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Assessment on Exposure to Highly Pathogenic Avian Influenza A(H5N1) and Poultry Trading Practices among Poultry Traders in Traditional Markets of Sukoharjo District, Central Java Province, Indonesia, 2012

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Abstract

Sukoharjo District has been an endemic area of highly pathogenic avian influenza (HPAI) subtype A(H5N1). We conducted a serology investigation to determine the level of human exposure to HPAI A(H5N1) and describe trading practices of poultry in eight live bird markets in Sukoharjo. A cross-sectional study was conducted in traditional markets. Total 75 traders were selected using simple random sampling proportionally from 221 traders in all eight markets. Serum samples were tested for H5N1 antibody titer by hemagglutination inhibition test. There was no trader with positive H5N1 antibody. Majority of the traders washed carcasses (84.0%), used containers to carry poultry and carcasses (94.7%), and cleaned places of trading (94.7%). Poultry traders had not been infected by HPAI A(H5N1).

Keywords: HPAI A(H5N1), antibody titer, poultry traders

Introduction

Highly pathogenic avian influenza (HPAI) subtype A(H5N1), also known as bird flu, is a zoonotic disease of poultry and caused by type A influenza viruses of the family *Orthomyxoviridae*. HPAI A(H5N1) viruses can also infect humans, causing severe respiratory symptoms or deaths.^{1,2}

The current epidemic of HPAI A(H5N1) began during late 2003 in southern China, and quickly spread to Vietnam, Thailand, Indonesia and East Asian countries.³ Since it was first detected in late 2003, HPAI A(H5N1) viruses have infected people from 31 out of total 34 provinces in Indonesia, and millions of birds died from the virus. Despite the widespread, the incidence of HPAI A(H5N1) outbreaks among poultry gradually decreased every year from 2006 to 2011.⁴ Human infection with HPAI A(H5N1) was first reported in Indonesia during 2005. By March 2012, there were 155 confirmed human cases, marking Indonesia with the highest number of human casualties due to avian influenza globally.⁵ The first outbreak in Sukoharjo was reported during 2008, with number of poultry deaths reported as many as 2,006 from 12 sub-districts in May 2012⁶ while

human cases were reported in 2007 and 2009. As of May 2012, two confirmed cases of human infection were identified with HPAI subtype H5N1.⁷

Traditional market supply of live poultry and carcasses is one of the important factors for spread of HPAI virus subtype H5N1.^{2,8} Live bird markets (LBM) are also sources of infection for humans, especially for poultry traders who handle poultry themselves.^{8,9} People can be infected with HPAI A(H5N1) through contact with infected poultry either via direct contact or processing for consumption.⁸

This study was proposed to determine the level of human exposure to HPAI A(H5N1) and describe poultry trading practices at LBM in Sukoharjo.

Methods

A cross-sectional study was conducted among 221 poultry traders who were in all eight traditional markets in Sukoharjo between April and May 2012. Total 75 traders were recruited to estimate 50% prevalence at 95% confidence, with precision of 10% and estimated drop out of 10%¹⁰. Number of samples in each market was allocated proportionally to number of traders in the market. Within each market,

traders were selected randomly¹¹ and collected their serum samples which were submitted to Basic Biomedicine and Technology of Health in Jakarta for laboratory testing using hemagglutination inhibition (HI) assay to determine antibody titer against HPAI A(H5N1) viruses. Serum samples with HI titer 40 or more were identified as positive, indicating previous exposure and infecting with the viruses.^{12,13}

Questionnaires were developed to gather information from the participating traders on their characteristics such as gender, age, level of education and contact details. The questionnaires also inquired information on sources of birds, trading practices, transportation, slaughtering practices and previous contact with sick or dead poultry prior to the study. The researchers interviewed the participating traders using the questionnaire during sample collection.

Prevalence of seropositivity and associated 95% confidence interval were calculated to determine level of exposures among the participating traders. Descriptive analysis of attributes collected from the questionnaires was performed. The study also examined the possible associations between traders' characteristics and their trading and slaughtering practices which might increase the risk of HPAI exposure. The associations were then characterized by odds ratios (OR) with 95% confidence intervals.

Results

Total 75 traders were included in the study. Majority of them were females (74.7%) and age 41-60 years old (64.0%) following by 20-40 (30.7%) and more than 61 years old (5.3%). Their highest education backgrounds were elementary school (40%), junior high school (29.3%), senior high school (28%) and bachelor degree (2.7). Most of them had 6-15 years experience (62.7%) of being poultry trader and they did poultry trading without any other side jobs (69.3%). They traded poultry products such as carcass and meat (77.3%), live poultry (20.0%) and both (2.7%). Majority of them traded broiler chickens (77.3%), followed by domestic poultry (18.7%), birds (2.7%) and ducks (1.3%). The traders also kept some live poultry for selling. It included domestic poultry (18.7%), birds (2.7%), ducks (2.7%), broilers (1.3%) and multiple species (8.0%) (Table 1).

Sukoharjo District has 12 sub-districts defined as endemic areas of HPAI, except Bendosari, Weru, Bulu, Gatak and Grogol. From our study population, poultry were originated from Sukoharjo, Kartasura, Polokarto, Gatak, Nguter, Tawang Sari, Mojolaban, Bendosari, Weru, Bulu, Grogol, Baki and other

Table 1. Demographic characteristics of poultry traders from markets in Sukoharjo District, Central Java Province, Indonesia, 2012 (n=75)

Characteristic	Number	Percent
Gender		
Male	19	25.3
Female	56	74.7
Age group (year)		
20-40	23	30.7
41-60	48	64.0
≥ 61	4	5.3
Education		
None	0	0
Elementary	30	40.0
Junior high school	22	29.3
Senior high school	21	28.0
Diploma	0	0
Bachelor/university	2	2.7
Side Job		
Farmer	11	14.7
Livestock trader (large animals)	2	2.7
Fish trader	2	2.7
Labor	1	1.3
Rickshaw puller	2	2.7
Grocery trader	2	2.7
Plastic trader	1	1.3
Multi-level Marketing seller	1	1.3
Traditional soy product (Tempe) maker	1	1.3
None	52	69.3
Working period (year)		
< 5	13	17.3
6-10	25	33.3
11-15	22	29.3
16-20	6	8.0
21-25	3	4.0
> 26	6	8.0
Bird species being traded		
Broilers	58	77.3
Domestic poultry (Buras)	14	18.7
Ducks	1	1.3
Birds	2	2.7
Kind of birds being kept		
Domestic poultry (Buras)	14	18.7
Broilers	1	1.3
Ducks	2	2.7
Domestic poultry (Buras) and ducks	3	4.0
Range chickens, broilers and ducks	1	1.3
Birds	2	2.7
Birds and other poultry	2	2.7
Type/form poultry trade		
Live poultry	15	20.0
Carcass/meat of poultry	58	77.3
Live poultry and carcass/meat of poultry	2	2.7

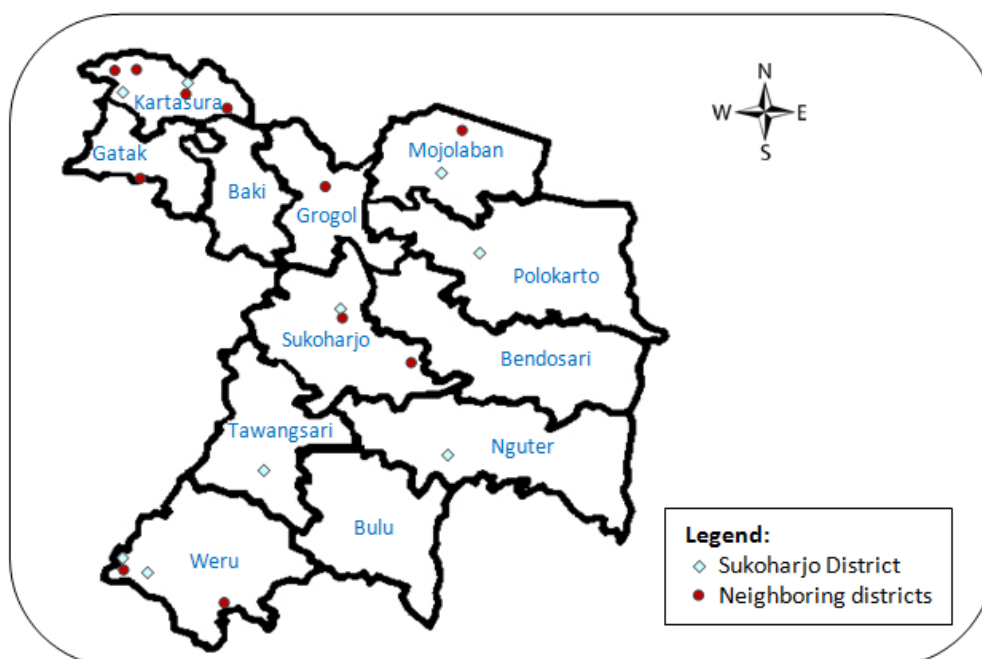


Figure 1. Distribution of Poultry Origins in Sukoharjo District, Central Java Province, Indonesia, 2012

neighboring districts. Thus, poultry sold in the eight traditional markets came from Sukoharjo and neighboring districts which were endemic areas as well (Figure 1).

History of possible exposure to HPAI of the traders was categorized into direct and indirect contact. Majority of direct contact exposure among traders was through butchering poultry (80.0%) and washing carcasses (84.0%) while few of them had only contacted with dead poultry (28.0%). Indirect contact among traders was through transporting poultry or carcasses (94.7%) and cleaning trade location (94.7%). Not all of them washed their hands after the trading (Table 2). Even though, the traders had high risk of exposure, all 75 traders had negative titer of H5N1 antibody.

When we examined the two most frequent exposure or risk behaviors of the traders, slaughtering poultry and washing carcass/offal, we found that traders aged 40 years and above had a tendency to slaughter poultry 32.5 times more than those of 20-40 years old. Less educated traders had more tendency than highly educated traders in washing the carcass/offal of poultry (Table 3).

Table 2. Risk factors related to poultry among poultry traders from markets in Sukoharjo District, Central Java Province, Indonesia, 2012 (n=75)

Risk factor	Number	Percent
Direct contact		
Slaughtering	60	80.0
Plucking feathers	58	77.3
Washing carcass/offal	63	84.0
Contact with carcass	21	28.0
Maintaining	25	33.3
Indirect contact		
Transporting poultry/ carcass with container	71	94.7
Washing hand after trade	65	86.7
Cleaning place of trading	71	94.7

Discussion

All 75 samples had negative H5N1 antibody titer which might be due to the fact that poultry traders or workers (both males and females), though highly exposed to live poultry, have limited exposure to H5N1 virus in the markets.¹⁴ The finding was similar to a study in Sukabumi (West Java)¹⁵ as well as one study in eight provinces (Lampung, Banten, West Java, Central Java, Yogyakarta, East Java, Bali and Kalimantan).¹⁴

Table 3. Relationship between risk factors and demographic characteristics of poultry traders from markets in Sukoharjo District, Central Java Province, Indonesia, 2012

Risk factor	Characteristic	Odds ratio	95% CI
Slaughtering poultry	Age (≥ 40 years)	32.5	6.33-166.91
Washing carcass/offal	Educated (less-medium)	62.0	2.06-1864.98

Majority of the traders slaughtered poultry, plucked feathers, washed carcasses, handling dead poultry and cleaning places of trading. However, they were all negative for H5N1 antibody. This finding implied that the traders had not been infected by H5N1 virus prior to blood collection although they had high risk behaviors.¹⁶⁻¹⁸

The results showed the H5N1 antibody titer negative in traders who raised poultry and did not keep poultry regardless of vulnerable species as well as the traders who sold live poultry. This was probably because the traders maintained and sold live poultry that were not infected with H5N1 virus. Based on the opinions of previous researchers, maintaining poultry of random species and selling live poultry could infect people with H5N1 virus. Sensitive bird species such as chickens, turkeys, quails, ornamental chicken, and various kinds of domestic and wild birds can be infected with H5N1 virus. Ducks, geese, gulls and shorebirds can be carriers for all types of influenza A virus subtypes that have the potential to mutate into highly pathogenic as H5N1 after moving and adapting to the new hosts.^{19,20}

Negative H5N1 antibody titer could also be due to low titer from cross-neutralization by circulating antibody after previous infection by human influenza virus,^{21,22} which could occur in mild flu or asymptomatic H5N1 infection.²³ In addition, the last endemic incidence of H5N1 among fowls in Sukoharjo was in February 2011, and thus, the antibody level might be no longer detectable.²⁴ Furthermore, as this research used H5N1 antigen in 2012 which was not derived from similar areas and year,¹⁵ there might be changes in amino acid of 2012 H5N1 antigen. Low antibody response induced by H5N1 virus with mutation could not be detected by HI test.¹⁵ Negative or low titer might be caused by genetic and specific receptor factors as well.²⁵

It was found that age and education of the traders were significantly associated with behaviors which increased the risk of HPAI exposure. The findings were similar to other studies which were conducted among poultry farmers, sellers, chicken product handlers and workers in poultry collection facilities.^{8,14,16}

Conclusion

Based on our study, poultry traders in Sukoharjo District had not been infected by HPAI A(H5N1) since all poultry traders in the traditional markets in Sukoharjo District had negative antibody titer of H5N1. However, almost all traders were highly exposed to live poultry and carcasses which could

increase their risk of getting HPAI infection once the agents spill into the market.

Recommendations

Assessment on exposure to HPAI A(H5N1) should be continued among poultry traders in the traditional markets. The Department of Health should identify effective methods including sero-surveillance to detect the infection early with proper timing of specimen collection and better screening test of H5N1 antibody.

Suggested Citation

Indah Purnama B, Budiharta S, Wongsathapornchai K. Assessment on exposure to highly pathogenic avian influenza A(H5N1) and poultry trading practices among poultry traders in traditional markets of Sukoharjo District, Central Java Province, Indonesia, 2012. OSIR. 2015 Dec;8(4):14-18. <<http://www.osirjournal.net/issue.php?id=88>>.

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