et al., 2020). High levels of fly density in restaurants can pose health risks to their employees or customers due to the potential of flies to transmit bacteria or viruses from contaminated surface to the food served inside restaurant, thereby increasing the likelihood of foodborne illnesses (Kadir et al., 2022). Flies typically move from dirty areas, contaminating the areas they visit, including the food served in restaurants. This condition makes flies a vector for foodborne diseases that can spread various harmful microorganisms, such as bacteria or viruses, to health. This is due to flies' tendency to consume feces and other organic matter and their ability to adapt and live alongside humans (Andiarsa, 2018). Food or beverages touched by flies can potentially be contaminated by microorganisms emitted through the flies' mouths. If someone consumes contaminated food or beverages, it can lead to illness, including diarrhea (Novitry et al., 2021). Research by Yanti, Ediana, and Rizki (2018) proved a significant relationship between fly density and the incidence of diarrhea (p=0.001). It was found that moderate fly density levels have a seven times greater potential for diarrhea incidence compared to low fly densities. A preliminary study in several Padang restaurants in Tembalang District showed that not many restaurants manage their waste, such as the absence of waste sorting among types. The containers used also do not meet the requirements, with many containers lack of lids. Although no health impacts were found on restaurant employees, there were fly vectors present around the restaurant area, which could potentially contaminate the food or beverages served.

Data from the Central Statistics Agency of Semarang City in 2020 shows that there are 151 restaurants in Tembalang District (Badan Pusat Statistik , 2020). The high number of food businesses in Tembalang District raises concerns about the high amount of food waste they produce. Considering the routine activities carried out by Padang restaurants, which involve food preparation, the probability of food waste generation tends to increase. Therefore, this research aims to investigate the relationship between waste management and fly density level at Padang restaurants in Tembalang District. Through this research, this study tends to understand and provide some insights about the effective waste management practices and their implications for controlling the fly population in food services area. Furthermore, this research seeks to differentiate from the previous studies by focusing on Padang restaurants and providing an analysis of waste management practice and fly density.

2. Methods

2.1. Design Study

This study used an analytical research method with a cross-sectional design. The independent variables in this study were waste sorting practice and waste containers practice. Meanwhile, the dependent variable in this study was the level of fly density in Padang restaurants. The study was conducted from October to December 2023.

2.2. Population and Sample

The population in this study included all Padang restaurants located in Tembalang District, totaling 50 restaurants. Meanwhile, the sample in this study consisted of 45 restaurants selected using total sampling method because the population size was relatively small (Sugiyono, 2014). The inclusion

criteria in this study were Padang restaurants located in the research area, Padang restaurants not closed during the study period, and the owners of Padang restaurants willing to participate as respondents. Whilst, the exclusion criteria in this study were respondents unwilling to participate and unable to be reached during the study period.

2.3. Data Collection

Data collection techniques were carried out through questionnaires to determine the characteristics of wood waste and waste management, observation to determine the waste containers, and measurement to determine the fly density level on 45 sample. The measurement of fly density was conducted using a fly grill by placing it at the sampling point for 30 seconds with 10 repetitions. From these calculations, the 5 highest measurements were taken and averaged to determine the fly density measurement results for each restaurant. The measurement of fly density was conducted near the food serving area in each Padang restaurant.

In determining the scoring for fly density levels in Padang restaurants, the reference used was Regulation of the Minister of Health Republic of Indonesia Number 50 of 2017, which states that the standard value of fly populations should be less than 2. Fly densities will be categorized as high if the average measurement results are more than 2, and categorized as low if the average measurement results are less than 2. The density of flies indicates the sanitation condition in restaurants, where a high level of fly density indicating poor sanitation issues. Meanwhile, scoring for waste sorting and containers refers to the Guttman Interval Scale measurement formula, which divides the range and categories to obtain the interval limit of a variable (Sugiyono, 2014). In this study, the interval limit for waste sorting and waste containers was 0.5. Waste sorting and waste containers will be categorized as good if the results range from 0.5 to 1, and categorized as not good if the results range from 0 to 0.5.

2.4. Data Analysis

The data sources used in this study were primary and secondary data. Primary data were obtained through questionnaire completion activities related to the characteristics of food waste and waste sorting, observation related to waste containers, measurement related to the amount of food waste and fly density. Meanwhile, secondary data were obtained from the National Waste Management Information System (SIPSN), Semarang City Environmental Service, and relevant previous journals.

The data analysis technique used was univariate and bivariate analysis. Univariate analysis was used to describe research variables, namely the characteristics of waste management in restaurants, including waste sources, types of waste, waste sorting, waste containers, and fly density. Meanwhile, bivariate analysis was used to find the relationship between waste sorting and waste containers with fly density levels using the chi-square test.

3. Result and Discussion

Padang restaurants are a type of business known for their distinctive taste in serving menus using various authentic Padang spices. They offer a variety of dishes that show the culinary heritage of the region. In Tembalang District, most Padang restaurants are located in strategic and easily accessible locations, often along major roads. On any given day, sales at Padang restaurants in Tembalang District range from 50 to 400 servings of food sold. This variability in sales is influenced by some factors, such as location, peak hours, and the variety of food prepared. Despite the fluctuations, Padang restaurants remain as a popular place for dining among both locals and visitors, drawn by the authentic flavors and diverse menu offerings.

3.1 The Characteristic of Restaurants Waste Management

In its various activities, Padang restaurants generate a considerable amount of food waste from unused food ingredients or food that is no longer consumable. In this study, the majority of wasted food comes from customers' plate waste at 27 restaurants (60.0%). This indicates that some portion of food

that is served to customers ends up unconsumed, leading to food waste. Among the types of wasted food, rice emerges the most commonly wasted type of food at 17 restaurants (37.8%). One of the factors that contributing the excessive disposal of rice is because of the portion size of Padang restaurant food serve which tends to be larger than the actual needed for the customers to eat.

Table 1. The characteristics of restaurant waste management

Variable	Frequency (f)	Percentage (%)
Source of Food Waste		
Food Processing	15	33.3
Food Serving	3	6.7
Plate Waste	27	60.0
Type of Food Waste		
Rice	17	37.8
Meat Dishes	15	33.3
Vegetables	13	28.9
Waste Sorting		
Performed waste sorting	12	26.7
Waste sorting facilities are available	12	26.7
Carried out food waste processing or utilization	7	15.6
Waste Containers		
Have lids	6	13.3
Using color-coded according to the type of waste generated	16	35.6
The materials are durable and waterproof	29	64.4
The capacity is sufficient for generated waste	35	77.8
Placed near the waste sources	41	91.9

Research on waste sorting activities in Padang restaurants shows that only 12 restaurants (26.7%) have actively implemented waste sorting practices, 12 restaurants (26.7%) have sorting facilities, and 7 restaurants have reused sorted food waste as animal feed (15.6%). Out of the total 45 Padang restaurants studied, 30 restaurants (66.7%) had poorly rated waste sorting practices, while 15 restaurants (33.3%) had good waste sorting practices. This condition indicates the lack of effective waste management strategies that are carried out by restaurant employees.

Waste sorting at Padang restaurants in Tembalang District is still not optimally implemented. Many restaurants are found not sorting waste according to its type. The suboptimal waste sorting in this study is influenced by several factors, including the lack of knowledge and awareness among restaurant owners about the importance of waste management. One factor that can shape someone's behavior is knowledge. In this case, restaurant owners or employees with good knowledge of waste management will be more responsible in handling the waste generated. Furthermore, cultivating a culture of waste management in the restaurants can contribute to more effective waste sorting practices that leads to a cleaner environment in the restaurants. Research conducted by Ali and Christiawan (2019) found that traders do not fully understand that environmental cleanliness in trading areas is not only the responsibility of local governments and sanitation officers but also the responsibility of every trader.

Another factor that influences waste sorting is the availability of facilities that support sorting activities. For restaurants that are lacking waste sorting facilities, the waste generated daily will be mixed together in the same place. This is due to the difficulties faced by restaurant employees in sorting different types of waste because of the absence of proper waste sorting facilities. Research conducted by Hasanah

and Ibrahim (2021) proves that there is a relationship between the availability of facilities and waste management in restaurants, where the availability of waste management facilities can influence someone's behavior, as reflected in their actions, in this case, waste management in restaurants. With the presence of adequate waste management facilities, including facilities for separating organic and non organic waste, waste sorting practice can be facilitated. This condition could ease waste sorting practice before it is disposed of to the temporary shelter (TPS) (Padmita & Marwati, 2019).

Organic waste or food waste, once sorted, can be processed and reused in various beneficial forms, such as biogas, compost, or animal feed. Instead of throwing away food waste, some Padang restaurants in Tembalang District transformed it into a valuable resource. In this study, the sorted food waste is largely reused as animal feed. Animal feed produced from restaurant waste has a high protein content, at 22.40%, making it suitable for animal consumption (Pramadita et al., 2021). Converting food leftovers into animal feed also presents a practical solution that can contribute to reducing environmental damage. Due to the abundance of nutrients in food waste, improper disposal or management can result in several adverse environmental outcomes (Nath et al., 2023).

Research on waste containers indicates that only 6 restaurants (13.3%) have lids on their waste containers, 16 restaurants (35.6%) use different colored waste containers to distinguish types, 29 restaurants (64.4%) have waste containers made of durable and waterproof materials, 35 restaurants (77.8%) have waste containers with appropriate capacities, and 41 restaurants (91.9%) place waste containers near the source of waste. Out of the total 45 Padang restaurants studied, 29 restaurants (64.4%) have waste containers that meet the requirements, while 16 restaurants (35.6%) have inadequate waste containers.

Most waste containers available at Padang restaurants in Tembalang District already meet the applicable standards. The majority of waste containers are placed near the source, made of waterproof materials, and have a sufficient capacity. However, it is found that almost all restaurants have open waste containers without lids. This condition poses some problems such as unpleasant odor emission and scattering of waste materials, which could compromise the restaurant's cleanliness and sanitation concerns. Furthermore, the use of easily damaged materials for waste containers, such as plastic bags and sacks could increase the problem, as they can potentially lead to leakage and spillage that creating other hygiene concerns.

The lack of understanding among restaurant employees regarding the importance of waste containers lids, coupled with the misconception that waste containers without lids can ease waste disposal processes are the main factors that contribute to the high number of restaurants with open waste containers in Padang restaurants. Some employees mistakenly perceive that waste containers without lids would simplify the waste disposal practice, without considering consequences, such as potential odor emissions that could attract flies and other vectors. Research conducted by Safitri and Rangkuti (2022) states that many respondents do not understand the need for waste containers to have lids and be waterproof. This lack of understanding is due to the level of education that influences respondent's thought patterns in waste management. This misconception highlights the critical need for comprehensive training and education to enhance employees awareness regarding proper waste management practices.

The ideal material for waste containers needs to comply with the applicable standards, such as SNI 19-2454-2002. These standards outline specific requirements for waste containers materials to ensure efficient waste management practices. It is essential for waste containers to be durable, waterproof, equipped with lids, cost economical, and easy to empty. Additionally, the sizing of waste containers should be determined based on some factors, such as the number of residents, waste generation rates, and the frequency of waste collection, as specified by the Indonesian National Standard (Standar Nasional Indonesia, 2002). Moreover, it is also necessary for waste containers to be strategically located near the waste source to minimize odor emissions and facilitate convenient disposal. Open waste containers

without lids could pose significant health and hygiene risks as they can attract insects and flies to the waste area (Sari and Mualim, 2022).

Every day, restaurants produce waste that is collected and transported to the nearest temporary shelter (TPS). In many cases, waste collection is carried out regularly by restaurant employees or through garbage collectors. In Tembalang District, waste collection at Padang restaurants is mostly done by garbage collectors. Generally, waste is transported to the TPS every day to prevent decomposition and odor issues caused by the waste collected. However, it has been observed that some Padang restaurants only transport their waste to the TPS every two or three days. Less frequent waste disposal may lead to accumulation of waste collection can cause odors that attract flies to gather around the waste storage area (Prayogo and Khomsatun, 2015).

To ensure optimal waste management practices in Padang restaurants, active participation from their employees is needed. Therefore, efforts to improve the knowledge of Padang restaurant employees about the importance of waste management are necessary. Knowledge plays a crucial role in shaping someone's behavior, especially in the context of waste management practices. It encompasses the ability to remember concepts or phenomena that were previously taught to them. Someone's knowledge of waste management is developed based on their ability to think in accordance with the circumstances they observe and encounter in their surrounding environment (Harun, 2017). Research by Martiyani, Jaksa and Andriyani (2023) states that knowledge is related to waste management behavior (p=0.000). Good knowledge will influence good behavior. Increased knowledge can be achieved through various educational methods, both formal and non-formal. Through these efforts, it is hoped that restaurant employees understanding of waste sorting and containers can increase, thereby reducing and preventing the negative impacts caused by waste (Martiyani et al., 2023).

3.2 Fly Density Level

Trash becomes one of the places that is often visited by flies, making it necessary for restaurants to manage their waste properly to prevent the presence of flies. The results of fly density measurements show that Padang restaurants across the Kedungmundu Sub-District have the highest fly density compared to other sub-districts, with an average fly density of 6 flies per measurement. On the other hand, Padang restaurants across the Tandang and Sendangguwo Sub-Districts have the lowest average fly density, namely 2 flies per measurement. Overall findings show that out of the surveyed restaurants, there are 24 restaurants (53.3%) with high fly densities and 21 restaurants (46.7%) with low fly densities. These results highlight the importance of implementing effective waste management strategies to control fly population in restaurant areas.

Table 2. Fly density level at padang restaurants in Tembalang District

No	Sub-District	Total of Padang Restaurants (n)	Average of Fly Density Level
1	Tembalang	8	4
2	Kramas	2	5
3	Bulusan	6	3
4	Meteseh	8	4
5	Rowosari	1	3
6	Sendangmulyo	6	5
7	Kedungmundu	4	6
8	Sambiroto	7	3
9	Tandang	1	2
10	Sendangguwo	2	2

Fly density measurements are adjusted to the Regulation of the Minister of Health Republic of Indonesia Number 50 of 2017, which outlines Environmental Health Quality Standards and Health Requirements for Vectors and Disease-Carrying Animals and Their Control. This measurements involve the use of a fly grill by counting every fly that lands within a 30 second interval using a hand counter. This stage is repeated up to 10 times to ensure accuracy and reliability. After that, the five highest measurement results from each sample are selected and averaged to obtain a representative value. Then, a comparison is made between the measured fly density and the quality standard value that specified in the regulation, which stipulates that fly density should be less than two flies (Kementerian Kesehatan, 2017).

Flies, which belong to the order *Diptera*, are considered as pests due to their habit of landing on wet and muddy surfaces like waste. When flies contaminate food, it can lead to disease if it is ingested by humans, since flies can carry microorganisms, such as bacteria, protozoa, larvae, or viruses (Saputra et al., 2022). The presence of flies in restaurants is an important concern in efforts to maintain cleanliness and comfort for customers. Despite efforts to address this issue, a significant number of Padang restaurants still have high fly density levels. The results found that all Padang restaurants have provided waste containers both inside and outside their premises. Most of the containers inside the restaurants are placed in the kitchen area. However, there are some restaurants that place the containers around the food serving area. This could potentially disrupt the comfort of both employees and customers due to the smell of discarded food leftovers mixed with various types of other waste, attracting flies to come. Improper handling of food waste, such as leaving it without adequate management, has the potential to create an environment that supports fly breeding.

Flies tend to be attracted to wet and odorous food materials, especially those that have decayed because they can support fly life for obtaining food sources and breeding grounds. Factors that strongly support fly breeding, resulting in a population that significantly disrupts the environment, including high humidity, warm temperatures, and abundance of food sources like organic waste. These circumstances are commonly observed in aresa that characterized by inadequate sanitation and unsanitary conditions (Andiarsa, 2018). Generally, locations favored by flies are those related to human activities. This is supported by the large number of human activities that produce waste. The large number of waste generated by human activities would create numerous opportunities for flies to thrive (Putri and Emilia, 2022). Research by Masyudi (2018) states that high density of flies in restaurants is caused by inadequate waste management, where trash bins are combined into one and waste is not disposed of immediately, causing it to accumulate and attract flies to settle on it.

Vectors, such as cockroaches, rodents, and flies are widely recognized as risks to food safety in area where food is handled. It indicates that there is a potential risk posed by flies in picking up, carrying, and transmitting bacteria, including pathogens that are responsible for foodborne illness, to surfaces or food items. Therefore, it is necessary to minimize the risk of flies being present in the food handling area. This required ensuring proper cleaning and sanitation to reduce and eliminate the potential breeding sites for flies and other vectors (Black et al., 2018). Flies have been proven to play a significant role as mechanical vectors in spreading various pathogenic microorganisms through their bodies by flying and landing on various surfaces. Bacteria that are consumed by flies can thrive within their body and become a source of contaminants that are expelled through fly vomit and feces. The higher the density of the fly population, the more likely cases related to foodborne disease vectors will emerge (Andiarsa, 2018).

Padang restaurants, with a significant amount of food waste generated every day, become one of the most potential places for flies to come. This condition emphasizes the importance of proper handling of food waste to reduce the potential presence of disturbing flies. Therefore, efforts to improve basic sanitation, especially in waste management, need to be carried out. Monitoring of waste can also be done to prevent waste accumulation that can become a breeding ground for flies. Research conducted by Inna et al., (2023) proves that waste management is related to fly density (p=0.000). It was found that locations

that have good waste management have low fly densities, and locations that have poor waste management have high fly densities.

3.3 The Relationship Between Waste Sorting and Waste Containers Practice with Fly Density Level

Restaurants generally become breeding grounds for flies because they produce a lot of food leftovers and other organic waste that can attract flies (Saputra et al., 2022). Organic waste, such as food leftovers, when undergoing decomposition, can produce a strong foul odor (Puger, 2018). Improperly handled waste can generate unpleasant odors and attract insects, which can pose a risk of food contamination (Yunus et al., 2015). In this study, the measurement of fly density was conducted in the food serving area. This area often serves as the focal point of activities within the restaurant, ranging from displaying dishes on the counter to interactions between customers and employees.

Table 3. The relationship between waste sorting and waste containers practice with fly density level

Research Variables	Fly Density Level				Total		*p-value*
	High		Low				
	f	%	f	%	f	%	
Waste Sorting Practice							
Not Good	19	63.3	11	36.7	30	100.0	0.057
Good	5	33.3	10	66.7	15	100.0	
Waste Containers Practice							
Do Not Meet Requirement	12	75.0	4	25.0	16	100.0	0.030
Meet Requirement	12	41.4	17	58.6	29	100.0	

The results of the chi-square test indicate that there is no significant relationship between waste sorting practice and fly density levels at Padang restaurants in Tembalang District (p=0.057). Based on the observational findings, restaurants that had already conducted waste sorting practice tend to place the waste sorting containers near the dishwashing area in an open condition, posing a risk of being splashed by water. This situation leads to quicker decomposition and emits odor. Consequently, fly vectors are still found around the containers. The presence of flies is also supported by the clean environmental conditions and waste handling practices in Padang restaurants.

Research conducted by Kanan et al. (2023) states that there is no direct relationship between waste sorting practices and fly density in restaurants. However, it was found that even though there was no statistical relationship, restaurants that did not performed waste sorting practice had a higher number of flies density compared to the restaurants that perform waste sorting practice. The presence of flies is often influenced by various factors caused by ineffective waste management, such as scattered waste, uneven waste collection, and improper waste containers. (Yunus and Juherah, 2020). Therefore, while waste sorting may be carried out, if waste management practices are not optimized, flies are still likely to be attracted to come to the area.

While this study may not directly demonstrate a clear relationship between waste sorting practice and fly density, the importance of waste sorting activities as a preventive measure against the impacts of fly presence in restaurant areas is still needed. Therefore, it is necessary to take steps to provide facilities by providing facilities to separate organic and non organic waste in the restaurants. Implementing waste sorting practice may reduce the likelihood of flies being present in restaurant areas. Research conducted by Novitry et al. (2021) states that waste containers are related to fly density (p=0.03). Restaurants that have undivided waste containers, do not differentiate between wet and dry waste, and are not covered and waterproof are more susceptible to be infested with flies due to the presence of rotting waste.

Meanwhile, the results of the chi-square test show that there is a significant relationship between waste containers practices and fly density levels at Padang restaurants in Tembalang District (p=0.030). Results of the observation found that restaurants with adequate waste containers, such as have lids, durable and waterproof materials, sufficient capacity, and placed near the waste sources, are better equipped to prevent flies from accessing and breeding in restaurant areas. On the other hand, restaurants with inadequate waste containers may create condition that could attract flies to come and breed in restaurant area. It was also found that a small number of restaurants that do not have an adequate waste containers tend to have a scattered waste within the kitchen, which particularly attracts flies.

Flies tend to thrive in unclean locations, such as human and animal feces, as well as on damp and decomposing organic matter. Flies also enjoy unpleasant odors and the aromas produced by food (Andriani, 2021). Open waste containers without lids will generate unpleasant odors and facilitate the breeding of insects or flies (Kumala and Pawenang, 2017). Flies are attracted to dirty places, including garbage scattered on the floor. Garbage that is scattered on the floor is usually caused by the insufficient capacity of waste containers available to accommodate the waste generated by restaurants. Therefore, the capacity and number of waste containers need to be adjusted according to the amount of waste generated each day, taking into account the waste collection period (Prajaningtyastiti and Pawenang, 2023).

Research conducted by Andriani (2021) proves the relationship between waste containers and fly density in restaurants. It is mentioned that inadequate waste management practices become the primary cause of high density of flies. Many restaurants still use waste containers made of non-waterproof materials, lack lids, are structurally weak, and easily leak. This condition create an environment that is favorable to flies, as the organic matter, such as protein, fat, carbohydrates, and ammonia, present in the waste decomposes, emitting odors that attract them. Additionally, research by Putri and Dewi (2017) states that trash bins without lids are likely more susceptible to attracting flies and producing odors that can disturb the surrounding environment.

When it comes to waste management practices, the majority of Padang restaurant employees in Tembalang District routinely transfer waste from containers inside the restaurant to containers outside ones before the restaurant's closing time each night. Generally, most restaurants have disposed their waste generated every day to the temporary shelter (TPS), either by their employees or by garbage collectors. However, there are small numbers of Padang restaurants that only dispose their waste every two or three days instead of on a daily basis. Yet, the frequency of waste disposal has an impact on the accumulation of waste in containers, potentially leading to higher fly density.

Research conducted by Novitry (2021) indicates that the high density of flies in adequate waste containers is caused by waste accumulation resulting from infrequent waste disposal, which only occurs after the restaurant is closed. This leads to waste containers, previously compliant during the day or evening, being swarmed by flies due to the decaying waste. Regular waste disposal will prevent potential waste accumulation in containers, thereby controlling the risk of increased fly populations. To prevent flies from gathering around the restaurants, regular waste disposal should be conducted. This can be done by emptying the waste containers whenever it reach the capacity. By consistently implementing regular waste disposal, it can minimize the likelihood of attracting flies.

Therefore, efforts to control the presence of flies in restaurants can be made by ensuring the use of appropriate waste containers, where waste containers with lids, made of durable and waterproof materials, easy to clean, and with a capacity suitable for the amount of waste generated each day are needed to avoid the potential for fly breeding. In addition, regular monitoring of waste management conditions is also required to prevent waste accumulation that could attract flies. Research conducted by Prajaningtyastiti and Pawenang (2023) states that waste management monitoring activities are related to fly density (p=0.029). It was found that locations with poor monitoring are 1.816 times more likely to have a high density of flies. Waste management monitoring, especially in transporting and disposing waste, is necessary to prevent excessive waste accumulation. Restaurants with effective waste management

monitoring can prevent flies from gathering around. This is because the waste produced has been properly disposed of, so it can minimize odors and potential breeding grounds for flies. Effective waste management monitoring can also contribute to a clean and hygienic environment in the restaurant.

4. Conclusions

The research findings indicate a correlation between waste containers practices and fly density in Padang Restaurants. It is observed that waste containers without lids, made of easily damaged materials, and possessing inadequate capacity are significantly associated with higher fly density levels at Padang restaurants in Tembalang District. The results of this research highlight the importance of effective waste management practices in controlling the flies population near the restaurants. By emphasizing the importance of using compliant waste containers, this research could also enhance sanitation practices and pest control measures in food service areas.

This study recommends the need for efforts to provide or replace waste containers with lids, sufficient capacity, and durable materials. By doing so, prevention and control of flies around restaurant areas can be achieved. This study is limited to discussing the relationship between waste management and fly density. Health impacts have not been identified. Further research is needed to understand the influence of waste management and its health effects.

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