Indonesian Journal of Agricultural Research Vol.04, No. 01, 2021 | 21 – 30

talenta PUBLISHER

InJAR
Indonesian Journal of Agricultural Research

Seroprevalence and Risk Factor Analysis of Hog Cholera Disease at Small Farm in Deli Serdang Regency

Soula Wulandary, Ma'aruf Tafsin*, and Faisal

Animal Husbandry Department, Faculty of Agriculture, Universitas Sumatera Utara, Indonesia

Abstract. Hog cholera is an epizootic viral diseases that attack pig. The disease is caused by Pestivirus C which belongs to the genus Pestivirus and the family Flaviviridae. Information about the prevalence and risk factors of hog cholera incidence in North Sumatra and especially in the Deli Serdang Regency became the basis for this research. This study aims to find out the prevalence and factors associated with seropositive hog cholera in Deli Serdang Regency. Samples were taken using a random sample technique with a simple random type. A total of 196 blood samples were collected from 8 sub-districts, 11 villages, and 54 farms in the Deli Serdang district. Animal and breeder data were collected with questionnaires to determine the incidence and causative factors of hog cholera seropositive. Data analysed using univariable and multivariable logistical regression tests to determine the association between hog cholera infection and risk factors. The results showed that the prevalence of Hog Cholera seroposive events at the agricultural level was 9% (5/54) and the individual rate was 10% (20/196). The results showed that the prevalence of Hog Cholera seroposive events at the agricultural level was 9% (5/54) and the individual rate was 10% (20/196). The conclusion of this research that the risk factors associated with pig cholera were landrace pigs (OR 14,28, 95% CI: 1.04-195) were more likely to have seropositif than other breeds and vaccination (OR 0.0048, 95% CI: 0.004-0.498) potential factors reducing hog cholera infection.

Keywords: hog cholera, pigs farm, prevalence

1. Introduction

Animal husbandry has a strategic role in the provision of food and community empowerment as an alternative economic activities that is quite helpful to the community. Pork is widely consumed in the world has great potential to become an international trading commodity. Asia, especially Southeast Asia and East Asia have a vast pork culinary culture is no exception in countries with a majority Muslim population such as Malaysia and Indonesia [1].

Classical Swine Fever is considered one of the most relevant remergent viral disease in swine [2] also known as hog cholera. The disease attacks commercial and wild pigs. Hog cholera is caused by a virus from the genus Pestivirus, family of Flaviviridae which is strongly associated with Bovine Viral Diarrhea Virus and Border Disease [3]. Considering its severe repercussions from

*Corresponding author at: Animal Husbandry Department, Faculty of Agriculture, Universitas Sumatera Utara, Jl. Prof. Sofyan No. 3, Medan, Indonesia, 20155

E-mail address: maruf_tafsin@usu.ac.id

p-ISSN: 2622-7681 | e-ISSN: 2615-5842 | DOI 10.32734/injar.v4i1.5165
Journal Homepage: https://talenta.usu.ac.id/InJAR

an economic and sanitary standpoint, the disease is notifiable to the world organisation for animal health (OIE) [3].

Classical swine fever is characterized by fever, hemorrhages, ataxia, and purple discoloration of the skin; however, the clinical presentation varies, depending on host characteristics and the particular virus strain causing the infection. CSF occurs in several forms, including highly lethal, acute, chronic, or subclinical. Acute forms of CSF, associated with highly virulent CSFV strains, are characterized by an incubation period that is typically 3–7 days, with death occurring within 10 days after infection. Fever > 41°C (105.8°F) is usually seen and persists until terminal stages of the disease when body temperature drops and becomes subnormal. Constipation followed by diarrhea and vomiting is common [4].

This disease could spread through direct and indirect contact. Direct contacts could occur among pigs with or between pig and humans, particularly those who used to get close to the infected animals such as workers, visitor or veterinarians who work on the farms. Indirect contacts can occur through cages, work clothing or transport equipment tools such as motorcycles, wagon or truck. This virus will spread through contact with blood, nasal discharge and saliva, urine, faeces, and semen [5].

According to [6], the prevalence of hog cholera seropositive incidence in pigs in Sukoharjo regency is 29%. In this study found several factors associated with hog cholera at the livestock and farm level. Those factor were pig ($\chi 2 = 29.9$; OR= 81), rearing purposes ($\chi 2 = 9{,}768$; OR = 0), rearing type ($\chi 2 = 30.81$; OR = 21.5), rearing system ($\chi 2 = 41.0$; OR = 0.03), and vaccination ($\chi 2 = 15.08$; OR = 33.0). Results of [7] in Karanganyar showed that seroprevalence was 65.3% (252/386) while the factors associated with seropositives were training activities, last vaccine, type of rearing, washing materials, mating system and incidence of sudden death during the last three months.

The Deli Serdang district that borders Medan city, has a high pig farm population and one of the central pig farms in North Sumatera. So, pig movement became more frequent which is assumed to be main factor spreading virus where the hog cholera virus spreads from one farm to another vice versa. In North Sumatera the information about the prevalence and risk factors of hog cholera incidence is lacking. This study was conducted to find out the prevalence and risk factors of hog cholera on people's farms in Deli Serdang Regency. Research on prevalence and risk factors in livestock and livestock in Deli Serdang Regency has never been done.

This research expected to provide an overview of seroprevalence and risk factors that influence the occurrence of hog cholera disease in Deli Serdang Regency. Data from this study could be used as base for formulating policy in preventing and eradicating hog cholera disease, especially in Deli Serdang Regency anf more generally in North Sumatra Province.

2. Material and Methods

2.1. Time, Location, Sample Size, and Study Design

Cross-sectional study was carried out from October to December 2019. The objects of this research were some pig populations in Deli Serdang Regency. The number of samples used in this study was determined assuming the prevalence value of suspected hog cholera by 14% with a confidence level of 95% and an error rate of 5%. Pig farming were sampled by probability sampling method with simple random sampling. Information about farm management is obtained by interview. Interviews were conducted in person using structured questionnaires to identify possible factors associated with the presence of hog cholera, as described in the data analysis section.

2.2. Sample Collection and Serological Assay

Blood samples (2ml) were taken using a 3 ml syringe without anti-coagulant from the anterior vena cava and immediately incubated at room temperature for an hour in an inclined position. The blood was then incubated for 18 hours at 40°C to get serum. The serum was separated and accommodated into the Eppendorf tube then stored at a temperature of -20°C until an antibody test was carried out. Detection of antibodies of hog cholera was made using Competitive ELISA. The Testing Stage was carried out according to the procedure issued by the kit manufacturer. Reagents used in the form of ELISA Kit antibodies hog cholera VDPro ® CSFV Antibody C-ELISA Kit. JENO Biotech Inc.

2.3. Data Analysis

Seroprevalence hog cholera was measured at an individual level and pig farms that were not vaccinated. If the ELISA test showed seropositive result then the pigs are identified to have antibodies against hog cholera. Farm management informations were collected in the excel form, and then analyzed using univariable and multivariable logistics regression model (EPI Info 7 CDC). The initial univariable analysis was used to identify possible links between variables and results. Each risk factor with a p-value of ≤0.25 was followed by multivariable analysis. In the second stage analysis grouped variables with a multivariable backyard logistics regression model using a possible p-≤ ratio test of 0.05 were considered a factor related to hog cholera.

3. Result and Discussion

A total of 196 serum samples were collected from 54 pig breeders. Samples from eight sub-districts and 11 villages in Deli Serdang regency was presented Table 1.

Table 1. Recapitulation of Hog Cholera Surveillance Samples in Deli Serdang Regency

District	Village	Number of Breeders	Number of Samples
STM Hilir	Negara Beringin	4	12
Beringin	Sidoarjo dua ramunia	3	10
Hamparan Perak	Kelambir V kebun	2	17
Lubuk Pakam	Pasar melintang	1	9
Percut Sei Tuan	Amplas	21	63
	Cinta Damai	6	11
	Tanjung rejo	1	2
	Tanjung selamat	1	2
Tanjung Morawa	Ujung Serdang	2	14
Patumbak	Marindal II	5	15
Pantai Labu	Denai Kuala	8	41
Total		**54**	**196**

The results of surveillance (Table 2) showed that the number of pigs owned by the farmer ranged from 5-600 heads with average number of 35 pigs. Most of the farmers 75.9%, reared the pigs in semi-intensive system in permanent stall with cemented floors and walls while roof were made from zinc or asbestos. This type of stall allowed the farmers to clean the stall and to feed the pigs reatively easy. Type of stall widely used by breeders in Deli Serdang Regency distict was semi-permanent and colonies 74.1%.

Table 2. Percentage of Livestock Parameters in Deli Serdang Regency

Parameters	Sub parameters	Percentage (%)
Pig type	Pig *Landrace*	26% (14/54)
	Pig Duroc	7%(4/54)
	Pig *Yorkshire*	22% (12/54)
	Pig local	11% (6/54)
	Pig crossing	34% (18/54)
Maintenance type	Intensive	24.1% (13/54)
	Semi Intensive	75.9% (41/54)
Cage type	Semi Permanent and colony	74.1% (39/54)
	Semi Permaneny dan communal	1.9% (1/54)
	Permanen dan colony	14.8% (8/54)
	Permanen dancommunal	9.2% (5/54)
Types of feeds	Bran	22.2% (4/54)
	Household waste	92.6% (50/54)
Water source	Well water	100%(54/54)
Vaccination	Vaccination	70.3% (38/54)
	No vaccine	29.7% (16/54)
Biosecurity	Applied	29. 6% (16/54)
	Not applied	70.4% (38/54)

The result of this research showed type of feed widely used by pig farmers in the Deli Serdang Regency comes from household waste 92.6% some pigs farmers 22.2% fed bran to their pigs. Feed is one of the factors have a big influence on the productivity of pigs. On pig farms, 60-70% of the total production cost comes from feeds. The utilization of household waste as feed can be benefit farmers because the need for animal feed can be supplied from results of this waste at very low cost.

Most farmers in the Deli Serdang district have been vaccinated 70.3%. The success of vaccination is determined by the formation of protective antibodies in the body of pig livestock, titer protective antibodies are influenced by various factors, one of which is by the age of pig livestock during the implementation and maternal status of piglet antibodies [8].

The application of biosecurity in pig farms Deli Serdang regency is very low, due to the lack of knowledge of farmers about the principles that must be applied in the farm. This biosecurity principle covers various precautions, control, and extermination of various infectious diseases as well as various measures to maintain human health as a manager of a production, animals, and the environment. Biosecurity includes three main things that must be considered by farmers, namely isolation, traffic control, and sanitation [9]. Moreover, a better biosecurity may help to improve productivity and may contribute to reducing the use of antibiotics. Biosecurity can be defined as the application of measures aimed to reduce the probability of the introduction (external biosecurity) and further spread of pathogens within the farm (internal biosecurity) [10].

Isolation means keeping livestock away from sources or carriers of pathogens, such as people, vehicles, and objects that can carry pathogens. Creating an environment where livestock are protected from carriers of pathogenic bacteria (people, other animals, air, and water). Traffic control is sought to screen people, tools, goods, and other animals so that the traffic activities that it does do not cause the entry of pathogens into the farm. Sanitation is an act of cleaning and disinfection to kill germs. Sanitation also means pest control efforts aimed at preventing pests (wild birds, rodents, and insects) from carrying pathogens [3].

Table 3. Univariable Analysis at the Individual Level of Pigs

Factor		Hog cholera Seropositif	Hog cholera Seronegatif	OR (95%CI)	π
Age	>6 monts	3	138	0.74 (0.30-1.78)	0.32
	≤6 monts	17	38	Ref	
Sex	Male	10	89	0.53 (0.69-2.23)	0.45
	Female	10	87	Ref	

The results of univariable analysis at the individual level of pigs showed a seropositive prevalence of 10% (20/196). At this stage, it was found that age and gender factors in individual pigs statistically did not affect the occurrence of hog cholera. Age ,>6 months and ≤6 months and the sex of the pig has no association with the incidence of hog cholera. The disease can attack pigs of all ages and all breeds. Hog cholera disease is acute (very rapid occurrence until it causes death, 1-7 days). In chronic cases, the incubation period ranges from 5-14 days to 3 months. [11]. The results of univariable analysis at the livestock level showed the prevalence of hog cholera seropositive events in Deli Serdang Regency in 2019 of 9% (5/54) (Table 4). Factors associated with the incidence of hog cholera in this study were pig type, cage type, biosecurity including free

access, access to owner-only breeders, isolation of new pigs, and vaccinations statistically affecting the occurrence of hog cholera.

Risk factors for the spread of hog cholera according to [12] namely, animal health management of the separation of sick animals from groups, separation of sows from infected groups–vertical contagion properties, traffic of pig and pig breeds (pig movements), management of animal rearing are organized in groups by age and multiplied, mixing of pigs in each market chain (market, village, and transportation), limited biosecurity status, direct or indirect transmission, vaccination, presence of wild pigs, management of pig farm products and by-product and the presence of mechanical vectors.

Table 4. Univariable Analysis at the Farm Level

Factor		HC (+)	HC (-)	OR (95%CI)	π
Pig Duroc	Yes	1	3	1.75 (0.16-19.0)	0.64
	No	8	42	ref	
Pig Yorkshire	Yes	2	10	1.75 (0.37-8.28)	0.7
	No	7	35	ref	
Pig Landrace	Yes	**6**	**8**	**9.24 (1.9-45.0)**	**0.059**
	No	3	37	ref	
Pig Local	Yes	0	6	undefined	
	No	9	39		
Cross pig	Yes	0	29	0.44 (0.10-1.87)	0.6
	No	9	16	ref	
Intensive	Yes	3	10	1.75 (0.37-8.28)	0.7
	No	6	35	ref	
Semi Intensive	Yes	6	35	0.57 (0.12-2.70)	0.7
	No	9	10	ref	
Extensive	Yes	0	0	undefined	
	No	9	9		
Semi-permanent and colony	Yes	6	33	0.72 (0.15-3.37)	0.8
	No	3	12	ref	
Permanent dan colony	Yes	**3**	**5**	**4.0 (0.75-21.2)**	**0.10**
	No	6	40	ref	
Semi-permanent dan communal	Yes	0	1	undefined	
	No	9	44		
Permanent communal	Yes	0	5	undefined	
	No	9	40		
Bran	Yes	2	10	1.0 (0.17-5.59)	1.0
	No	7	35	ref	
Household waste	Yes	8	42	0.57 (0.05-6.19)	0.4
	No	1	3	ref	
Pulp tofu	Yes	3	11	1.54 (0.33-7.23)	0.8
	No	6	34	ref	
Well water	Yes	9	45	undefined	
	No	0	0		
PAM water	Yes	0	0	undefined	
	No	9	45		
River water	Yes	0	0	undefined	
	No	9	45		
Knowledge of biosecurity	Yes	2	14	0.63 (0.11-3.44)	0.59
	No	7	31	ref	

Table 4. Continued

Factor	HC (+)		HC (-)	OR (95%CI)	π
Owner-only farm access	Yes	**8**	**30**	**3.99 (0.45-34.95)**	**0.21**
	No	1	15	ref	
Free Access	Yes	**1**	**14**	**0.27 (0.03-2.43)**	**0.24**
	No	8	31	ref	
Visit another farm	Yes	3	19	0.68 (0.15-3.08)	0.62
	No	6	26	ref	
Used APD (boots)	Yes	2	11	0.88 (0.16-4.90)	0.88
	No	7	34	ref	
New Pig Insulation	Yes	**6**	**18**	**3.0 (0.66-13.56)**	**0.15**
	No	3	27	ref	
Owner-only farm manager	Yes	5	29	0.68 (0.16-2.93)	0.61
	No	4	16	ref	
The manager of the owner's farm assisted workers	Yes	4	16	1.45 (0.34-6.17)	0.61
	No	5	29	ref	
Disinfecting the Cage	Yes	0	0	undefined	
	No	9	45		
Vaccination	Yes	**3**	**34**	**0.16 (0.03-0.75)**	**0.020**
	No	6	11	ref	

Additional factors that influence the spread of hog cholera disease are the high density of pigs in the geographic region, the high population of boars in direct contact with domestic pigs that can increase the risk of transmission and spread of hog cholera virus [13].

Table 5. Association of Risk Factors in Multivariable Analysis

Factor		OR (95%CI)	Π
Pig Landrace	Yes	**14.28 (1.0-195)**	**0.04**
	No	Ref	
Vaccination	Yes	**0.048 (0.0004-0.498)**	**0.01**
	No	Ref	

The results of the further analysis were carried out with a multivariable logistics regression model with a P-≤0.05 probability ratio test at the livestock level (Table 5). It is shown that landrace pig breeds had a 14 times higher becoming seropositive hog cholera compared to other pig breeds. Landrace pig breed has been reported to be Landrace pig breed has a higher level of stress compared to other breeds [14], which states that Landrace pigs are stress-sensitive types of pigs if cortisol hormone levels exceed normal levels so that it harms five main factors associated with pig livestock production namely: pig performance, reproduction, behavior, immunity and meat quality [15]. Stress affects the immune response and susceptibility to infection. Elevated levels of cortisol and epinephrine can disrupt homeostasis and increase susceptibility to disease through various mechanisms. Cortisol causes potential and immunosuppressive anti-inflammatory effects. This is evidenced by the administration of cortisol in large quantities reducing the inflammatory response to infections that cause pigs to be more prone to diseases such as hog cholera [16].

The results of multivariable analysis of vaccination parameters showed that vaccination is a potential factor that reduces the potential for hog cholera infection by 21 times higher than in

farmers who do not vaccinate. Vaccination is one of the effective ways to prevent the spread or transmission of hog cholera disease. The success of the vaccination program is determined by the formation of protective antibodies in the body of pig livestock. Protective antibody titer is influenced by various factors, one of which is by the age and maternal status of piglet antibodies [17], [18] as well as vaccine antigens used, disease conditions in a region, and health conditions of pigs to be vaccinated.

Seropositive result of hog cholera virus antibodies in unvaccinated pigs by 10% (20/196). The presence of these antibody titers can be caused by pigs having natural infections as well as pigs having maternal antibodies [19]. Vaccination when maternal antibodies are high there will be a neutralization reaction between maternal antibodies and vaccine antigens that enter the body of piglets [20]. Pigs that have been exposed to natural infections in the body of the pig will form antibodies. This can also be caused by the mother of the pig has been vaccinated so that maternal antibodies will be passed down to her cubs [21].

4. Conclusion and Recommendation

4.1. Conclusion

Breeds of pigs crossed more is maintained as much as 34%, semi-intensive type of maintenance as much as 75.9% and types of semi-permanent cages and colonies 74.1%. The type of feed used in the Deli Serdang Regency mostly comes from the household waste of 92.6%. Hog cholera vaccination is commonly done by farmers in Deli Serdang Regency, from the data on livestock vaccinated as much as 70.3% of the samples taken. Prevalence of seropositive incidence of hog cholera at the farm level of 9% (5/54). At the individual level pigs for the age and sex factor of pigs have no association with seroprevalence of hog cholera disease.

The results of multivariable analysis showed the risk factors associated with seropositive hog cholera in Deli Serdang Regency were Landrace pig (OR=14.28) and vaccination (OR= 0.048). Landrace pig breeds have a 14 times higher chance of being positive about hog cholera when compared to other pig breeds. Vaccination is a potential factor that reduces the potential for hog cholera infection, in this study vaccination provides protection 21 times higher than in farmers who do not vaccinate. Further research to look at other risk factors and include antigen detection testing will further enrich the results of this study.

4.2. Recommendation

To prevent the spread of Hog Cholera the movement of pigs must be controlled, increase breeders' knowledge of hog cholera disease, and improve biosecurity and biosecurity in traditional pig farms. Vaccination should be carried out correctly and regularly to improve the health of pig livestock. Further studies should be conducted to find out the more complete hog cholera subtype

and collect representative samples for all districts in the province so that the actual prevalence of hog cholera will be obtained.

Acknowledgments

The authors were highly thankful to those farmers who directly involved in this survey for completion of this study.

REFERENCES

[1] N. R. Ichwanda, W. Lie, and S. G. Prakoso, "A Study about Pork Farm in Surakarta as Export Commodity," *Glob. Strateg.*, vol. 13, no. 1, pp. 123–132, 2019.

[2] A. Postel et al., "Reemergence of classical swine fever, Japan, 2018," *Emerg. Infect. Dis*., vol. 25, no. 6, p. 1228, 2019.

[3] M. Woodford, "Office International des E pizooties: World Organization for Animal Health," Encycl. Bioterrorism Def., 2005.

[4] L. Ganges et al., "Classical swine fever virus: The past, present and future," *Virus Res.*, vol. 289, p. 198151, 2020.

[5] P. M. Maranata, "FA-1 Case Study of Hog Cholera in Flores 2017 and Its Controlling," Hemera Zoa, 2018.

[6] E. A. A. Kusuma, "Prevalensi dan Faktor Risiko Seropositif Hog Cholera pada Babi di Kabupaten Sukoharjo," Universitas Gadjah Mada, 2014.

[7] A. Herawati, "Prevalensi Seropositif Hog Cholera Pascavaksinasi pada Babi di Kabupaten Karanganyar," Universitas Gadjah Mada, 2014.

[8] Y. Luo, S. Li, Y. Sun, and H.-J. Qiu, "Classical swine fever in China: a minireview," *Vet. Microbiol.*, vol. 172, no. 1–2, pp. 1–6, 2014.

[9] R. Mappanganro, J. Syam, and C. Ali, "Tingkat Penerapan Biosekuriti Pada Peternakan Ayam Petelur Di Kecamatan Panca Rijang Kabupaten Sidrap," *J. ilmu dan Ind. Peternak*., vol. 4, no. 1, pp. 60–73, 2019.

[10] L. V. Alarcón, A. A. Alberto, and E. Mateu, "Biosecurity in pig farms: a review," *Porc. Heal. Manag*., vol. 7, no. 1, pp. 1–15, 2021.

[11] E. Leslie, "Formal pig movements across Eastern Indonesia–Risk for classical swine fever transmission," 2010.

[12] A. Postel, V. Moennig, and P. Becher, "Classical swine fever in Europe—the current situation," *Berl Munch Tierarztl Wochenschr,* vol. 126, no. 11–12, pp. 468–475, 2013.

[13] B. A. Baldwin and D. B. Stephens, "The effects of conditioned behaviour and environmental factors on plasma corticosteroid levels in pigs," *Physiol. Behav.*, vol. 10, no. 2, pp. 267–274, 1973.

[14] D. Smulders, G. Verbeke, P. Mormède, and R. Geers, "Validation of a behavioral observation tool to assess pig welfare," *Physiol. Behav*., vol. 89, no. 3, pp. 438–447, 2006.

[15] R. Larasati, "Pengaruh Stres pada Kesehatan Jaringan Periodontal," *J. Skala Husada J. Heal*., vol. 13, no. 1, 2016.

[16] I. R. Tizard, "Dendritic cells and antigen processing," Vet. Immunol. An Introd., pp. 89–100, 2000.

[17] K. Budiasa, "Titer Antibodi Hog Cholera Berbagai Tingkat Umur pada Ternak Babi," Universitas Udayana.

[18] S. Ivanyi, "Eradication of classical swine fever in Hungary.," 1977.

[19] J. T. Van Oirschot, "Experimental production of congenital persistent swine fever infections: II. Effect on functions of the immune system," Vet. Microbiol., vol. 4, no. 2, pp. 133–147, 1979.

[20] A. Sarosa, I. Sendow, and T. Syafriati, "Pengamatan Status Kekebalan Terhadap Penyakit Hog Cholera Dengan Teknik Neutralization Peroxidase Linked Essay," Balai Penelit. Vet., 2004.

[21] S. Suradhat, S. Damrongwatanapokin, and R. Thanawongnuwech, "Factors critical for successful vaccination against classical swine fever in endemic areas," *Vet. Microbiol*., vol. 119, no. 1, pp. 1–9, 2007.