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ANALYSIS OF IMPLEMENTATION OF VECTOR AND PEST CONTROL IN HOSPITAL

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ABSTRACT

Disease vector control in hospitals is an important aspect of environmental health management, because the presence of vectors such as mosquitoes, flies, cockroaches, and rats can be a source of transmission of various nosocomial and community infectious diseases. Based on preliminary observations, signs of vector presence were found in hospitals such as the discovery of rat holes and even rats entering work rooms, nutritional installation corridors, the presence of mosquito larvae in open clean water reservoirs, there were also signs of cockroaches in the kitchen area, and there were still many flies in the garbage disposal. Cleaning of rooms and buildings that was not optimally carried out by responsible officers was evidenced by the achievement of the target which only reached 70% of the 100% target achievement. This became one of the problematic factors in vector control because dirty rooms and buildings became a breeding ground for vectors that endanger patients. The type of research used was qualitative research with descriptive methods. The data collection method was through observation and in-depth interviews with triangulation informants. While data analysis was carried out by means of data reduction, data presentation, and drawing conclusions/verification. Based on research results at Hospital X, it was discovered that disease vector and pest control measures have been implemented, including cold fogging, hot fogging, and the use of mosquito rackets. However, the hospital is not yet mosquito-free due to several factors, including the limited use of cold fogging. Fly vectors are still found in the garbage dump near the kitchen, despite the installation of fly traps. The cockroach control process has been completed and yielded satisfactory results, and has been effectively managed, so the vector is no longer visible. Rat vectors are still found in several service units and other rooms due to the continued access for rats. Meanwhile, cat vectors are no longer visible roaming the hospital environment. Hospital X needs to increase vector and pest control activities because they can have a negative impact on patients, their families, and staff.

Keywords: control; hospital; pest; vector

INTRODUCTION

A hospital is a healthcare institution that provides comprehensive individual healthcare services, including inpatient, outpatient, and emergency care. According to the World Health Organization (WHO), hospitals are an essential part of social and health organizations tasked with providing comprehensive services, healing, and disease prevention to the community (WHO, 2020). Based on Decree of the Minister of Health of the Republic of Indonesia Number 7 of 2019 concerning Environmental Health Requirements within Hospitals, hospitals should be kept clean and have sanitation facilities of good quality and quantity. This aims to prevent insects, rodents, and other pests from breeding and nesting within the hospital (Permenkes No. 7 Tahun 2019). Maintaining a healthy and clean hospital environment is crucial to prevent the transmission of various diseases. Effective measures to control disease vectors and pests are necessary to minimize the risk of disease transmission in hospitals (Marlinae, et al., 2021).

According to Minister of Health Regulation No. 50 of 2017 concerning Environmental Health Quality Standards and Health Requirements for Vectors and Disease-Carrying Animals and Their Control, a vector is an arthropod that can transmit, move, and/or become a source of disease. A vector is an arthropod that can transfer or transmit an infectious agent from an infectious source to a susceptible host. A vector is an organism that does not cause disease but spreads it by carrying pathogens from one host

to another (Marlinae, et al., 2021). Disease vectors are arthropods that act as disease transmitters, so they are known as arthropod-borne diseases or often called vector-borne diseases, which are important diseases and are often endemic or epidemic and pose a health hazard to death. Animals classified as vectors include mosquitoes, flies, cockroaches, and fleas (Permenkes, No. 50 Tahun 2017).

Disease vector control in hospitals is an important aspect of environmental health management, as vectors such as mosquitoes, flies, cockroaches, and rats can be a source of transmission of various nosocomial and community-acquired infectious diseases. Hospitals are highly sensitive to the spread of disease, given the high concentration of patients with weakened immune systems and the complex medical activities involved. Therefore, vector control plays a role not only in maintaining the physical cleanliness of the environment but also as part of a broader infection prevention and control strategy. Vector control activities, according to Minister of Health Regulation No. 50 of 2017, include bioecological observation and investigation, determination of vector status, resistance status, and efficacy, and sample examination. Vector control can also be carried out through vaccination and the use of insecticides or drugs to control the population of vectors and disease-carrying animals. Within the hospital environment, vector and pest control are carried out regularly and systematically, taking into account risk factors for disease transmission (Permenkes, No. 50 Tahun 2017). In this regard, hospitals must have an integrated and sustainable vector and pest control program, involving all stakeholders in hospital environmental management. The role of cleaning and sanitation staff is crucial in maintaining a clean and healthy hospital environment. Furthermore, community and patient participation is also crucial in maintaining a clean hospital environment and preventing the spread of disease (Aisyah, 2020).

Research conducted by Aisyah and Ardan (2024) found that vector and pest control at Medika Sangatta General Hospital was not optimal due to four factors, namely human, material, machine, and environment. Meanwhile, research conducted by Sari (2020) found that the density of fly and cockroach vectors from three type C hospitals in Surakarta was categorized as low, with details obtained that the density of rats in the Nutrition Installation of Surakarta Regional General Hospital was categorized as high, namely 25% with 1 type of rat found in the nutrition installation section. The mosquito density in the Inpatient Ward of Surakarta Regional General Hospital and Bung Karno Regional General Hospital was categorized as high, while the mosquito density in the Inpatient Ward at Soelastri Dental and Oral Hospital, Muhammadiyah University of Surakarta was categorized as low. In general, the 3 hospitals have carried out disease vector and pest control efforts, but have not been carried out routinely at least once a month.

Hospital X is a type D general hospital located in Wonogiri City. Hospital X was established in 2012. The services provided are inpatient, outpatient, and emergency services. Based on preliminary observations, signs of vector presence were found in the hospital such as the discovery of rat holes and even rats entering the work room, the nutritional installation corridor, there were mosquito larvae in the open clean water reservoir, there were also signs of cockroaches in the kitchen area, and there were still many flies in the garbage disposal. Cleaning of rooms and buildings that were not optimally carried out by responsible officers was proven by the target achievement which only reached 70% of the 100% target achievement. This is one of the problem factors in vector control because dirty rooms and buildings become nesting places for vectors that endanger patients. From the results of initial interviews in the vector handling report and environmental monitoring of Hospital X for vector handling is carried out by a third party. If there are reports or signs of rats in the work room, handling is carried out against this rat vector using rat traps. So far there has been no handling of rat holes due to limited budget. Mosquito vector control in clean water reservoirs is carried out if signs of mosquito larvae are found, and treatment

is carried out using Abate. After the spraying/vector control process is complete, the next step is to prepare a report and note any areas where vectors are identified. The report is summarized and reported to management. Finally, the work is evaluated again

METHOD

The type of research used for this study is qualitative research with descriptive methods. Descriptive research is research that attempts to describe a symptom, event, and incident that occurs at the present time (Jayusman & Shavab, 2020). The descriptive methodology approach is used to describe the current condition of the research subject based on the facts found at hospital X. This method is subjective from the perspective of someone who explains until general results are obtained. The data collection method is through observation and in-depth interviews with informants. An informant is someone who can provide information about a phenomenon or problem being discussed in the study, there is no mention of a minimum sample size in qualitative research. Qualitative research usually uses a small sample. Even in certain cases using only one informant. The adequacy and suitability of informants must be considered in determining the number of informants (Heryana, 2018). The conditions in determining the number of informants in qualitative research are: (1) If there is a lack of information, the researcher can increase the number of informants (2) If the information obtained by the researcher is sufficient, the researcher can reduce the number of informants (3) If the informant is not cooperative in the interview, the researcher can replace the informant. The informants in this study used triangulation, namely key informants: Head of the Sanitation Sub-Unit, Sanitation Sub-Unit Staff. Main informants: Head of Inpatient, Outpatient, and Emergency Rooms. Supporting informants: Head of Hospital Facilities Maintenance Installation, Head of Cleaning Service, Cleaning Service staff.

The data sources in this study used primary and secondary data. Primary data is information collected directly from trusted subjects, in this case research subjects (informants) who have an interest in the variables being studied (Beno, et al., 2022). The author obtained primary data from interviews with informants and reports on environmental management efforts and environmental health monitoring efforts in hospitals. Meanwhile, secondary data included books, scientific journals, the internet, and other sources. According to Sugiyono, secondary data is data that is not immediately provided to data collectors (Beno, et al., 2022). This study only focused on five disease vectors and pest fauna: mosquitoes, flies, cockroaches, rats, and cats. This is because these five vectors are commonly found in hospital environments and have not been fully managed according to the quality standards stipulated in the regulations of the Minister of Health of the Republic of Indonesia. Meanwhile, data analysis was carried out through data reduction, data presentation, and drawing conclusions/verification. Data reduction is the process of sorting, focusing on simplifying, abstracting, and transforming raw data from written field notes (Zhahara, et al., 2021). Data presentation refers to the process of creating a report on the results of the data and information obtained by the researcher (Zhahara et al., 2021). Conclusions are drawn from the data obtained during interviews with informants and observations. Conclusions are also verified by the author during the research. Verification stems from the analyst's reflections during writing and a review of field notes (Zhahara, et al., 2021).

RESULT AND DISCUSSION

Triangulation informants is a technique in qualitative research in which researchers use multiple sources of information or informants to test the accuracy and reliability of the collected data. The goal is to gain a more comprehensive and robust understanding of a phenomenon by comparing information from multiple perspectives. The triangulation informants in this study were key informants: the Head of the Sanitation Sub-Unit, Sanitation Sub-Unit Staff. Primary informants: Heads of Inpatient, Outpatient, and

Emergency Rooms. Supporting informants: Head of Hospital Maintenance Installation, Head of Cleaning Service, Cleaning Service staff. The following is a description of the characteristics of triangulation informants.

Table 1.
Primary informants

No	Code	Informant	Position	Education	Age (Years)	length of service (Years)
1	IK1	Key Informants	Head of the Sanitation Unit	Bachelor degree	42	11
2	IK2	Key Informants	Sanitation Unit Staff	Bachelor degree	33	9
3	IU1	Key Informants	Head of the Inpatient Ward	Bachelor degree	37	4
4	IU2	Key Informants	Head of the Outpatient Ward	Bachelor degree	41	8
5	IU3	Key Informants	Head of the Emergency Ward	Diploma	30	3
6	IP1	Supporting Informants	Head of the Hospital Facilities Maintenance Unit	Diploma	27	3
7	IP2	Supporting Informants	Head of the Cleaning Service	Senior High School	32	9
8	IP3	Supporting Informants	Cleaning Service Staff	Senior High School	26	2

Based on the results of interviews with informants regarding vector and pest control at Hospital X, it is known that the process of controlling vectors and pests is carried out by a third party every 2 weeks, while secondary monitoring is carried out every day. The third party operators consist of 2 people and are divided into 2 shifts. Inspection activities for the presence of vectors and pests inside and outside the hospital. The principle used by the third party for vector control is IPM (Integrated Pest Management), which prioritizes physical control and sanitation, while chemical control is the last alternative if the vector population has increased and the non-chemical vector control carried out does not have a major impact on control efforts. The flow of vector and pest control at the hospital is as follows:

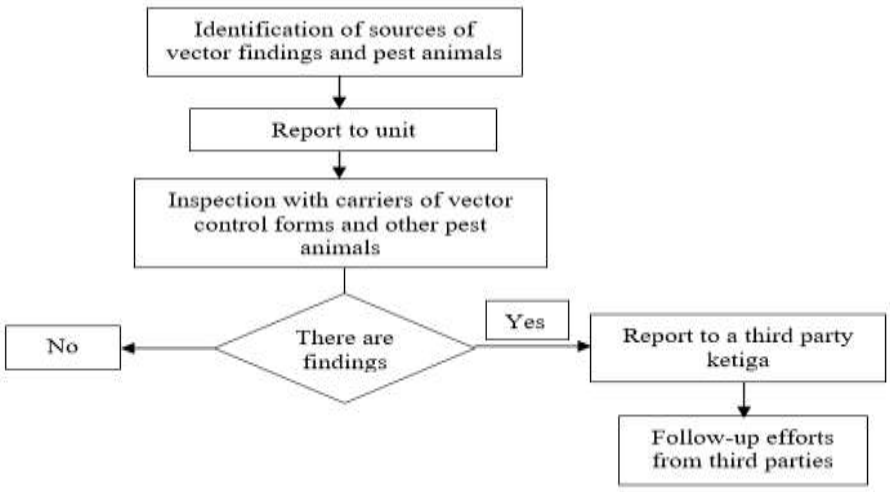

Figure 1. Flow of Vector Control Efforts at Hospital X

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Mosquitoes are the most common vector found both inside and outside hospital buildings. Mosquito inspections are conducted every Thursday with the assistance of cleaning staff. Inspections are conducted in every room and other locations or containers holding water, which may serve as breeding grounds for mosquitoes. In addition, water storage areas, especially dispensers, and toilets that use tanks or water reservoirs, are also regularly checked. Mosquito control prioritizes non-chemical methods. Non-chemical methods include the use of mosquito lamps. Chemical methods include the use of abate to control mosquito larvae in areas with stagnant water that are difficult to clean. If mosquitoes are present on a large scale, misting is carried out.

From the results of interviews with informants, it is known that mosquito monitoring is carried out by directly examining Aedes aegypti larvae in bathtubs and toilets once a month by carrying out abatization by providing abate powder in bathtubs and toilets, mosquito eradication is also carried out by using mosquito rackets by cleaning staff in each room, using wire mesh and insect killer to eradicate mosquitoes in every corner of the room, carrying out cold fogging in every room and hot fogging outside the room, and conducting regular observations of larvae in water storage facilities and places that have the potential for the development of mosquito vectors. However, from the information obtained, mosquito handling has not been carried out optimally in several rooms, such as in the nutritional installation and several rooms in the inpatient unit as stated by the informant as follows:

> "*In the cooking area, spraying cannot be done because there are a lot of food ingredients*" (IK1)

> *"Sometimes when cold fogging is carried out indoors, employees are still there and have not gone home so the cold fogging is not optimal"* (IU1)

From the results of observations conducted by Hospital X, mosquitoes were still seen in several wards in the Inpatient Unit, this was due to limitations in carrying out cold fogging and only using insect killer. Meanwhile, in the processing room and food storage area, officers were also unable to carry out cold fogging because there were many food ingredients. This study is in line with the results of research conducted by Sari (2020), it was found that in the nutrition installation and also in the rooms within the Surakarta City Regional General Hospital, mosquito vectors were still found caused by air humidity which is an important factor in mosquito growth.

According to Sunaryo (2015), light intensity is related to the presence of mosquitoes, which prefer dimly lit rooms protected from direct sunlight. Rooms with light intensity levels (<60 Lux) can positively influence mosquito development. Furthermore, rainfall is closely related to the rate of increase in the Aedes aegypti mosquito population (Tavares, et al., 2014).

Fly inspections are conducted every Friday. Fly grills are used when fly populations are high in the garbage dump and in the canteen. These fly density measurements are conducted to determine fly density in both locations and identify control measures that can be implemented. Non-chemical fly control involves the use of fly catchers. Flies are often found in the nutrition facility. To prevent fly entry, fly catchers are installed at the entrance and food receiving doors. Fly catchers are a type of light that attracts flies and contains glue, trapping them. Houseflies' preferred egg-laying sites include manure, feces, and decaying, moist organic waste. Greenflies breed in liquid or semi-liquid materials derived from animals, meat, fish, carcasses, animal waste, and soil containing animal waste. Greenflies also lay eggs in animal and human wounds.

Chemical control measures, if flies are still present, include spraying with dichlorophos indoors and cyphermethrin outdoors. Fly vector monitoring is conducted in areas with potential fly breeding sites, particularly garbage dumps. Monitoring of the fly vector was conducted by installing fly traps around the waste disposal area and using fly cells in the kitchen, canteen, and other areas with high fly densities. After conducting interviews, researchers found that the fly infestation within the nutrition installation had been controlled, but flies were still found in abundance near the kitchen waste disposal area and in the gutters surrounding the waste disposal area. As explained by the following informant:

> *here are no more flies in the nutrition room, the only ones that are still there are at the back near the trash can*" (IP2)

The above statement was further strengthened by key informant IU2 that fly vectors that were still visible around the garbage dump had been handled using the fly tree method.

> *ear the landfill there are still a lot of food leftovers, but fly traps have been installed*" (IK2)

Consistent with research conducted by Sari (2020), fly densities were observed during food preparation and distribution in the nutrition facility at Surakarta Regional General Hospital. One reason for this is the proximity of the nutrition facility to the waste disposal area, despite the proper sanitation requirements for separating wet and dry waste.

Observations revealed several fly traps in areas where flies congregate, and fly traps remain installed around the kitchen to prevent flies from entering through the goods receiving entrance and exit. The presence of these flies is tolerable according to the environmental health quality standards stipulated in the Indonesian Minister of Health Regulation Number 50, ratified in 2017.

Cockroaches thrive in protected environments with abundant food, such as kitchens. Cockroaches typically migrate (as eggs or adults) via cardboard boxes, bags/suitcases, furniture, buses, trains, ships, and airplanes. Cockroaches are omnivorous, meaning they eat anything. Cockroaches are nocturnal insects (active at night), and will roam during the day if disturbed or if they develop large populations. Thigmotactic, resting in crevices in walls and ceilings. Gregarious, resting in large groups, often in narrow, dark, and damp crevices. Grooming, cleaning themselves by licking.

Visual inspections for cockroaches are carried out every two weeks. Cockroach control involves applying a gel-based poison called Blattica, containing the active ingredient imidachloropid, to potential cockroach infestation areas. This poison damages the digestive system when ingested by cockroaches, causing them to die. Their carcasses are then eaten by other cockroaches due to their cannibalistic nature, which also leads to their death. Cockroach control, carried out every two weeks by administering gel-based poison and setting hoy-hoy traps, is very effective in reducing cockroach populations. This is in accordance with the following informant's statement:

> *nstalling hoy-hoy traps is enough to reduce the cockroach population"* (IK1)

The statement K1 is strengthened by the statements IU1, IU2, and IU3 as follows:

> *"In the inpatient unit, several pests such as mosquitoes, cockroaches, rats and flies have been controlled"* (IU1)

> *"Thankfully, there are fewer pests in the outpatient unit. Cockroaches are also rare."* (IU2)

> *"Yes, installing traps is quite effective in reducing cockroaches"* (IU3)

In a study conducted by Sari (2020), no cockroaches were found in the nutrition installation of Surakarta Regional General Hospital. Cockroaches are the most controlled vector because the room is tidy and does not produce indoor waste. During observations, no cockroaches were seen roaming around in the inpatient unit, outpatient unit, emergency unit, or other rooms. The presence of these cockroaches has been managed in accordance with environmental health quality standards stipulated in the Regulation of the Minister of Health of the Republic of Indonesia Number 50, which was ratified in 2017.

Inspections for rats are conducted regularly every two months. If rats are found, such as through tracks, droppings, or reports of rats, rat control is carried out by setting rat traps with bait, rat glue, and covering access points for rats if found. Rat monitoring is carried out daily by sanitation staff. This monitoring involves setting rat traps in every hospital room (kitchen, cafeteria, inpatient wards, outpatient wards, emergency room, and outdoor areas). This is because rats are still found coming from the hospital's sewers, and the distance between residential areas and the hospital is very close, allowing rats to access the hospital from the residential roof. Rats typically gain access through doorways and connecting cables between buildings. This information is supported by the following informant:

> *"Rats sometimes emerge from overhead cable holes, but they are quickly dealt with to prevent them from breeding inside. Mouse traps are always in place"* (IK2)

> *"In several agencies, several pests such as mosquitoes, cockroaches, rats and flies have been controlled"* (IP1)

However, this is contrary to the results of interviews with other informants:

> *"Yes, sometimes there are still rats scurrying around in some rooms, it's really annoying and very dangerous for patient safety"* (IU1)

> *"There are still some, but they are usually handled immediately"* (IP3)

Based on observations using rat traps conducted previously in several facilities, such as inpatient wards, linen rooms, and food storage rooms, one (1) to two (2) rats were found using bait consisting of salted fish and sausages. Therefore, these findings indicate that Hospital X is not yet free of rat vectors.

Rat population factors can be influenced by both biotic and abiotic environmental factors. Biotic factors that influence rat populations include plants or small animals as food sources, predators, and humans (Priyambodo, 2003). Abiotic factors that influence rat populations include water and nests. Furthermore, weather can indirectly influence rat populations by affecting the growth and development of plants and

small animals that serve as food sources for rats (Rusmini, 2011).

Cat inspections were conducted due to the large cat population disrupting the comfort and the presence of cat feces, which caused an odor in the hospital environment. Cats were captured using large nets, then placed in cages and taken to the market or a cat shelter. The cat problem at Hospital X has been resolved. This is consistent with the following information from the informant:

> *"Cats haven't been in the units or rooms for a long time. They're safe. Even if there are any around the canteen, they're immediately captured"* (IK1)

> *"I haven't seen a cat around the service unit for a long time"* (IU1, IU2, IU3)

From the results of the observations conducted, no cats were seen roaming around the hospital. The presence of cats in hospitals, especially stray cats, can make the hospital environment unsterile and cause several hazards. Cats can carry diseases such as toxoplasmosis, cat scratch disease, and ringworm, which can be transmitted to humans, especially to people with weak immune systems and pregnant women. In addition, cats can also make the hospital environment unsterile and cause discomfort for patients. Some diseases that arise due to the presence of cats in hospitals are: Toxoplasmosis, Cat Scratch Disease, Ringworm, Allergies, Germs and other Parasites.

Based on the overall research results conducted at Hospital X, the control of vectors and other pests has not yet met the requirements for being vector-free even though it has been handled in accordance with the SOP (Standard Operating Procedure), Regulation of the Minister of Health Number 374 in 2010 which discusses disease vectors and also Regulation of the Minister of Health Number 1204 in 2004 concerning Health requirements in Hospitals. Informants are able to explain about disease vectors and the causes of diseases caused by vectors and pests, informants also know about how to control existing vectors. Control of vectors and pests in the hospital is carried out every day and the reporting is complete.

Vectors and pests are still found in abundance and have not been optimally controlled due to several factors. Some of these include the lack of training for vector and pest control for each officer responsible, this allows for a lack of knowledge about vector and pest control strategies that meet standards. The location of the hospital is directly adjacent to people's homes, which have no barriers so that pests often enter the hospital area, endangering patient recovery. In addition, many damaged items were found piled up in the back area of the hospital. Insufficient lighting in the area supports the gathering place of vectors and pests. Piled up items in areas that are accessed by patients and hospital staff can endanger their safety. This study is in line with the results of research conducted by Rachmawati et al. (2022) which stated that cleanliness, the role of employees, facilities and infrastructure, and the environment or open hospital area become access for vectors and pests to enter and exit.

Within the framework of environmental health management, vector control encompasses a range of planned efforts, from waste management and sanitation improvements to vector monitoring and evaluation, to the judicious use of pesticides. According to the World Health Organization (WHO, 2012), vector control in healthcare facilities should be implemented through an Integrated Vector Management (IVM) approach, which emphasizes efficient resource use, the selection of methods appropriate to local conditions, and cross-sectoral participation. Furthermore, hospitals have a legal and moral responsibility to create a safe environment for patients, visitors, and healthcare workers, which can only be achieved through comprehensive and sustainable environmental management. Evaluating the effectiveness of

vector control implementation in hospitals is also crucial. This aims to identify any obstacles/barriers, and the strengths/weaknesses of the vector management program implemented in hospitals, with the hope of further improving the quality of vector management.

CONCLUSION

Based on research conducted at Hospital X, it was discovered that disease vector and pest control measures have been implemented, including cold fogging, hot fogging, and the use of mosquito rackets. However, the hospital has not yet been completely free of mosquitoes due to several factors, including limited cold fogging. The fly vector is still found in the garbage dump near the kitchen, despite the installation of fly traps. The control process for the cockroach vector has been completed and yielded satisfactory results, and has been effectively managed, eliminating the presence of the vector. The rat vector is still found in several service units and other rooms due to the continued access of rats. Meanwhile, the cat vector is no longer visible roaming the hospital grounds.

Overall, the implementation of vector and pest control activities at Hospital X has not been optimal. Numerous factors remain, including limited human resources, machinery or supporting equipment, incomplete procedures, and the hospital environment, which are major obstacles. Hospital X needs to improve vector and pest control activities, as they can negatively impact patients, their families, and staff. Hospital X can provide mosquito extermination equipment in every room, make Ovitraps, hospital walls, carry out control and eradication, and impose sanctions on individuals who do not carry out their duties and responsibilities which hinder the success of vector control activities.

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