Raising medium-sized livestock and hepatitis risk: A national study in Indonesia

Maria Holly Herawati

Center of Applied Technology and Clinical Epidemiology, National Institute of Health Research and Development, Indonesian Ministry of Health

Abstrak

Latar belakang*: Sanitasi lingkungan, termasuk kandang pemeliharaan ternak sedang, berpengaruh terhadap penyebaran penyakit hepatitis A dan E. Tujuan penelitian ini menilai lokasi kandang pemeliharaan ternak sedang berkaitan dengan risiko gejala hepatitis di beberapa propinsi dengan prevalensi hepatitis tinggi di Indonesia.*
Metode: *Data berasal dari sebagian hasil Riset Kesehatan Dasar (Riskesdas) tahun 2007 di Indonesia. Untuk penilaian ini, data yang dipakai berasal dari 12 propinsi dengan prevalensi tinggi (0,6%) hepatitis di Indonesia, dan dipilih hanya subjek yang tidak memelihara ternak serta hanya yang memelihara ternak sedang. Subjek hepatitis adalah responden yang pada saat wawancara mengatakan pernah mempunyai gejala hepatitis atau pernah di diagnosis menderita hepatitis oleh dokter atau paramedik dalam kurun waktu 12 bulan terakhir.*
Hasil: *Dari 141.291 subjek, 1.257 (0,8%) menderita hepatitis. Pada umumnya yang memelihara ternak sedang berisiko 86% lebih banyak terkena hepatitis dibandingkan dengan yang tidak memelihara ternak [rasio odds suaian (ORa)=1,86; 95% interval kepercayaan (CI=1,61-2,09]. Risiko tertinggi (2 kali lipat) terkena hepatitis terjadi di antara subjek yang mengandangkan ternak sedang di dalam rumah (ORa=1,98; 95% CI=1,47-2,66), sedangkan risiko terkecil (38% lebih besar) terkena hepatitis terjadi di antara yang mengandangkan ternak sedangnya di luar luar rumah dibandingkan dengan tidak memelihara ternak sedang (ORa=1,38; 95% CI=1,14-1,67) dibandingkan dengan tidak memelihara ternak.*
Kesimpulan*: Kandang di luar rumah untuk meliharaan ternak sedang yang paling kecil menyebabkan risiko hepatitis. (**Health Science Indones 2011;2:14-20)***

Kata kunci*: peternakan hewan sedang, kandang, risiko hepatitis*

Abstract

Background: Environmental sanitation, among others raising medium-sized livestock, affect the spread of hepatitis A and E. This paper presents an assessment of relation between place of raising medium-sized livestock and risk of hepatitis in high prevalence endemic hepatitis provinces in Indonesia.
Methods: This paper used a part data of the Basic Health Survey (*Riskesdas*) 2007 in 33 provinces in Indonesia. For this assessment samples consisted of those who had as well as did not have medium-sized livestock in twelve provinces with Hepatitis prevalence above national average. Hepatitis subject was those who ever diagnosed hepatitis by health workers (physician or paramedic) or ever had symptoms of hepatitis in the last 12 months.
Results: Of 141,291subjectts, 1,257 (0.8%) subjects ever had hepatitis.
In general, subjects who had raising medium-sized livestock had 83% more hepatitis risk compared to who did not have raising medium-sized livestock [adjusted odds ratio (ORa)= 1.83; 95% confidence interval (CI)= 1.61-2.09].
The highest risk (almost 2-fold) to be hepatitis occurred among who had corral inside the house for raising medium-sized livestock (ORa=1.98; 95% CI=1.47-2.66), and the least risk (38% more risk) to be hepatitis occurred among who had corral outside the house for raising medium-sized livestock (ORa=1.38; 95% CI=1.14-1.67) compared with who did not have raising medium-sized livestock.
Conclusion: The least risk to be hepatitis occurred among who had corral outside the house among whom raising medium-sized livestock. ***(Health Science Indones 2011;2:14-20)***

Key words: raising medium-sized livestock, corral, risk of hepatitis

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Corresponding author: Maria Holy Herawati
E-mail: maria@litbang.depkes.go.id

Hepatitis is still a health problem in developing countries such as Indonesia. The incidence rate of hepatitis per 10,000 population fluctuated during the past years. In 2003, the incidence rate was 1.40 and felt to 0.56 in 2004, but increased to 0.9 in 2005.[1]

Hepatitis A and E which are clinically comparable are self-limiting diseases, and during the duration of the infection, they may cause lowering persons' ability to work and daily activity.

Hepatitis A reservoir among others is human, and the modes of transmision are person to person by the fecal oral route. Recent studies suggest that hepatitis E reservoir may exist in domestic animals including swine, and the mode of transmission are also person to person by the fecal oral route.[2] Furthermore, hepatitis A and hepatitis E are waterborne diseases, and related to poor environmental conditions.

In addition, there is a possibility of zoonotic spread of the virus, since several non-human primates, pigs, cows, sheep, goats, dogs, and rodents are susceptible to infection.[3] Raising medium-sized livestocks - such as sheep, goats, and swine – were also noted a possibility of hepatitis E transmission from swine to humans in an endemic area.[4] At present time, along with the increasing population number in Indonesia, raising medium-sized livestocks in neighborhood increased - in urban as well as rural area - to fulfill meat. Inappropriate corral place of raising medium-sized livestock might causing negative effects community health.[5] This paper presents an assessment between corral place of raising medium-sized livestock and risk of hepatitis in high prevalence endemic hepatitis provinces in Indonesia.

METHODS

This paper used a part data of Basic Health Survey (*Riskesdas*) in 2007 which was implemented all 33 provinces of Indonesia.

The *Riskesdas* 2007 study had the same sampling technique with the National Social Economy Survey *(Susenas)* 2007. The *Susenas* 2007 sampling technique used sampling frame of census blocks. For each census block selected, using by Probability Proportional to Size (PPS) were drawn 16 households in a systematic random sampling.[6] Due to internal budget problem in Ministry of Health of Indonesia in fiscal year 2007, the implementation of the *Riskesdas* 2007 was not at the same period, collecting data was conducted as follow. In 28 provinces the study were conducted in July 2007 to January 2008), and in rest of five hard provinces (Papua, West Papua, Maluku, North Maluku, and East Nusa Tenggara) was carried out in August-September 2008.[7]

Data collection methods based on Questionnaire Guideline on *Riskesdas* 2007 as follow.[6] Data were collected by personnel who had special trained for the study and using a tested previously questionnaire. Data regarding hepatitis was for subjects aged 10 years or less based on information from their parents or those who familiar with them. Whereas for senile subjects the hepatitis data came from those who familiar with them.[6]

Hepatitis criteria based on diagnosis or had symptoms of hepatitis during the last 12 months. A subject considered had hepatitis if she/he: (1) had been diagnosed hepatitis by a health workers (physicians, paramedics) during the last 12 months; or (2) ever had suffered fever, weakness, gastrointestinal disturbances (nausea, vomiting, no appetite), upper right abdominal pain, accompanied by dark brown colored urine, yellow eyes or skin.[7]

Several environmental indicators were as follow. Measurement of physical quality of drinking water were by interviewing subject as well as observation of the water including its color, smell, taste, muddiness and the presence of foam. Processing drinking water before consumption was boiling (cooking) water before consumption, filtering, UV, chemical material and others.

The average of clean water usage per person per day for every individual based on WHO-Unicef standard (limit to the clean water consumption should be 20 liters/person/day). Moreover, source of water pollution based on distance from source of water, waste water spillway facility, water reservoir, and garbage disposal.[8]

Our assessment revealed that total subjects of *Riskesdas* 2007 study was 987,205. However, those who had complete data on hepatitis were 973,118.

For this assessment, the participating provinces were provinces which had prevalence of hepatitis above national average (0.6%), i.e. Aceh, West Sumatra, Riau, West Nusa Tenggara (NTB), East Nusa Tenggara (NTT), Central Sulawesi and Southeast Sulawesi, Gorontalo, North Sulawesi, North Maluku, West Papua, Papua. Furthermore, for this assessment, the included subjects were 141,291 subjects consisted of those who had medium-sized livestock (21,217 subjects) and who did not have medium-sized livestock (120,074 subjects**)**.

Furthermore, age was divided into 4 groups (0-17 years; 18-29 years; 30-59 years; and 60-98 years); education divided into 2 groups (low education = never went to school, unfinished elementary school, and finished elementary school; high education = finished junior high school, or senior high school, or university); employment divided into 5 groups (self employment = merchant, entrepreneur, service provider; employee = civil service/army/ police/state own company/private employee; housewife; student; labor = jobless, labor, fisherman etc.); economy status were divided into 2 groups (low = quintile 1 and quintile 2; high = quintile 3, quintile 4 and quintile based on *Susenas* criteria.

The results physical quality of drinking water was divided into 2 groups (good = not colored, smelled, have no taste, foamed, and muddy; bad = colored, smelled, had taste, foamed, and muddy.

The average of clean water usage per person per day for every individual was divided into 2 groups (good = 20 liters or more clean water per day; bad – less than 20 liters clean water per day). Furthermore, source of water pollution was divided into 2 groups (good = in distance 10 m from source of water does not have pollution or otherwise); Waste water spillway facility was good whenever waste water spillway facility (closed or otherwise); water reservoir was good whenever water reservoir in closed container or otherwise); and garbage disposal data of garbage disposal includes the availability of garbage (inside or outside of home).

Statistical analysis using a computer with Stata version 9.0 software. Unconditional logistic regression analysis was used in order to determine the cofounding effects and to determine the risk factors for hepatitis.[8,9] A risk factor was considered to be a potential confounder if in the univariate test it had a P value <0,25 which would be considered as a candidate for multivariate model along with all known risk factors for hepatitis.

This study received the ethical clearance from ethical commission of the National Institute of Health Research and Development, Ministry of Health, Republic of Indonesia. Informed consent was obtained from study participants.

RESULTS

Of 141,291 subjects for this assessment, a number of 1,257 (0.9%) subjects ever had symptoms or diagnosed of hepatitis, and 140,034 (99.1%) never had symptoms or diagnosed hepatitis.

Table 1 shows urban areas were more likely had higher risk of hepatitis than rural. In term of provinces, the hepatitis prevalence rate differed among provinces. The lowest prevalence of hepatitis occurred in South Sulawesi (0.35%), whereas the highest prevalence in Central Sulawesi (2.13%).

Table 2 shows that hepatitis and non hepatitis subjects were similarly distributed with respect to gender. However, compared with respective referred groups, hepatitis cases were more likely occurred among elder groups, no self employment, lower education and low economic status.

Table 1. Area, province and risk of hepatitis

	Hepatitis				Crude odds ratio	95% confidence interval	P
	No		Yes				
	(n=140,034)		(n= 1,257)				
	n	%	n	%			
Area							
Rural	51,953	37.1	305	24.3	1.00	Reference	
Urban	88,081	62.9	952	75.7	1.84	1.62-2.10	0.000
Province							
South Sulawesi	19,834	14.2	69	5.5	1.00	Reference	
Southeast Sulawesi	12,697	9.1	73	5.8	1.65	1.89-2.30	0.003
North Maluku	5,636	4.0	33	2.6	1.68	1.11-2.55	1.014
West Sumatra	20,700	14.8	131	10.4	1.82	1.36-2.44	0.000
Papua	6,644	4.7	58	4.6	2.51	1.77-3.56	0.000
Aceh	18,095	12.9	158	12.6	2.51	1.89-3.33	0.000
West Nusa Tenggara	12,259	8.8	108	8.6	2.53	1.87-3.43	0.000
Riau	14,240	10.2	126	10.0	2.54	1.89-3.41	0.000
West Papua	2,784	1.9	29	2.3	2.99	1.94-4.63	0.000
North Sulawesi	5,440	3.9	64	5.1	3.38	2.40-4.76	0.000
East Nusa Tenggara	12,562	8.9	209	16.6	4.78	3.64-6.28	0.000
Central Sulawesi	9,143	6.5	199	15.8	6.26	4.75-8.24	0.000

Table 2. Some socio-demographic characteristics and risk of hepatitis

	Hepatitis				Crude odds ratio	95% Confidence Interval	P
	No		Yes				
	(n=140,034)		(n= 1,257)				
	n	%	n	%			
Gender							
Female	71,953	51.4	630	50.1	1.00	Reference	
Male	68,081	48.6	627	49.9	1.05	0.94-1.18	0.372
Age							
0-17 years	56,179	40.1	314	24.9	1.00	Reference	
18-29 years	26,982	19.3	255	20.3	1.69	1.43- 2.00	0.000
30-59 years	47,280	33.8	545	43.4	2.06	1.80-2.37	0.000
60-98 years	9,593	6.9	143	11.4	2.67	2.19-3.25	0.000
Employment							
Self employment	33,435	23.9	165	13.1	1.00	Reference	
Employee	22,875	16.3	179	14.2	1.59	1.28-1.96	0.000
Housewife	20,970	14.9	198	15.8	1.91	1.56-2.35	0.000
Education	21,781	15.6	145	11.5	1.35	1.08-1.69	0.009
Labor	40,973	29.3	570	45,4	2.82	2.38-3.35	0.000
Education							
High	50,516	36.1	383	30.5	1.00	Reference	
Low	89,518	63.9	874	69.5	1.29	1.14-1.45	0.000
Economic status							
High	80,177	57.3	658	52.4	1.00	Reference	
Low	59,857	42.7	599	47.7	1.84	1.62-2.10	0.000

Table 3. Some environmental characteristics and risk of hepatitis

	Hepatitis				Crude odds ratio	95% Confidence Interval	P
	No (n=140,034)		Yes (n=1,257)				
	n	%	n	%			
Quality of drinking water							
Good	120,366	85.9	1,016	80.8	1.00	Reference	
Bad	19,668	14.1	241	19.2	1.45	1.26-1.67	0.000
Water treatment before consumption							
Processed	128,036	91.4	1,135	90.3	1.00	Reference	
No processed	11,998	8.6	122	9.7	1.15	0.95-1.38	0.152
Clean water usage							
Enough	126,228	90.1	1,14	90.7	1.00	Reference	
Not enough	13,806	9.9	117	9.3	0 .94	0.78- 1.14	0.514
Source of water pollution							
No	133,749	95.5	1,18	93.9	1.00	Reference	
Yes	6,285	4.5	77	6.1	1.12	1.03-1.21	0.006
Waste water spillway *facility*							
Closed	61,157	43.7	478	38.0	1.00	Reference	
Opened	78,877	56.3	779	61.9	1.26	1.13-1.42	0.000
Water reservoir							
Closed	15,116	10.8	91	7.2	1.00	Reference	
Opened	124,918	89.2	1,166	92.8	1.55	1.25-1.92	0.000
Garbage disposal							
Closed	13,042	9.3	88	7.0	1.00	Reference	
Opened	126,992	90.7	1,169	93.0	1.36	1.10-1.70	0.005

Table 4. Relationship between place of raising livestock and risk of hepatitis

	h				Adjusted odds ratio	95% confidence Interval	P
	No (n=140,034)		Yes (n=1,257)				
	n	%	n	%			
Raising medium-sized livestock							
No raising livestock	119,123	85.1	951	75.7	1.00	Reference	
Raising livestock	20,911	14.9	306	24.3	1.83	1.61-2.09	0.000
Corral for raising medium-sized livestock							
No livestock	119,123	85.1	951	75.7	1.00	Reference	
Corral inside the house	2,389	1.7	48	3.8	1.98	1.47-2.66	0.000
Corral outside the house	9,706	6.9	126	10.0	1.38	1.14-1.67	0.001
No corral	8,8816	6.3	132	10.5	1.50	1.26-1.68	0.000

∗Adjusted for area, age, employment, economy status, education, physical quality of drinking, source water pollutant

Table 3 shows that hepatitis and non hepatitis subjects were similarly distributed with respect to average of clean water usage. However, compared with respective referred groups, hepatitis cases were more likely to occur among subjects with bad physical quality of drinking water, subjects who have source of water pollution, subjects with opened waste water spillway facility, subjects with opened water reservoir, and subjects with opened garbage disposal.

Table 4 reveals that in general, subjects who had raising medium-sized livestock had 83% more hepatitis risk compared to who did not have raising medium-sized livestock [adjusted odds ratio (ORa)= 1.83]; term of several types of corral place for raising medium-sized livestock, the highest risk (almost 2-fold) to be hepatitis occurred among who had corral inside the house for raising medium-sized livestock (ORa=1.98), and the least risk (38% more risk) to be hepatitis occurred among who had corral outside the house for raising medium-sized livestock (ORa=1.38). In addition, who did have corral for raising medium-sized livestock had 50% increased risk to be hepatitis. All risks were compared with who did not have raising medium-sized livestock.

DISCUSSION

There are several limitations which must be considered in the interpreting of findings. Among others, the subjects came 11 provinces which had prevalence of hepatitis above national average (0.6%) out of 33 provinces in Indonesia. Secondly, the diagnosis of hepatitis was based on anamnesis only. Thirdly, this study used period prevalence. The subjects were asked about the history of hepatitis during the last 12 months which might caused recall their experiences on symptoms or ever had diagnosed hepatitis. Fourthly, the type of hepatitis in this study was general for hepatitis; it was not specific for hepatitis A and E, even though hepatitis A and E usually related to poor sanitization environment. On the hand hepatitis B, C, D may be spread by direct contact with secretions and blood of patients. Lastly, the definition of livestock was not specific for raising medium-size livestock such as lamb, goat, pig, etc. This study did not collect personal hygiene of subjects.

In spite of these limitations, the data was numerous as a part of a national wide study in high hepatitis prevalence of 12 provinces in Indonesia. Secondly, the diagnosis of hepatitis only based on anamnesis was enough when in fact sample of the study very large, limited funding and ease of field implementation. If this research used laboratory diagnosis, it would cost too much and complicated handling of specimens in the field, and need to be sure whether the specimens are still eligible to be examined in the laboratory.

In this assessment, of 141,291 subjects for the prevalence of hepatitis (ever had symptoms or diagnosed of hepatitis) was 0.9%. This figure was lower than prior study noted that the prevalence of hepatitis in a non outbreak community in East Java was 3%.[10] This study shows that urban areas were more likely had higher risk of hepatitis than rural. The same problems occurred in developed and well as developing countries.[5] Since limited land in Indonesia, hepatitis need more attention in particular in urban.

This assessment shows that lowest hepatitis prevalence was South Sulawesi (0.35=99.65/ 19,903), and the highest occurred in Central Sulawesi (2.13=199/9,342). Higher prevalence rate in Central Sulawesi most likely due to in this province was more pigs as livestock.

Prior in East Java revealed that the usage of river water as primary source for bathing, human-waste disposal, and drinking purposes differed significantly ($P < 0.00001$) between the communities in outbreak areas and those in non-outbreak areas. There is no significant influence attributed to 'boiling water' on acute HEV. No climatic influences (flooding or drought) predisposed this instance of epidemic HEV transmission. This outbreak represents the first

documented evidence of epidemic HEV transmission in Java, Indonesia. [10]

Even though the *Riskesdas* 2007 did not have data to prove mode of zoonotic transmission on hepatitis, however prior study indicated that hepatitis E an emerging zoonotic disease.[3] Another study noted that hepatitis E is a zoonotic disease.[11]

This assessment noted that the highest risk being hepatitis occurred among who had corral inside the house for raising medium-sized livestock, and the least risk to be hepatitis occurred among who had corral outside the house for raising medium-sized livestock.
Habits of the Indonesian people have cattle sheds outside the house, but the cage is very close to the house that is in front of the house or next to a house near the door, they rarely have a cage outside the home away from house, except some large livestock such as horses, buffalo them loose in the garden away from home. They have fears of losing their livestock, therefore they have corral close to house, so that feces and urine of livestock will make pollution around the house. This was shown several subjects that have a cage outside the house tend to have a risk of hepatitis.

In conclusion, the least risk being hepatitis occurred among who had corral outside the house among whom raising medium-sized livestock.

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