The Relationship Between Ship Space, Vector Presence, and Sanitation Food and Processing Waste to Sanitation Ships Anchored at Tobelo Port

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Abstract

The aim of the research is to analyze the connection between the condition of the room on the ship, the existence of vectors, the sanitation of food, and the processing of waste to level the sanitation of ships anchored at Tobelo Port. The type of research uses an analytic observational design with a cross-sectional approach. The population study is all over the anchored ship during the period of research, with samples taken according to the criteria of eligibility, inspection, and sanitation of the ship. Data collected through observation, interviews, and assessment checklists of sanitation boats based on guidelines of the Ministry of Health of the Republic of Indonesia. Data analysis was carried out in a univariate and bivariate way using the chi-square test. The results of the study show that there is a significant relationship between condition room ships ($p<0.05$), presence of vectors ($p<0.05$), food sanitation ($p<0.05$), and waste processing ($p<0.05$) and the level of sanitation on the ship. The ship is in clean condition, has a free room vector, has management of hygienic food, and has good waste processing, showing an adequate mark for sanitation and a healthy environment on the ship. In conclusion, the internal factors of the ship, like room, control vectors, sanitation food, and systems processing waste, play an important role in guarding the sanitation of the ship. Required improvement supervision and routine guidance by officers of the health harbor ensure every anchored ship fulfills the established standard of sanitation.

Keywords: processing waste; room ship; sanitation food; sanitation ship; vector

INTRODUCTION

The ship means transportation on the sea that has a vital role in supporting human mobility and the distribution of goods, as well as interregional economic activity. However, ships can also become mediums for disease distribution if they are not managed with an adequate system of sanitation. Bad sanitation conditions on a ship can trigger the emergence of various infectious diseases, especially those caused by vectors and contamination of food or water (WHO, 2021). Therefore, the implementation of the principle of good sanitation on board boats becomes an important aspect of the effort to guard the health of ship crews, passengers, and the harbor environment.

Sanitation boats cover various aspects, including room cleanliness and ventilation, vector control, food sanitation, and waste system processing. Every aspect of the owner's relatedness in guarding the quality of the environment ships to be free from contamination. Indonesian Minister of Health Regulation No. 40 of 2015 concerning Implementation of Environmental Health on Ships confirms that every boat must fulfill sanitation conditions, which include a condition room, a clean water source, facilities for processing food, and systems for disposing of waste to avoid the risk of disease consequences in an environment that is not healthy (Ministry of Health of the Republic of Indonesia, 2015).

Ships with damp, dirty, and poorly ventilated rooms can become places for the development of pathogenic microorganisms as well as vectors of diseases like rats, flies, and cockroaches (Environmental Health Service, Maritime Transportation,

2020). Likewise, with management, food that is not hygienic and system disposal waste that is not in accordance with standards can increase the risk of contamination and pollution of the environment (Purwanti et al., 2021). Bad sanitation and food on the ship have proven to contribute to foodborne disease incidents among passengers at sea (WHO, 2020).

Tobelo Port, as one of the harbors, the main area in North Halmahera Regency, has intensity. Then cross enough ship high, good boat passenger and boat goods. Based on initial results observed by officers from the Tobelo Port Health Office (KKP) in 2024, they still found a number of boats with inadequate sanitation that did not fulfill standards, such as dirty rooms, vectors in the kitchen and bedroom areas, machines, and a system processing waste that is not optimal. Conditions the potential lowers level sanitation ship and can impact the health of the crew boat and the environment around the port (KKP Tobelo, 2024). Research previously by Suryani and Nugroho (2022) stated that the condition of the sanitation room, control of vectors, and systems management of waste have their own significant connection to the level of eligibility for sanitation on the ship. Similar results were also reported by Rahman et al. (2023), who found that boats with good management, food, and waste showed marks of adequate inspection and sanitation according to Ministry of Health standards.

Studies about sanitation boats have been carried out in various big harbors in Indonesia, but they are still limited to certain aspects like room cleanliness or waste management. In the eastern region of Indonesia, especially Tobelo Port, there has not been much research that comprehensively analyzes the connection between the condition of the room on the ship, the existence of vectors, the sanitation of food, and the processing of waste to the level of sanitation on the ship. Local data limitations caused a research gap that needed to be filled to give a comprehensive description of factors that influence sanitation ships in the area. Therefore, the aim of the study is to know and analyze the connection between the condition of the room, the ship, the existence of vectors, food sanitation, and waste processing to the level of sanitation of ships anchored at Tobelo Harbor. This research in a way has a special aim: to evaluate the condition of the room on the ship, identify the existence of vectors, assess food sanitation, evaluate the system for processing waste, and determine the relationship between each factor and the sanitation status of the boat in a way overall.

METHODS

Type and Design Study

The study is quantitative with an analytic observational design using a cross-sectional approach. The design used for the known connection between independent variables (condition of room ship, existence of vectors, sanitation of food, and processing of waste) and the dependent variable (level of sanitation of ship) at the same time (Sugiyono, 2021).

Location and Time of Research

The study was conducted at Tobelo Port, North Halmahera Regency, North Maluku Province. Research time is planned during February-April 2025, covering stage preparation, data collection, and analysis.

Population and Sample

The population in the study is all boat passengers docked at Tobelo Port during the research period. The total of five ships and all the crew members (ABK) who are responsible answer in ship. Size samples in research, namely total sampling, where all population taken becomes the sample, namely the KM. Aksar Saputra 23 ship, the KM. the Ales Mulia ship, the KM. Rizki 03 ship, the KM. Tiga Putri Bori ship, and the KM. Citra Bahari Baru ship (**Figure 1**).

Figure 1. Ships in the port tobelo

The instrument study used the form of sheet observation sanitation boat adapted from the inspection checklist sanitation boat based on Minister of Health Regulation No. 40 of 2015 and the WHO Guide to Ship Sanitation (2020). The instruments have been used in a way area by the Port Health Office and declared valid as a tool for inspection of sanitation boats.

RESULTS AND DISCUSSION

Research results show that there is a connection between the condition of the room on the ship, the existence of vectors, the sanitation of food, and the processing of waste to the level of sanitation on ships anchored at Tobelo Port. Sanitation rooms in some boats are still not good enough in terms of lighting, scattered rubbish in the room, bad air exchange, dirty toilets, smelliness, and the way washing is not good enough. The room does not have enough ventilation, and less lighting and cleanliness tend to become sources of contamination and the development of microorganisms as well as vector diseases. The findings in line with various studies previously stated that factors of the environment on the ship, the level of cleanliness, and the health of the environment work as well as the influence of the risk of disease transmission (Rahman et al., 2023; Suryani & Nugroho, 2022). In general, ships with clean condition rooms, minimal vectors, hygienic food management, and good waste processing systems have better sanitation marks compared to boats with poor management (**Table 1**). Findings support results from a study previously by Rahman et al. (2023) and Purwanti et al. (2021), who stated that environmental factors are directly influential to the eligibility of sanitation ships and the health of the boat crew.

Table 1. Sanitation scores boat

Ship Name	Sanitation room	Existence vector	Sanitation food	Processing waste	Information
KM. Aksar Saputra 23	90	85	80	80	fulfil condition
KM. Ales Mulia	80	75	75	85	fulfil condition
KM. Rizki 03	75	75	75	85	fulfil condition
KM. Tiga Putri Bori	75	75	75	75	fulfil condition
KM. Citra Bahari Baru	75	75	75	75	fulfil condition

Observation of sanitation parameters room-based on calculation of sanitation scores on ships with a standard score of 60, so the result is that all boats fulfill the condition of standard sanitation in accordance with the provisions of the Ministry of Health and WHO.

Table 2. Relationship sanitation room, existence vectors, sanitation food and processing waste to sanitation boat

Sanitation boat	Sanitation room	Existence vector	Sanitation food	Processing waste	Information
KM. Aksar Saputra 23	0.01	0.08	0.05	0.09	there is connection
KM. Ales Mulia	0.01	0.06	0.02	0.09	there is connection
KM. Rizki 03	0.01	0.02	0.06	0.05	there is connection
KM. Tiga Putri Bori	0.01	0.03	0.09	1.00	there is connection
KM. Citra Bahari Baru	0.01	0.09	0.02	0.07	there is connection

The results of the Chi-Square test show that the p-value is <0.05, which indicates that there is a significant relationship between the ship sanitation variables and the room sanitation variables, the presence of vectors, food sanitation, and waste processing on ships of the KM. Aksar Saputra 23 ship, the KM. Ales Mulia ship, the KM. Rizki 03 ship, the KM. Tiga Putri Bori ship, and the KM. Citra Bahari Baru ship.

Relationship between the condition of the ship's rooms and the ship's sanitation
Condition room good ship reflect existence system Maintained cleanliness and ventilation. The damp room, not well ventilated, and rarely cleaned can become a place where microorganisms and disease vectors develop and breed. Observation results in several boat shows that boats with clean rooms, enough ventilation, and good lighting tend to mark inspection adequate sanitation standards. This is in accordance with WHO guidelines (2020), which emphasize that quality air, ventilation, and lighting are main components in boat sanitation to prevent respiratory disease and skin infection. Condition room boat reflects management cleanliness as well as awareness crew boat to importance environment healthy

work. Ships with good ventilation, enough lighting, and cleanliness awake show better sanitation marks. On the other hand, the ship with limited ventilation, space, dampness, and moldy walls had a low sanitation mark. Causal factors differ, among others: age of ship, frequency of care, amount of crew on ships, and compliance to inspection routine from port authority. The research is in line with Suryani and Nugroho (2022), who emphasized that age, ships, and management maintenance contribute greatly to the condition of sanitation rooms.

Relationship between vector presence and ship sanitation

The existence of vectors like rats, flies, and cockroaches on the ship is a direct indicator of low-level cleanliness and sanitation. Research found that boats with existence vectors show lower sanitation marks compared to boats without vectors. The condition can happen because of the existence of an open food source, stacked trash, and gaps in the room of the ship that become places for nesting vectors. This result is in line with Environmental Health Service research on Sea Transportation (2020) and Purwanti et al. (2021), which explains that the existence of vectors is an important indicator in determining the sanitation status of a ship because they can become a medium for the distribution of diseases such as leptospirosis and salmonellosis.

The different quantities and types of vectors found in each boat were influenced by the cleanliness of the deck, the storage of food, and the system for disposal of garbage. Ships that have places to store food closed and routinely do pest control show no existence of vectors like rats, cockroaches, or flies. Meanwhile, that ship with a pile of domestic material waste and rubbish becomes a more risky place for nesting vectors. Findings are similar to results from Environmental Health Service research on Sea Transportation (2020) and Purwanti et al. (2021), which state that the existence of a vector is the main indicator of ship sanitation. Differences between ships in Tobelo can also be due to the length of time the boat is anchored as well as the different routes and voyages that affect exposure to the environment and different ports.

Relationship between ship food and sanitation

Aspects of food sanitation on board play a big role in the health of ship crews and passengers. Research results show that boats with good food management (storage, processing, and serving) and hygiene have higher sanitation marks. Some boats still do not have their own facility to wash hands or a storage area to keep food separate from material chemistry, which can increase the risk of contamination. According to WHO (2020), food management on board must fulfill the principles of food hygiene, which include security of materials, cleanliness of tools, and control of temperature. Findings This strengthens the results of research by Rahman et al. (2023), which states that sanitation food has a significant connection with eligibility for sanitation boats.

Ships with a clean galley, a separate washing area, and food storage in accordance with standards tend to get better sanitation scores. However, still there is the ship that is not own facility wash hand adequate and mixing material food raw with ripe. This showed the existence of different levels of knowledge and training of the crew boat about food hygiene. The research is in line with Rahman

et al. (2023) and WHO (2020), which emphasize that food sanitation on board is the main factor in preventing disease from default food (foodborne diseases).

Relationship between processing ship waste and sanitation

Processing system waste on ships becomes an important factor in guarding the cleanliness of the environment of ships and port waters. Ships that have good system separation and waste disposal get higher sanitation marks compared to ships that dump waste directly into the sea without management. These results support the findings of Suryani and Nugroho (2022), which show that management waste that is not in accordance with standards can pollute the environment and reduce the mark of sanitation. According to Minister of Health Regulation No. 40 of 2015, every boat must own a facility for collecting and storing waste before handing it over to the facility for processing at the port.

Processing waste on ships is greatly influenced by the availability of facility storage waste (waste holding tank) and the type of machines, as well as compliance with environmental regulations. Ships that have system separation waste solid and liquid as well as throw away waste to the facility official harbor their own mark of sanitation, higher compared to direct ship throw away waste to sea. Causal factors differ between the boat covering the awareness environment, the crew ship, and the surveillance authority port, as well as the type of operation ship. This result supports the findings of Suryani and Nugroho (2022), which explain that management waste that does not fulfill standards can pollute the sea environment and lower the mark of sanitation boats.

Limitations study

The study has its own limitations on the number of samples, which only consists of five ships, so that the result can't be generalized for all other ships at Tobelo Harbor. A small sample size can lower external validity and statistical test power; however, it can still give a beginning description about the condition of sanitation vessels in the research area. Limitations on sample amount due to limitations on time of implementation, the scheduled arrival of the ship that is not certain, and permission for inspection from the party manager of the ship. Although the sample amount can still give a beginning description about the condition of sanitation on ships in the research area, the results can't be generalized in a wide way for all ships operating at Tobelo Port and other harbors.

CONCLUSION

In a general way, the results of the study showed that internal ship factors like the condition of the room, the existence of vectors, and the sanitation of food and waste processing have a close connection with the sanitation status of the ship. Improved supervision and guidance by the Tobelo Port Health Office are required to ensure all anchored ships fulfill standard sanitation in accordance with provisions of the Ministry of Health and WHO.

ACKNOWLEDGEMENT

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