

Knowledge, Attitudes, and Practices Toward The Culture of Caging Chickens To Prevent Avian Influenza (H5N1)

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Abstract

Bogor Regent Regulation No. 16 of 2007 on poultry caging was enacted to restrict poultry contact with people to prevent the spread of the Avian Influenza (AI) H5N1 virus. Because of the close proximity of poultry and people, backyard chicken rearing poses the danger of contracting AI. To determine if the community has adopted the poultry-caging policy to prevent H5N1 infection, a survey of knowledge, attitudes, and community behaviors on poultry caging is required. In September 2010, the investigation was carried out in two sub-districts of Bogor Regency, namely

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Ciomas and Cibinong. With a prevalence ratio of 6.312 (CI 95%: 1.051–37.887), $p < 0.05$, the results revealed that "practice" was the key component of the implementation of poultry caging. The conclusion is that some communities did not confine their chickens, exposing the community to the danger of re-emergence of H5N1.
Keywords: backyard, caging, culture, H5N1, society.

1. INTRODUCTION

Poultry rearing in sector IV (home backyard) poses a significant risk of avian influenza (H5N1) infection due to its proximity to people. Backyard poultry breeding has the potential to jeopardize public health (K Osbjør et al., 2016; Sultana et al., 2012). Chickens, birds, geese, and ducks are typical poultry breeds in Indonesia's sector IV (Yupiana et al., 2010; Joob and Wiwanitkit, 2015). Avian influenza (AI) type H5N1 in humans was one of the zoonotic illnesses that Indonesia prioritized in countermeasures when it became an epidemic in Asia, Europe, and Africa (Cattoli et al., 2011; Loth et al., 2011).

The number of avian influenza cases in Indonesia, as of July 2012, was as high as 190 confirmed cases, with 158 deaths. The case fatality rate (CFR) was 85%, which was much higher than the other countries on average, which reached only 59% (Roostita et al., 2010; Sedyaningsih et al., 2007; Santhia et al., 2009). Although the avian influenza outbreak has come to an end, preparedness measures for the re-emerging avian influenza must be implemented considering that avian influenza is transmitted mainly via poultry such as chickens and ducks, which are popular farm animals in Indonesia.

West Java province was included in the area of high risk for AI. Bogor Regency is one of the districts in West Java Province that provides poultry products for its surroundings. Unfortunately, Bogor was one of the districts that were heavily hit by AI (Agoes and Masria, 2009; Karokaro et al., 2019; Yupiana et al., 2010). This condition was the basis for the formulation of Bogor Regent Regulation No. 16 of 2007 concerning the intensification of handling and control of avian influenza in the Bogor Regency. This regent regulation obliged poultry owners to put their livestock in cages to lessen the contact of domesticated poultry with humans. The participation of the community in implementing government policies is very important to the success of the policy in achieving its goals. One of the factors that caused the unsuccessful poultry-caging policy was the behavior of the community towards the policy (Shanta et al., 2017; Novita, 2017).

According to the findings of a study performed by the Academy of Educational Development in partnership with the United States Agency for International Development (USAID), the typical community that farms chicken in settlements has a poor level of education and

economics (N Rimi et al., 2016). As a result, the implementation of the poultry-caging policy proved challenging. Given the foregoing, the purpose of this study was to analyze the Bogor regency community's knowledge, attitudes, and practices regarding poultry-caging policy as a preventive measure against avian influenza.

2. METHODS

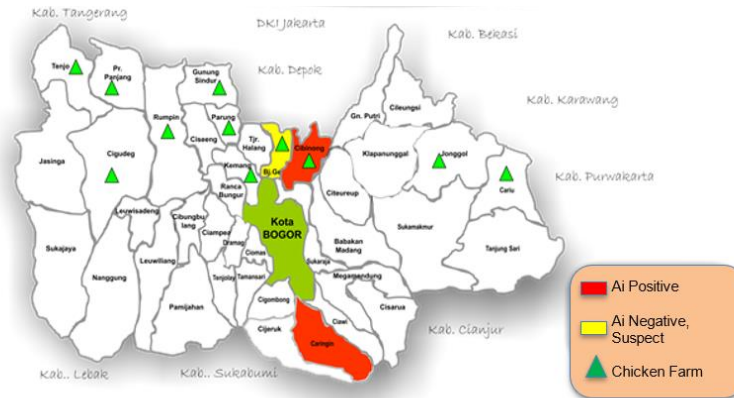
This research was a quantitative study with a cross-sectional design. The sample size was set at 53 participants with a 95% confidence level and 80% test power (John W. Creswell, 2009). The selection of respondents was carried out with multistage random sampling in two selected subdistricts with the largest population of chickens in Bogor Regency. The data was analyzed in bivariate and multivariate stages. A bivariable analysis was used to determine the relationship between the variables of knowledge, attitudes, and practices of respondents with poultry-caging policy using the chi-square test. The multivariable analysis used logistic regression to analyze the relationship between one or more independent variables and a dependent variable of a dichotomous nature (John W. Creswell, 2009).

The score of knowledge, attitudes, and practices of the community towards the implementation of the poultry-caging policy was composited and classified into three categories. The composite score of >75% indicated that the implementation of the poultry-caging policy has gone well; 55-75% meant that the policy implementation was not going well; < 55% meant that the poultry-caging policy was not implemented, and 0% meant that the poultry-caging policy was bad.

3. RESULTS AND DISCUSSION

The research was conducted in two sub-districts, namely Ciomas and Cibirong. A map of the research area can be seen in Figure 1.

Figure 1. Map of Bogor Regency AI-free areas in 2010



As seen in Figure 1, Bogor Regency had many chicken farming centers marked by a green triangle shape, namely Tanjo, Parang Panjang, Rumpin, Cigudeg, Gunung Sindur, Parung, Kemang, Bojong Gede, Cibinong, Jonggol, and Carlu areas. Areas with positive AI rapid test results are marked in red, namely, Cibinong and Caringin, while the areas that had suspected cases of AI, but negative rapid test results were Bojong Gede.

3.1. Respondents' demographic characteristics

Respondent demographic data is presented in the following table. Most of the respondents were male, over the age of 50, and kept poultry in their yards.

Table 1. Distributions by Respondent Characteristics

Characteristics of Respondents			Poultry Caging		Total (n)	PR (95% CI)	p
			Yes (n)	No (n)			
Gender							
•	Woman		2	9	11	1.53	0.584
•	Man		5	37	42	(0.34-6.84)	
Age							
•	<30 years		2	1	3	-	0.001
•	30–39 years		0	6	6		
	old		0	19	19		
•	40–49 years		2	23	25		
	old						
•	>50 years old						
Education							
•	Senior High School		7	43	50	-	0.610
			0	3	3		

• Bachelor's Degree					
Occupation					
• Housewife	0	6	6	-	1.000
• Laborer	1	6	7		
• Private	1	3	4		
• Public Sector	0	2	2		
• Self-employed	2	16	18		
• Pension	0	5	5		
• Driver	0	2	2		
• Farmer	0	9	9		
Income (IDR)					
• <1,300,000	6	39	45	1.07	0.949
• >1,300,000	1	7	8	(0.15-7.72)	
Breeding experience					
• 5 years	3	20	23	0.98	1.000
• >5 years	4	26	30	(0.24-3.95)	-
Reasons for caging poultry					
• The economic value of the poultry	0	3	3	-	0.001
• No neighbor tolerance	4	43	43		
• because it's announced	0				
Exposure to outreach					
• Not Exposed	4	34	38	0.53	0.359
• Exposed	3	12	15	(0.13-2.08)	

IDR: Indonesian Rupiahs; PR: prevalence ratio; CI: confidence interval

Based on Table 1, variables that showed significant association with poultry caging were age and reason for caging poultry ($p < 0.05$). The results of observations on poultry-caging policy implementation showed that out of 53 households that raised poultry in their backyard, as many as 7 households had performed poultry caging while 46 households did not.

Table 2. Relationship of Respondents' Level of Knowledge, Attitudes, and Practices towards the Implementation of Poultry-caging Policy

Variable	Poultry Caging		Total (n)	PR (95% CI)	P
	No (n)	Yes (n)			
Knowledge					
• Less	15	0	41	-	0.031
• Enough	24	4	12		
• Good	7	3	10		
Attitude					
• Not supporting	29	3	32	1.12	0.309
• Support	17	4	21	(0.88–1.42)	
Practice					
• No	43	0	43	1.67	0.000
• Yes	6	4	10	(1.00–2.76)	

PR: prevalence ratio; CI: confidence interval

Table 3. Final Model of Logistic Regression Relationship between Knowledge and Practice Towards Implementation of Poultry-caging Policy

Variable	β coefficient	SE (B)	P	PR (95% CI)
Practice	1.842	0.914	0.044	6.312 (1.051–37.887)
Knowledge	1.285	0.794	0.106	3.615 (0.762–17.144)

SE: standard of error; PR: prevalence ratio; CI: confidence interval

Knowledge and practice were significantly associated with poultry caging. Therefore, these variables were taken into multivariable analysis. The result of multivariable logistic regression (table 3) showed that practice was the only variable that had a significant association with poultry caging (OR 6.312; 95% CI: 1.051–37.887).

3.2. Knowledge, attitude, and practice

Knowledge is a significant predictor of human behavior (Khun et al., 2012; Tenzin et al., 2017). As a result, raising awareness of backyard poultry caging to prevent the spread of H5N1 requires urgent attention and the utmost effort from the government so that the

community may take an active part in caging poultry in settlements (Khun et al., 2012; Tenzin et al., 2017). Home backyard care is crucial to preventing H5N1 transmission to people since the backyard is a haven for a variety of poultry, including chickens and ducks (Islam et al., 2020; Gatter, 2012). Respondents did not execute poultry caging optimally, although there was previously local legislation requiring poultry caging to keep chickens and ducks from roaming freely in residential areas (Pongcharoensuk et al., 2012; Karki, 2019; Gatter, 2012).

According to the findings of the multivariable analysis, "practice" was the variable that had the most influence on poultry-caging policy. Bogor Regency residents did not believe that chicken caging was beneficial to their health. This situation was exacerbated by their view that avian influenza was not a major issue, even though most avian influenza patients did not have chickens as farm animals (Roostita et al., 2010; Sutanto, 2013; Novita, 2017). Furthermore, there was a gap in attitudes toward chicken caging between the general population and the authorities (Gutiérrez et al., 2011; Roostita et al., 2010). Poultry should be kept in cages all day, according to Bogor government regulations, to limit interaction with humans. People, on the other hand, believed that the poultry should be kept in a cage at night only.

3.3. Culture of poultry caging

The result of this study supports the results of research conducted by C. Hunter et al. in 2014 that found only 48% and 22% of respondents caged their poultry in Lombok and Bali, respectively (Hunter et al., 2014). According to respondents in Bali, they caged poultry only when the chickens were moaning and hatching their eggs. After hatching, the chickens were released into the yard to look for food. Another reason expressed by respondents in Bali was that if the chicken or poultry was placed in a cage, it would increase the risk of the poultry being stolen. Whereas if released, chickens would not be easily stolen. Besides, chickens also did not need a cage because, at night, they would perch on a tree to sleep. So, this was a challenge for the government to manage poultry in the backyard to minimize the risk of infection in humans from poultry-borne diseases (Sedyaningsih et al., 2007; Shanta et al., 2017; Conan et al., 2012). Another risk factor for AI in the backyard was the presence of wild birds and waterfowl, such as ducks and geese. The assembling of these poultry in one location increased the risk of H5N1 transmission (Tenzin et al., 2017; Conan et al., 2012). To protect the backyard sector from H5N1, restrictions were carried out between farm chickens and wild birds and waterfowl (Shanta et al., 2017; Gatter, 2012).

Based on the researcher's observations, respondents in Bogor Regency who raised chickens, in general, did not have the above risk factors. Most of the respondents raised only one species of poultry in

their yard so that the case of H5N1 could be suppressed. However, this can be biased since this study was conducted in September 2010, and considering data from the avian influenza prevention countermeasures unit of the Director-General of Agriculture of the Ministry of Agriculture, H5N1 cases in Indonesia reached their peak in April 2010. This month is the transition period from the wet to dry seasons, which is the ideal condition for the H5N1 virus to multiply (Wibisono and Meliana, 2017; Yupiana et al., 2010; Karo-karo et al., 2019).

To prevent H5N1 cases in the backyard sector, the community must be educated about the danger of avian influenza and how to prevent them. Adequate knowledge enabled people to have good preparation to face the reemerging of the H5N1 virus by caging the poultry, including waterfowl, maintaining environmental cleanliness by spraying disinfectants when necessary, and isolating sick chickens and ducks apart from the healthy ones (Lee and Lao, 2018; Tenzin et al., 2017; Conan et al., 2012).

The backyard sector or IV sector farms has a higher risk compared to sector I-III farms because of the suboptimum biosecurity implementation to protect poultry against viruses (Yupiana et al., 2010; Shekaili et al., 2015). Biosecurity practices that have not been optimally implemented in the backyard sector are not vaccinating the poultry, not disinfecting animal cages regularly, and not using masks and gloves when holding sick poultry (Osby et al., 2015). Previous research by Elelu indicated that education plays a major role in the practice of poultry caging (Elelu, 2017; Elelu et al., 2019). Respondents who had a low education had a low level of knowledge of Avian Influenza, so it was more difficult to practice poultry caging.

4. CONCLUSION

In the final model, "practice" was the variable that was significantly associated with poultry-caging policy implementation. Bogor Regency Livestock and Fisheries Office suggested initiating village organizations to foster village communities to raise poultry properly, for example by providing a special area that can accommodate all domesticated poultry with a semi-intensive maintenance system. This is done because AI vaccination in sector IV is ineffective.

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Bibliography

- Agoes, R., and S. Masria. "Epidemiology of Avian Influenza in Indonesia. Why Is West Java Having the Highest Endemicity?" Proceedings of the Third ASEAN Congress of Tropical Medicine and Parasitology (ACTMP3), The Windsor Suites Hotel, Bangkok, Thailand, 22-23 May 2008. *Parasites: A Hidden Threat to Global Health*, 2009, pp. 38–42, <http://www.ptat.thaigov.net/Procasean/038-042PPRS2008.pdf>.
- Cattoli, Giovanni, et al. "Evidence for Differing Evolutionary Dynamics of A/H5N1 Viruses among Countries Applying or Not Applying Avian Influenza Vaccination in Poultry." *Vaccine*, 2011, <https://doi.org/10.1016/j.vaccine.2011.09.127>.
- Conan, Anne, et al. "Biosecurity Measures for Backyard Poultry in Developing Countries : A Systematic Review." *BMC Veterinary Research*, vol. 8, no. 240, 2012, pp. 1–10, <https://doi.org/doi:10.1186/1746-6148-8-240>.
- Elelu, Nusirat. "International Journal of Veterinary Science and Medicine Epidemiological Risk Factors of Knowledge and Preventive Practice Regarding Avian Influenza among Poultry Farmers and Live Bird Traders in Ikorodu , Lagos State , Nigeria." *International Journal of Veterinary Science and Medicine*, vol. 5, no. 1, 2017, pp. 47–52, <https://doi.org/10.1016/j.ijvsm.2017.03.002>.
- Elelu Nusirat, Julius Olaniyi Aiyedun, Ibraheem Ghali Mohammed, Oladapo Oyedeji Oludairo, Ismail Ayoade Odetokun1, Kaltume Mamman Mohammed, et al. "Neglected Zoonotic Diseases in Nigeria: Role of the Public Health Veterinarian." *Pan African Medical Journal*, vol. 8688, no. 35, 2019, pp. 1–12, <https://doi.org/10.11604/pamj.2019.32.36.15659>.
- Gatter, Robert. "Shifting Public Health Priorities and the Global Effort to Prevent a Bird Flu Pandemic." SSRN, 2012, <https://doi.org/10.2139/ssrn.2015423>.
- Gutiérrez, Ramona Alikiiteaga, et al. "Eurasian Tree Sparrows, Risk for H5N1 Virus Spread and Human Contamination through Buddhist Ritual: An Experimental Approach." *PLoS ONE*, 2011, <https://doi.org/10.1371/journal.pone.0028609>.
- Hunter, C., et al. "Community Preparedness for Highly Pathogenic Avian Influenza on Bali and Lombok , Indonesia." *Rural and Remote Health*, vol. 3, no. June 2010, 2014, pp. 1–17, <https://doi.org/https://doi.org/10.22605/RRH2772>.
- Islam, Kamrul, et al. "An Assessment on Potential Risk Pathways for the Incursion of Highly Pathogenic Avian Influenza Virus in Backyard Poultry Farm in Bangladesh." *Veterinary World*, vol. 13, no. 10, 2020, pp. 2104–11, <https://doi.org/www.doi.org/10.14202/vetworld.2020.2104-2111> How.
- John W. Creswell. *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. Edited by Lauren Habib Vicki Knight, Sean Connelly, 3rd ed., Sage, 2009.

- Joob, Beuy, and Viroj Wiwanitkit. "Dynamics of Backyard Chicken Flows in Traditional Trade Networks in Thailand." *Trop Anim Health Prod*, vol. 47, no. 269, 2015, pp. 1–3, <https://doi.org/10.1007/s11250-014-0693-3>.
- Karki, S. "Effects of Highly Pathogenic Avian Influenza H5N1 Outbreak in Nepal from Financial and Social Perspectives: A Case Study." *Nepalese Veterinary Journal*, 2019, <https://doi.org/10.3126/nvj.v34i0.22861>
- Karo-karo, Desniwaty, et al. "Highly Pathogenic Avian Influenza A (H5N1) Outbreaks in West Java Indonesia 2015 – 2016: Clinical Manifestation and Associated Risk Factors." *Microorganisms*, vol. 7, no. 327, 2019, pp. 1–12, <https://doi.org/doi:10.3390/microorganisms7090327>.
- Khun, Mav, et al. "Knowledge , Attitudes and Practices towards Avian Influenza A (H5N1) among Cambodian Women : A Cross-Sectional Study." *Asian Pacific Journal of Tropical Medicine*, vol. 5, no. 9, 2012, pp. 727–34, [https://doi.org/10.1016/S1995-7645\(12\)60115-1](https://doi.org/10.1016/S1995-7645(12)60115-1)
- Lee, Hanl, and Angelyn Lao. "Transmission Dynamics and Control Strategies Assessment of Avian in FI Uenza A (H5N6) in the Philippines." *Infectious Disease Modelling*, vol. 3, 2018, pp. 35–59, <https://doi.org/10.1016/j.idm.2018.03.004>.
- Loth, Leo, et al. "Identifying Risk Factors of Highly Pathogenic Avian Influenza (H5N1 Subtype) in Indonesia." *Preventive Veterinary Medicine*, 2011, <https://doi.org/10.1016/j.prevetmed.2011.06.006>.
- NA., Rimi, et al. "Understanding the Failure of a Behavior Change Intervention to Reduce Risk Behaviors for Avian Influenza Transmission among Backyard Poultry Raisers in Rural Bangladesh: A Focused Ethnography." *BMC Public Health*, 2016, <https://doi.org/10.1186/s12889-016-3543-6>.
- Novita, Risqa. Implementasi Kebijakan Pengandangan Unggas Untuk Mencegah Avian Influenza Di Masyarakat Kabupaten Bogor The Implementation of Policy of Poultry Caging for Prevent Avian Influenza Infection in the Society of Bogor Sub Province. no. 16, 2017, pp. 39–41.
- Osbyer, K, et al. "Influenza A Virus in Backyard Pigs and Poultry in Rural Cambodia." *Transboundary and Emerging Diseases*, 2016, pp. 1–12, <https://doi.org/10.1111/tbed.12547>.
- Osbyer, Kristina, et al. "Household Practices Related to Disease Transmission between Animals and Humans in Rural Cambodia." *BMC Public Health*, vol. 15, no. 1, 2015, p. 476, <https://doi.org/10.1186/s12889-015-1811-5>.
- Pongcharoensuk, Petcharat, et al. "Avian and Pandemic Human Influenza Policy in South-East Asia: The Interface between Economic and Public Health Imperatives." *Health Policy and Planning*, vol. 27, no. 5, Aug. 2012, pp. 374–83, <https://doi.org/10.1093/heapol/czr056>.
- Rimi, N. A., et al. "Biosecurity Conditions in Small Commercial Chicken Farms, Bangladesh 2011–2012." *EcoHealth*, 2017, <https://doi.org/10.1007/s10393-017-1224-2>.
- Roostita, L. B., et al. "Surveillance of Caging and Poultry Separation Behavior in Relation toward Poultry Death Rate Caused by Avian Influenza at Bandung District." *International Journal of Animal and Veterinary Advances*, 2010.

- Santhia, Ketut, et al. "Avian Influenza A H5N1 Infections in Bali Province, Indonesia: A Behavioral, Virological and Seroepidemiological Study." *Influenza and Other Respiratory Viruses*, 2009, <https://doi.org/10.1111/j.1750-2659.2009.00069.x>.
- Sedyaningsih, Endang R., et al. "Epidemiology of Cases of H5N1 Virus Infection in Indonesia, July 2005–June 2006." *The Journal of Infectious Diseases*, 2007, <https://doi.org/10.1086/519692>.
- Shanta, I. S., et al. "Raising Backyard Poultry in Rural Bangladesh: Financial and Nutritional Benefits, but Persistent Risky Practices." *Transboundary and Emerging Diseases*, 2017, <https://doi.org/10.1111/tbed.12536>.
- Shekaili, Thunai Al, et al. "Sero-Surveillance and Risk Factors for Avian Influenza and Newcastle Disease Virus in Backyard Poultry in Oman." *Preventive Veterinary Medicine*, vol. 122, no. 1–2, 2015, pp. 145–53, <https://doi.org/10.1016/j.prevetmed.2015.09.011>.
- Sultana, Rebeca, et al. "Bangladeshi Backyard Poultry Raisers' Perceptions and Practices Related to Zoonotic Transmission of Avian Influenza." *Journal of Infection in Developing Countries*, 2012.
- Sutanto, Yadi Cahyadi. *Highly Pathogenic Avian Influenza Knowledge, Attitudes, and Practices Study among Live Bird Market Workers in Jakarta -- Indonesia*. Colorado State University, 2013.
- Tenzin, Tenzin, et al. "Biosecurity Survey in Relation to the Risk of HPAI Outbreaks in Backyard Poultry Holdings in Thimphu City Area, Bhutan." *BMC Veterinary Research*, vol. 13, no. 1, Apr. 2017, <https://doi.org/10.1186/s12917-017-1033-4>.
- Wibisono, Muhammad Jusuf, and Resti Yudhawati Meliana. "The clinical profiles of avian influenza in endemic and non-endemic regions in Indonesia. hospital-based studies and its implication on clinical management in the future." *Indonesian Journal of Tropical and Infectious Disease*, vol. 1, no. 3, Mar. 2017, p. 114, <https://doi.org/10.20473/ijtid.v1i3.2192>.
- Yupiana, Yuni, et al. "Risk Factors of Poultry Outbreaks and Human Cases of H5N1 Avian Influenza Virus Infection in West Java Province, Indonesia." *International Journal of Infectious Diseases*, 2010, <https://doi.org/10.1016/j.ijid.2010.03.014>.