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Risk Factors for Disease Occurrence in Pig farming in Medan Belawan sub-district, Medan City

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ABSTRACT

Pigs are one of the commodities that have been reported with many cases of sudden death due to outbreaks of disease viruses, so it is necessary to identify risk factors that have the potential to play a role in the emergence/transmission of disease viruses in pigs in Medan Belawan District. This study aims to identify several risk factors that have the potential to be sources of disease transmission, includes pen management, biosecurity management, waste management, disease prevention systems, sanitation and disinfection, carcass disposal systems and how these factors influence disease emergence in pig farming businesses. This research is a quantitative design that uses non-probability sampling with purposive sampling technique. The number of samples were 70 farmers from 3 sub-districts in Medan Belawan District, namely: Bagan Deli Village, Belawan Bahagia Village and Belawan Sicanang Village. The instrument test used is the validity and reliability test. The results of this study are that pen management partially has a positive effect on the risk of disease emergence in pig farming businesses, with a t-value of 2.258 and a sig. value of 0.028, Biosecurity management partially has a positive effect, with a t-value of 7.526 and a sig. value <,001, Waste processing partially has a positive effect, with a t-value of 2.390 and a sig. value. 0.017, partial disease prevention has a positive effect, with a t-value of 2.453 and a sig. value of 0.031, partial sanitation and disinfection have a positive effect, with a t-value of 5.047 and a sig. value <0.001, the carcass disposal system partially does not have a significant effect on the risk of disease emergence in pig farming, with a t-value of -0.733 and a sig. value of 0.466. The conclusion of this study that the independent variables/ risk factors as a whole have a significant effect on the dependent variable/ disease emergence.

Keyword: Biosecurity, Disease, Pigs, Transmission, Waste processing

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1. Introduction

Pigs are sensitive livestock to extreme environments. Pigs can be hosts that allow the virus to exchange genes, introducing new and dangerous strains. Pandemic viral diseases or outbreak is inseparable from animal health management on farms. Poor husbandry and animal health management systems can make a the situation worse by accelerating the spread of infectious animal diseases into the pig population. in the pig population. Pig health management includes management of management, disease control, livestock waste, sanitation and disinfection, biosecurity management, pest control, health status, carcass disposal systems, health status, pig carcass disposal systems and whether pigs come into contact with other pigs [1].

In Medan city, there are several sub-districts that have quite a large pig population. One of them is Medan Belawan. This area was chosen as the research location because based on observations in the field, pig farming in Medan Belawan Sub-district is still very traditional and there are many problems that refer to the susceptibility to viral diseases to the vulnerability of contracting viral diseases. Farmers in this sub-district generally build stilt-style pens made entirely of wood as a whole. The cages are also relatively simple because there are no supporting facilities. There are no supporting facilities in the pens other than lights and feed and water containers. The distance between pig pens between farmers also tend to be very close and often close together. This situation is actually not advisable considering that most of the diseases that diseases that infect pigs are viruses. Not only the pens between farmers, but the distance between pens and residential areas is also only about 5 meters [2,3].

Based on observations, farmers also rarely vaccinate and give vitamins, as well as the application of biosecurity and disinfection is still minimal. This situation is clearly very vulnerable to disease and can also lead to the spread of the disease which will be very difficult to control [4-6]. Therefore, a structured survey of pig farmers needs to be conducted to look at factors that have the potential to increase the risk of disease occurrence in pig farming. The objective of this study is to identify risk factors that play a role in disease transmission in Medan District Belawan Sub-district so that farmers can take precautions or take control measures against factors that have the potential to cause disease take control measures against factors that have the potential to be source of disease transmission.

2. Method.

2.1. *Research Methods*

The types of data used in this study include primary data and secondary data. Primary data is data obtained directly by researchers from respondents or research sources through interviews. While secondary data is supporting data needed in research and obtained from related institutions or agencies. The data collection technique in this study is to use data triangulation, namely the technique of collecting data by combining observation, interviews / questionnaires and literature studies.

2.1.1. *Observation/survey*

Observation is a method used to collect data by observing and recording directly at the research location.

2.1.2. *Interview*

Interview is an activity to collect data by conducting dialog, discussion and asking questions directly to research respondents. In addition to conducting interviews with respondents, to collect data directly. In this study, interviews were conducted to ensure that respondents met the criteria needed in this study.

2.1.3. Questionnaire

The questionnaire is data collection by asking questions through a list of written statements to be filled in by respondents, a form of statement accompanied by alternative answers and the respondent only has to choose one of these alternative answers.

2.2. Data Analysis

2.2.1. Qualitative Descriptive Analysis

Firtsly, all the required research data is collected which then the data obtained will be analyzed descriptively qualitatively, namely the presentation of the results of the data collected to be further reviewed, studied, interpreted and arranged into certain categories to be analyzed in accordance with the author's reasoning ability. Finally, the result will achieved in the form of conclusions. Descriptive analysis was used to identify the role and level of importance of the research objects, namely housing management, biosecurity management, waste treatment, disease prevention, sanitation and disinfection, carcass disposal system control.

2.2.2. *Research Instrument Test*

The research instrument test consists of 2 tests that need to be carried out, namely the validity test which functions to measure the validity of a questionnaire data, according to [7] the validity test is carried out using the *pearson correlation* method by looking at the rcount and rtablevalues. If rcount is greater than rtable then the data is said to be valid. The rtable value used in this study is 0.2423. Then for the second instrument test is the reliability test which serves to determine the feasibility of the instrument. if the reliability coefficient value or Cronbach's alpha is above 0.60, it is said to be realizable, otherwise if it is less than 0.60, it is not realizable, [7].

2.2.3. *Classical Assumption Test*

In this study, the classic assumption tests used include normality test, multicollinearity test and heteroscedacity test. The normality test serves to see whether the residual data in this study is normally distributed or not. This can be seen by looking at the significance value. If the significance value is greater than 0.05, it can be stated that the residual data is normally distributed and vice versa. The normality test was carried out using the *Kolmogrov-Smirnov* test [8].

Then there is a multicollinearity test to see if there is a correlation between the independent variables (free). This can be seen by looking at the Variance Inflation Factor (VIF) value and tolerance value. The data is said to have no multicollinearity problem if the tolerance value is <0.10 and the VIF value is> 10 and vice versa [9]. Next is the heteroscedacity test, this test is carried out to see whether in the regression model used there is an inequality of variance from the residual observations. The regression model is said to be homoskedasitas if the residual variant of an observation to another observation is constant, otherwise if it is different it is said to be heteroskedasitas [10].

2.2.4. *Multiple Linear Analysis*

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

Description:
Y = Risk of Disease Occurrence
α = Constant Value
β = Regression Coefficient
x_1 = Housing Management
x_2 = Biosecurity Management
x_3 = Waste Management
x_4 = Disease Prevention
x_5 = Sanitation and Disinfection
x_6 = Carcass Disposal System
ε = Standard error

This study uses the t test and F test, as well as the determination test (R2), each to see the significance value of 5% (0.05), meaning that if the t test is greater then the hypothesis is rejected, but if it is less than 0.05 the hypothesis is accepted, the t test or partial test serves to see the effect of each independent variable on the dependent variable. While the F test is carried out to see the effect of the independent variable on the dependent variable, then the determination test (R2) is carried out to measure how far the model's ability to explain the variation in the dependent variable [11].

3. Result and Discussion.

3.1. Multiple Regression Analysis Results

The multiple linear regression analysis model was used in this study to examine the hypotheses put forward. The following are the results of multiple linear regression calculations that have been included in Table 1. The multiple regression analysis that has been carried out produces regression coefficients,**tcount** values and significance levels as shown in table 1.

Table 1. Multiple Regression Analysis Results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
4. 1	(Constant)	6,948	1,280		5,064	<,001
	Housing Management (X_1)	-0,287	0,100	-0,309	-2,258	0,021
	Biosecurity Management (X_2)	-0,858	0,190	-2,902	-7,314	<,001
	Waste Management (X_3)	-0,212	0,147	-1,215	-2,210	0,029
	Disease Prevention (X_4)	-0,472	0,112	-0,205	-2,453	0,021
	Sanitation and Disinfection (X_5)	-0,453	0,125	-1,395	-2,356	<,001
	Carcass Disposal System (X_6)	-0,209	0,118	-0,578	-1,892	0,036

From these results, if the regression equation is written in *standardized corfficient* form as follows:
Y = 6.948 - 0.287 $_{X1}$ - 0.858$_{X2}$ - 0.212 X3. 0.472 X4 - 0.453 X5. 0.209 $_{X6}$ +
Description:
Y = Risk of Disease Occurrence
= Constant Value
= Regression Coefficient
$_{X1}$ = Housing Management
$_{X2}$ = Biosecurity Management
$_{X3}$ = Waste Management
$_{X4}$ = Disease Prevention
$_{X5}$ = Sanitation and Disinfection
$_{X6}$ = Carcass Disposal System
= Standard error
Based on the results of the regression equation, it can be explained that:
a. The constant (a) obtained a regression coefficient of 6.948 with a positive coefficient sign. This shows that if all independent variables (housing management, biosecurity management, waste treatment, sanitation and disinfection and carcass disposal system) are considered equal to zero (0) then the value of the dependent variable (risk of disease occurrence) is 6.948.
b. Variable X1 (Housing Management) obtained a coefficient of -0.287 with a negative coefficient sign. So it can be concluded that every 1 point or temporary unit increase in the housing management variable will reduce the risk of disease occurrence by - 0.287.
c. VariableX2 (Biosecurity Management) obtained a coefficient of -0.858 with a negative coefficient sign. So it can be concluded that every 1 point or temporary unit increase in the biosecurity management variable will reduce the risk of disease occurrence by -0.858.

d. Variable X3 (Waste Management) obtained a coefficient of -0.212 with a negative coefficient sign. So it can be concluded that every increase of 1 point or temporary unit in the waste treatment variable will reduce the risk of disease occurrence by -0.212.
e. Variable X4 (Disease Prevention) obtained a coefficient of -0.472 with a negative coefficient sign. So it can be concluded that every increase of 1 point or temporary unit in the Disease Prevention variable, will reduce the risk of disease occurrence by -0.472.
f. Variable X5 (Sanitation and Disinfection) obtained a coefficient of -0.453 with a negative coefficient sign. So it can be concluded that every increase of 1 point or temporary unit in the sanitation and disinfection variable, will reduce the risk of disease occurrence by -0.453.
g. Variable X6 (Carcass Disposal System) obtained a coefficient of -0.209 with a negative coefficient sign. So it can be concluded that every 1 point or temporary unit increase in the carcass disposal system variable will reduce the risk of disease occurrence by -0.209.

3.2. Effect of Housing Management on the Risk of Disease Occurrence

The results of the analysis used to see the effect of the variable of housing management on the risk of disease occurrence, it is obtained that variable X_1 (housing management) has a significance value of 0.021 which is smaller than 0.05. The housing management variable obtained test results with atcount value of -2.258 > ttable (1.669). This shows that housing management affects the risk of disease occurrence in pigs in Medan Belawan Sub-district, Medan City while this occurrence also found by [12] study, Based on the questionnaire results 94.2% of livestock pens are close to residential areas, 91.4% of pens are close to each other, 97.1% of farms do not have isolation pens, 72.8% of pens are made of simple wood, 67.1% of farms have cleaning equipment used.

Square-shaped with a size of approximately 1 x 2 meters, the distance between one farmer and another is only approximately 1 to 3 meters, even in some locations the cages between farmers have no distance at all / close together. The location of the farms is also close to residential areas, some are located directly behind the farmer's house, some are on the edge of the settlement but only about 5 meters away from the nearest resident's house. Almost all farmers do not have isolation cages, and only have 2 or 3 plots of cages for breeding cages, puppies, and fattening cages ready for sale. The majority of farmers only have a water bucket as a means of transporting water and cleaning the cage by directly pouring the water into the cage and the feces will fall directly to the bottom of the cage.

3.3. Effect of Biosecurity Management on the Risk of Disease Occurrence

The results of the analysis used to see the effect of the biosecurity management variable on the risk of disease occurrence, it is obtained that the variable X_2 (biosecurity management) has a significance value of <.001 which is smaller than 0.05. The biosecurity management variable obtained test results with atcount value of -7.314> ttable (1.669). This shows that biosecurity management affects the risk of disease occurrence in pigs [13]. It can be interpreted that the biosecurity management variable has a negative and significant effect on the variable risk of disease occurrence in pig farms in Medan Belawan Sub-district, Medan City.

Based on the questionnaire results 71.4% of farms do not apply foot dipping, foot dipping is very important to do because footwear that is directly in contact with the ground is very at risk of carrying viruses from outside the barn. 87.2% of farms do not quarantine livestock, this happens because farmers do not provide special quarantine pens. 80% of farmers did not prohibit people from entering the cage area and 68.5 farmers did not restrict vehicles from entering the cage area. The majority of farmers build their cages at the end of residential roads, so it is not possible to prohibit people or vehicles from entering or passing through the cage area. 54.2% of farmers had their own

clothes and the remaining 45.8% chose to use their daily clothes when feeding and cleaning the cattle pens.

3.4. Effect of Waste Management on the Risk of Disease Occurrence

The results of the analysis used to see the effect of the waste treatment variable on the risk of disease occurrence, it was found that variable X3 (waste treatment) has a significance value of 0.029 which is smaller than 0.05. The waste treatment variable obtained test results with atcount value of -2.210> ttable (1.669). This shows that waste management affects the risk of disease occurrence in pigs. It can mean that the waste management variable has a positive and significant effect on the risk of disease occurrence variable [14].

The results of the questionnaire showed that 81.4% of farmers dispose of livestock waste directly to the sea or river, when bathing livestock or cleaning cages, farmers usually only directly water the livestock/cages and the waste will fall directly under the cage, namely to the sea/river and the remaining 18.6% choose to collect waste in sacks first and then when the sacks are full, the waste is disposed of to the sea/river. This result occurs because the cages are not located in the river/sea area so farmers cannot directly dispose of the waste under the cages. No farmer has a waste storage pond, nor does any farmer process waste or sell it.

3.5. Effect of disease prevention on the risk of disease occurrence

The results of the analysis used to see the effect of the disease prevention variable on the risk of disease occurrence, it is found that variable $_{X4}$ (disease prevention) has a significance value of 0.014 which is smaller than 0.05. The disease prevention variable obtained test results with atcount value of -2.453> ttable (1.669). This shows that disease prevention affects the risk of disease occurrence in pigs [15]. It can be interpreted that the disease prevention variable has a negative and significant effect on the risk of emergence variable. Based on the results of the questionnaire, no farmers vaccinated their animals, this occurred due to the lack of information to farmers in obtaining vaccines for their animals. No farmer gives vitamins or health checks to their animals, and 52% of farmers do not clean the outside area of the cage.

3.6. Effect of Sanitation and Disinfection on the Risk of Disease Occurrence

The multiple linear regression analysis used obtained results to see the effect of sanitation and disinfection variables on the risk of disease occurrence, it was found that variable X5 (sanitation and disinfection) had a significance value of <0.001 which is smaller than 0.05. The sanitation and disinfection variable obtained test results with atcount value of -2.356> ttable (1.669). This shows that sanitation and disinfection affect the risk of disease occurrence in pigs [16]. It can mean that the variables of sanitation and disinfection have a negative and significant effect on the variable risk of disease occurrence in pig farming in Medan Belawan Sub-district, Medan City.

The results of the questionnaire 64.2 showed that farmers do not clean the cages regularly, the majority of farmers only flush livestock feces with water without brushing or even sweeping the feces left on the floor of the cage. 84.2% of farmers bathe their animals regularly, usually they bathe their animals once a day. 75.7% of farmers did not use any solution when cleaning the cage equipment, farmers only used sea/river water obtained from under the cage. 72.8% did not sanitize cages, 67.1% did not empty cages used by sick livestock while the rest did sanitize and empty cages, 32.9% of farmers moved sick livestock to a place far from the cage and even some farmers deliberately culled sick livestock to reduce the possibility of the disease virus spreading further.

3.7. Effect of Carcass Disposal System on the Risk of Disease Occurrence

The results of the analysis conducted to see the effect of the carcass disposal system variable on the risk of disease occurrence, it is found that variable X6 (carcass disposal system) has a significance value of 0.036 which is greater than 0.05. The carcass disposal system variable obtained test results with atcount value of -1.892 > ttable (1.669). This shows that the carcass disposal system has no effect on the risk of disease occurrence in pigs [17]. It can be interpreted that the carcass disposal system variable has a significant effect on the variable risk of disease occurrence in pig farms in Medan Belawan Sub-district, Medan City.

Not only does it have a negative impact on the risk of disease occurrence, pig carcasses dumped into the river/sea also have a negative impact on the surrounding environment and other commodities. This is related to the findings of (Butar-butar *et al.*, 2022) where there was pollution of the lake in Siombak due to the impact of disposal of pig carcasses affected by the Hog Cholera virus. That in the environmental pollution of pig carcasses can be said to be a new case where the police were very overwhelmed in handling the case where animals died up to 5,800 pigs where the animals could be from all over the city of Medan and the end point at Lake Siombak. So it can be concluded that the variable carcass disposal system, especially the actions of farmers who throw carcasses into the river, not only has a significant effect on the pig business itself, but these actions also affect the environment, especially waters, which can trigger more complex environmental problems.

Based on the results of the questionnaire, 60% dumped their carcasses into the river/sea and 40% chose to bury their carcasses. 92.8% of farmers who buried their animals did not do so far from the pen area, usually in the area around the farmer's own property. 98% of farmers did not agree with burning the carcasses of infected animals, this was considered troublesome and burning carcasses cannot be done carelessly, it must be done with a special machine. 94.2% of farmers do not sell infected/sick pigs, with the majority choosing to cull their animals rather than sell the meat even though the animals are not dead. This is in line with the fact that all farmers agree on the prohibition of consuming disease-infected livestock.

3.8. Effect of X1,X2, X3, X4, X5, X6 *on the Risk of Disease Occurrence (Y)*

This study with the F test obtained a significance value of 0.035 <0.05. Therefore, it can be concluded that there is a significant influence of the variables of housing management, biosecurity management, waste treatment, disease prevention, sanitation and disinfection and carcass disposal systems together on the variable risk of disease occurrence in pig farms in Medan Belawan Subdistrict, Medan City. Based on the coefficient of determination test, the *R square* value is 0.806 or 80.6%. This means that the independent variables (housing management, biosecurity management, waste management, disease prevention, sanitation and disinfection and carcass disposal system) simultaneously (together) can affect the dependent variable (risk of disease occurrence) by 80.6% and the remaining 18.4% is influenced by other variables outside this study.

4. Conclusions and Suggestions

4.1. Conclusion

This study conducted on the influence of housing management, biosecurity management, waste management, disease prevention, sanitation and disinfection and carcass disposal system on the risk of disease occurrence in pig farms in Medan Belawan Sub-district, Medan City. The following conclusions can be drawn:

1. Housing management partially affects the risk of disease occurrence in pig farms, with atcount value of -2.258 > ttable 1.669 and a significance value of 0.021 <0.05, then H01 is rejected and H1is

accepted . So it is concluded that the housing management variable has a significant effect on the risk of disease occurrence.
2. *Biosecurity* management partially affects the risk of disease occurrence in pig farming, with atcount value of -7.314 > ttable 1.669 and a significance value of <.001 < 0.05, then $_{H02}$ is rejected and H2 is accepted . So it is concluded that the biosecurity management variable has a significant effect on the risk of disease occurrence.
3. Waste management partially affects the risk of disease occurrence in pig farming, with atcount value of -2.210 > ttable 1.669 and a significance value of 0.029 <0.05, then H03 is rejected and H3is accepted . So it is concluded that the waste treatment variable has a significant effect on the risk of disease occurrence.
4. Disease prevention partially affects the risk of disease occurrence in pig farming, with atcount value of -2.453 > ttable 1.669 and a significance value of 0.014 <0.05, then H04 is rejected and H4is accepted . So it is concluded that the disease prevention variable has a significant effect on the risk of disease occurrence.
5. Sanitation and disinfection partially affect the risk of disease occurrence in pig farming, with atcount of -2.356 > ttable 1.669 and a significance value of <0.001 <0.05, then H05 is rejected and H5is accepted . So it is concluded that the variables of sanitation and disinfection have a significant effect on the risk of disease occurrence.
6. Carcass disposal system partially affects the risk of disease occurrence in pig farming, with atcount value of -1.892 > ttable 1.669 and a significance value of 0.036 > 0.05, then H06 is rejected and H6is accepted . So it is concluded that the variables of sanitation and disinfection do not have a significant effect on the risk of disease occurrence.
7. Based on the results of the statistical simultaneous F test, the variable data as a whole has a significance value of 0.035 <0.05, so it can be concluded that individually the independent variables as a whole have a significant effect on the dependent variable (risk of disease occurrence).

4.2. Suggestion

Based on the conclusions above, the suggestions that researchers convey in this study are as follows:
1. For Breeders

Farmers should pay more attention to the maintenance management adopted at this time, especially those variables in this study, to avoid a decline in productivity due to disease and mass mortality in pigs which will certainly cause losses to farmers and also cause environmental problems due to the carcasses of these pigs.
2. For future researchers

Future researchers can develop this research by examining other factors that potentially have an influence on the risk of disease occurrence in pig farming. Similar research can also be conducted in a different location from this study.

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