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Helminthiasis of rabbits on the upland and lowland areas and the risk factors

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Helminthiasis of rabbits on the upland and lowland areas and the risk factors

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Abstract. Rabbits are a potential livestock commodity to supply quality meat with higher protein and lower fat and cholesterol content than other meat. Helminthiasis is a parasitic worm infection that has imposed economic loss involving some risk factors. This study aimed to investigate the helminthiasis cases in both upland and lowland areas, as well as their risk factors on helminthiasis infection of rabbit farming. A total of 192 rabbit samples was derived from Baturraden and Kalibagor, Banyumas Regency, Central Java Province, Indonesia. The research engaged a survey method with a purposive sampling. Data on the correlation between the areas and helminthiasis incidence were subjected to a chi square analysis. The risk factors were computed in the 2x2 contingency table and analyzed with Odds Ratio. The result showed a significant correlation between the altitude of an area and the helminthiasis incidence ($P<0.05$). Regarding the host, male rabbit is 1.15 times as risky as the female counterparts to get helminthiasis infection. Meanwhile, the environmental factors, such as the metal floor of the rabbit cage contribute 7.42 times as much risk of helminthiasis infection as that of wooden floor.

1. Introduction

Rabbits are small mammals of the Leporidae family with great potential and excellent, low-cholesterol meat [1], [2]. Helminthiasis is one of the diseases that require further investigation because, like most parasitic worm infections, it is without clinical symptoms. When present, the clinical symptoms are usually mild and negligible [3]. Helminthiasis is a worm-parasitic disease which contributes to the inhibited rabbit's maintenance. Some species of parasites in rabbits could expose humans to disease (zoonosis), such as Hymenolepis, Giardia spp and Toxocara sp [4], [5], [6]. Additionally, some risk factors for gastrointestinal parasites include sex, age, and seasons [7].

Banyumas Regency in Central Java Province, Indonesia has a wet tropical climate and fertile agricultural land because it is located near an active volcano, Mount Slamet. Therefore, this area is potentially developed into livestock farming, including rabbits [8]. Banyumas covers an upland (at the foot of Mount Slamet) and lowland areas that potentially affect the condition of livestock maintenance. The high rainfall and humidity are the ideal condition for parasitic diseases, such as helminthiasis.

Epidemiological studies on the incidence and risk factors of diseases have been conducted in many countries [9], [4], [10], [7]. However, data on helminthiasis cases in Indonesia are limited. Meanwhile, rabbit meat is the potential substitute for other livestock meat because of its nutrition value [2]. Supplying ASUH meat (Safe, Healthy, Whole and Halal) to guarantee quality meat for public consumption and securing the health of the veterinary public is one of the main objectives of this study. Accordingly, this study aims to investigate the helminthiasis incidence in the upland and lowland areas of Banyumas Regency, as well as the risk factors of the causes to helminthiasis of rabbits.

2. Materials and Methods

This study conducted an analytical survey with two types of data: laboratory analysis of feces samples and a questioner interview with rabbit farmers. The researcher used the purposive sampling technique to collect rabbit's feces from rabbits farming in the upland (Baturraden) and lowland (Kalibagor) areas in the Banyumas Regency because both areas (Baturraden and Kalibagor) have a relatively large population of rabbits. The total samples were collected using the Slovin Formula: n=N/ 1+Ne2 where n is the total minimum samples, N is the population, and e is the error margins, such as 5% [11]. Therefore, the total samples collected was 192.

Feces were examined to identify worm eggs in the samples of rabbit feces using the native method and float test. Total feces samples were calculated using the Mc Master method as in the previous study [12], [13]. The rabbit farmers filled out the questioner when the researchers conducted the field survey. The dependent variable in this study was helminthiasis incidence. The independent variables included lands, sex, body condition, age, body weight, type of cage, total rabbits per-cage, cage cleanliness, cage density, cage cleaning frequency, type of feed, cage lighting, total drinking water, and water source. Data on the correlation between the lands (upland and lowland) and the helminthiasis incidence were subject to chi-square analysis. The risk factors data was computed into a 2x2 contingency table and analyzed with Odds Ratio [14].

Odds Ratio (OR) is the measure of association between the exposure (risk factors) and the disease incidence, which is calculated from the number of disease incidence in the risk group (exposed to risk factors) compared to the total disease incidence in the no-risk groups (not exposed to risk factors). If OR = 0 (zero), the variables are not the risk factors [15], [16]. The Odds Ratio in this study measures the extent of the risk factors/variables to the helminthiasis infection of rabbits and how many times rabbits exposed to risk factors are more likely to get infected than the not exposed ones. The Odds Ratio formula is ad/bc, where: "a" is cell a, "b" is cell b, "c" is cell c and "d" is cell d. A detailed information is presented in the Table 1.

Table 1. Table of 2x2 contingency of Odds Ratio

Factor	Disease	
	No	Yes
No	a	b
Yes	c	d

3. Result and Discussion

3.1 Helminthiasis in upland and lowland areas

Batturaden upland is located on the slope of Mount Slamet, so it has fresh air. Meanwhile, Kalibagor is a lowland with a temperature of 25°C [8]. Both areas are located in Banyumas Regency, Central Java Province, Indonesia. The geographic differences, such as altitude above sea level (asl) will result in different weather and microclimatic condition in those areas, especially temperature and humidity [17]. Helminthiasis distribution in both areas is presented in Table 2.

The result shows a significant correlation between land altitude and helminthiasis incidence (P<0,05). Different rabbits' age and sex, as well as the climate and season of an area, contribute to the helminthiasis incidence [9], [18], [19].

Table 2. Distribution of rabbit samples on helminthiasis in the upland and lowland areas

Lands	Total samples	Helminthiasis incidence		Percentage
		Positive	Negative	
Upland area	99	7	92	7.07%
Lowland area	93	27	66	29.03%

There was a lower helminthiasis incidence in the upland than that in the lowland area (Table 2). The prevalence of infection that causes helminthiasis in the upland (Baturraden) and lowland (Kalibagor)

areas was 7.07% and 29.03%, respectively. The contributing factors may include the different geographical conditions in which the upland area has a cooler weather and lower rate of rainfall than those of the lowlands; as a result, the rabbits are more comfortable living in the uplands. Furthermore, the maintenance system also contributes to the helminthiasis incidence in both areas. Rabbits are animals that enjoy living in ambiance temperature around 9-19°C [20].

Furthermore, Skriivanova and Nuriyasa [21], [22] reported that rabbits are animals that find it difficult to balance their body hit due to their limited sweat gland. During heat stroke, rabbits would undergo an accelerated respiratory rate and heartbeat. Regarding parasitic worms, the prevalent worm egg in Baturraden includes Strongyle, Trichuris sp, Cittotaenia and Toxocara sp while in Kalibagor are Strongyle, Trichuris sp, Cittotaenia sp, Trychostrongylus sp and Passalurus sp. Siegmund [23] stated that worms that are common in rabbits are Taenia pisiformis, Taenia serialis from Cestoda and Passalurus ambiguus from the Nematode class.

3.2 The risk factors of helminthiasis in rabbits

The transmission models of infectious disease are generally affected by 3 (three) factors, namely an infection agent (etiology), the host, and the environment. In the transmission of helminthiasis disease, the infectious agent and host characteristics are relatively constant; however, the environmental factor is more dynamic and influential to the infectious pattern of helminthiasis.

The risk factors for the parasitic gastrointestinal disease include sex, age, seasons, and climate [24], [7]. In this study, we attempted to dissect the environmental factors to the infection pattern of helminthiasis. We found four factors related to the host (group A) and 18 factors regarding the maintenance system that includes cage (group B), maintenance (group C), and feed and others (D).

Table 3. Odd Ratio (OR) value of the contributing factors to helminthiasis of rabbits

No	Risk factors	Helminthiasis incidence				Total samples	OR
		Infection		No infection			
		Total samples	%	Total samples	%		
A							
1.	Sex						
	a. Male	18	18.75	78	81.25	96	1.15
	b. Female	16	16.66	80	83.33	96	
2.	Body condition						
	a. Medium	27	17.53	127	82.47	154	0.94
	b. Fat	7	18.42	31	81.58	38	
3.	Age						
	a. Offspring	32	17.68	149	82.32	181	0.97
	b. Parent	2	18.18	9	81.81	11	
4.	Body weight						
	a. Below 1 kg	5	8.62	53	91.38	58	0.34
	b. Over 1 kg	29	21.64	105	78.36	134	
B							
1.	Types of cage						
	a. Dump	0	0.00	0	0.00	0	0.00
	b. Stage	34	17.71	158	82.29	192	
2.	Cage material						
	a. Wood	10	17.24	48	82.76	58	0.95
	b. Non Wood	24	17.91	110	82.09	134	
3.	Shape of cage floor						
	a. No slate	3	16.67	15	83.33	18	0.92
	b. Slate	31	17.82	143	82.18	174	
4.	Materials on cage						
	floor	33	20.37	129	20.37	162	7.42
	a. Wood	1	3.33	29	3.33	30	

No	Risk factors	Helminthiasis incidence				Total samples	OR
		Infection		No infection			
		Total samples	%	Total samples	%		
	b. Metal						
C							
1.	Cage cleaning method	11	21.57	40	78.43	51	
	a. Sweep	23	16.31	118	83.68	141	1.41
	b. Sweep and wipe with cleanser						
2.	Separate feses and urin disposal						
	a. No	0	0.00	9	100.00	9	0.00
	b. Yes	34	18.58	149	81.42	183	
3.	Feces and urine deposits	1	16.67	5	83.33	6	
	a. Around the house	33	21.57	153	85,26	186	0.93
	b. A dedicated place						
4	Cage cleaning frequency	10	14.93	57	85.07	67	
	a. Occasionally	24	19.20	101	80.80	125	0.74
	b. Everyday						
5.	Frequency of cleaning feces disposal	0	0.00	9	100.00	9	
	a. Occasionally	34	18.58	149	81.43	183	0.00
	b. Regularly						
6.	Daily residual feed is wasted	17	20.00	68	80	85	
	a. No/accumulated	17	15.89	90	84.11	107	1.32
	b. Yes						
7.	Feeding frequency						
	a. 2 times a day	34	18.28	152	81.72	186	0.00
	b. > 2 times a day	0	0.00	6	100.00	6	
8.	Frequency of feed waste disposal						
	a. Irregular	4	16.67	20	83.33	24	0.92
	c. Every day	30	17.86	138	82.14	168	
9.	Frequency of drinking water supply	13	18.57	57	81.43	70	
	a. Ad libitum	21	17.21	101	82.79	122	1.10
	b. Irregular						
10.	Total rabbits in one cage	7	12.28	50	87.72	57	
	a. More than one	27	20.00	108	80.00	135	0.56
	b. One						
11.	Cage density						
	a. = 60x40x40 per rabbit	2	7.14	26	92.86	28	0.32
	b. >60x40x40 per rabbit	32	19.51	132	80.49	164	
D							
1.	Type of dominant feed	4	9.30	39	90.70	43	0.41
	a. Grass and pellet	30	15.63	119	79.87	149	

No	Risk factors	Helminthiasis incidence				Total samples	OR
		Infection		No infection			
		Total samples	%	Total samples	%		
	b. Pellet						
2.	Water source						
	a. Non tap water	33	18.64	144	81.36	177	3.21
	b. Tap water	1	6.67	14	93.33	15	
3.	Cage lighting						
	a. Bright	30	20.41	117	79.59	147	2.63
	b. Dark	4	8.89	41	91.11	45	

Regarding rabbits' characteristics, the contributing factors to helminthiasis infection include sex (1,15), age (0,97), body condition (0,94) and body weight (0,34). Different sex is the highest factor with the OR value of 1,15. Accordingly, male rabbits are 1,15 times as risky as the female to get infected. Female animals are more resistant to parasitic infection than their male counterparts because of their hormonal performance.

Similar with previous study [25], that result, perhaps attributed to the aggressive nature of male animals when feeding, may pick up eggs of parasite. Previous studies by [26] and [7], this study found that young rabbits are more susceptible to infection than the adult. Additionally, fat rabbits are 0.34 times as risky as those under 1kg to get helminthiasis infection. Table 3 presents the detailed OR values in this study.

In the caging system, the highest risk of helminthiasis exposure is on the material of the cage floor. The wooden cage floor has a 7,42 OR, so it exposes rabbits to helminthiasis infection 7,42 times as much as that with a metal floor. The wooden cage floor may have higher humidity and take a longer time to dry, so it allows worm eggs or larvae to live longer and infect the rabbits. The farmers did not use grounded rabbit housing because it makes the rabbits step on their faces. Rabbits are animals that enjoy clean space, so when the cage is dirty, they prefer lying down in the cleanest spot. When all places are dirty, the rabbits will not lie down, and they show signs of discomfort.

Table 3 presents the detailed OR value of the caging system. The cage cleaning method obtains the highest OR value (1,41). Some farmers only swept the cage while others wiped it, occasionally using a chemical agent to make the cage cleaner. In the first method, the rabbits were 1,41 times exposed to helminthiasis infection than those in a cleaner cage. The technique of feed residue disposal also contributes to helminthiasis infection, with a 1,32 OR values. Farmers who did not discard the residual feed in the feed container, but only added more feed to the old one had made the rabbits 1,32 times as risky to get infected with helminthiasis.

Table 2 presents the detailed OR value of the maintenance system. Furthermore, rabbits' cage with a brighter lighting has the OR value of 2,63, so the rabbits are 2,63 times as risky to get infected with helminthiasis than those in the dark cage. A bright cage is assumed to make the rabbits more active and alert, so they need more energy than the rabbits that stay idle. Rabbits that feed more are more likely to get exposed to infectious parasites in the feed. Table 3 presents the detailed OR value of rabbit feed and other factors. In the cattle, prevalence of helminthiasis is multifactorial in different breeds. That is influenced by type of management system, frequency and type anthelmintic used, physiology and nutrition of the cattle [25].

4. Conclusion

Land altitude is significantly correlated with helminthiasis incidence ($P<0,05$). The infection prevalence of the causes of helminthiasis in the upland and lowland area is 7.07% and 29.03%, respectively. Regarding the host, the male rabbit is 1.15 times as risky as the female counterparts to get helminthiasis infection. Meanwhile, the environmental factors, such as the metal floor of the rabbit cage contribute 7.42 times as much risk of helminthiasis infection like that of the wooden floor.

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