

Incidence Proportion, Risk Factors and Blood Hematological Profile of Dogs with a Diagnosis of *Helminthiasis* in Gunung Kidul Regency

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ABSTRACT

For many people, dogs are considered to be a family members. However, dogs which is considered as family members are also not free from the possibility of experiencing disease infections. Parasitic infections such as helminths are a common problem in dogs. This study aims to determine the incidence proportion and risk factors for helminthiasis in dogs in Gunung Kidul Regency. Blood profiles were also analyzed to determine changes related to helminth infections. Data were collected by interviewing dog owners and examining feces samples using the native method. Total number of helminthiasis cases identified from examination of faecal samples was 8 out of 53 dogs. The incidence proportion of *helminthiasis* in dogs in Gunung Kidul is 15.09%. The worm eggs identified were *Ancylostoma spp.*, *Toxocara spp.*, and *Dipylidium spp.*

Keywords: dogs; helminthiasis; risk factors; blood profile; incidence proportion

INTRODUCTION

Infections caused by helminthic parasites (helminthiasis) are infections that are often found in pets such as dog (1,2) and cat (3). Dog do not only act as pets, for many people, dog is considered to be a family members. Dog are at risk of being infected with parasites such as helminths. *Ascaris* species commonly known as "roundworms" and *Ancylostoma* commonly known as "hookworms" can infect the small intestines of dogs and cats. Parasite components, such as eggs, larvae, and oocysts are excreted in dog feces and can survive for a long time and remain infective in the environment (4).

Some types of helminths that infect dogs can be transmitted to humans or zoonotic such as *Toxocara canis* (5-7) and *Ancylostoma spp.* Several types of helminths that can infect dogs include *Ancylostoma spp.*, *Uncinaria stenocephala*, *Toxocara canis*, *Toxascaris leonina*, *Trichuris vulpis* and *Dipylidium caninum*. Protozoa such as *Giardia*, *Cryptosporidium*, *Isoospora spp.* and *Sarcocystis spp.* also frequently infects dogs (11,12).

Factors can affect the proportion of helminthiasis in dogs such as age, sex, dog breed, food, environment, accuracy of sample examination, deworming, and geographic location (8). Knowing the epidemiological pattern of helminthiasis in different areas will provide a basic strategy for controlling helminthiasis. In addition to the risk factors for helminthiasis, knowing the impact of helminthiasis on changes in a dog's blood profile can increase awareness of potential zoonotic infections (13).

Statistics data about helminthiasis in dogs needs to be carried out regularly to increase public awareness of the potential for zoonotic infection diseases. Veterinarians often find cases of helminthiasis in dogs and cats in the clinics, but research on the presence of helminthiasis in dog populations has not been carried out routinely and is widely carried out, including in the Gunung Kidul area, Yogyakarta. This study aims to determine the proportion of diseases and risk factors that cause helminthiasis in dogs in Gunung Kidul Regency.

METHOD

This study used samples of feces and blood from dogs (male and female) of various ages in Gunung Kidul Regency, Yogyakarta. Feces samples were obtained from 53 dogs, which were collected, stored in a colling box and prepared for identification of worm eggs as an indicator of helminthiasis. A total of 52 blood samples from dogs used in the study were stored in *Ethylenediaminetetraacetic acid* (EDTA) tubes and prepared to assess the possibility of clinical blood changes. One dog blood sample could not be analyzed haematologically because blood is not collected as much as needed for blood testing. All research procedures, including blood collection process, are carried out by veterinarians and have considered all aspects of animal welfare. This research is supported by data on the maintenance and health status of the dogs used, through a questionnaire survey with the owners. Data collection process is carried out in November-December 2021.

Helminthiasis disease proportion

A total of 53 samples of dog feces were examined in this study to determine the proportion of helminthiasis in dogs kept in Gunung Kidul Regency. Calculating the proportion of helminthiasis in this study using the formula for the proportion of diseases = $\frac{\text{Case number}}{\text{Total Samples}} \times 100\%$.

Feces Examination

Feces samples were examined using a qualitative method (native method) to identify eggs from helminths that infect dogs in Gunung Kidul Regency. 53 faecal samples were collected by rubbing a sterile cotton swab into the dog's rectum then the cotton swab was inserted into a 1.5 ml eppendorf containing aquadest. Then in the laboratory, the sample was taken from the eppendorf and rubbed on the object glass, covered with a cover slip and examined under a microscope with an objective lens magnification of 40x. The sample is tested positive when at least eggs of helminths are found in the native method. Then parasite eggs are identified to the lowest taxonomic level (14,15).

Hematology Analysis

Blood samples were collected using a 3 ml syringe on the cephalic vein of the dog's forelegs, then put into a 3 ml EDTA vacutainer tube. Samples were analyzed using the Mindray BC-5000 Vet and BC-2800 Vet auto hematology analyzers. To compare the hematological parameters in a group of dogs infected with helminths and healthy. Hematological parameters that will be compared in the infected dog group and the healthy dog group are Packed Cell Volume (PCV), Haemoglobin (Hb), Total Erythrocyte Cell (TEC), Total Leucocyte Cell (TLC), lymphocytes, neutrophils, eosinophils and monocytes. (16).

Questionnaire and data analysis

Treatments and health status of dogs in this study were obtained through direct interviews with the owners.

The information asked in the interview was the status of deworming, vaccination status, type of feed, frequency of feeding and type of drinking water. The research data obtained are presented descriptively. Qualitative analysis of worm eggs in faecal samples was used to calculate the proportion of helminthiasis in Gunung Kidul Regency. the proportion of helminthiasis in dogs in Gunung Kidul Regency by age and sex was analyzed using Pearson's Chi-squared (significance level $p < 0.05$) using SPSS Statistics software, version 23.0.0 (IBM, New York, USA).

RESULTS

Helminthiasis disease proportion

The proportion of helminthiasis in dogs by sex and age in Gunung Kidul Regency is shown in Table 1. A total of 53 faecal samples from 53 dogs were examined for cases of helminths infection. In this study, worm eggs were identified in 8 faecal samples from 53 faecal samples examined in Gunung Kidul Regency. The average proportion of helminthiasis in dogs is 15.09%. The incidence of helminthiasis in dogs can be influenced by several risk factors. The risk factors studied were age and sex. The proportion of helminthiasis cases to sex was 14.70% in males and 15.78% in females. In the age group (<1 year, 1-5 years and >5 years), the proportion of helminthiasis was 22.22%, 12.90% and 0% respectively.

Helmints Egg Native Examination

Fifty-three dog feces samples were examined by the native method. The results of the faecal examination showed that 8 out of 53 dogs were infected with helminthiasis. The types of helminths eggs that identified were helminths eggs of *Ancylostoma spp.*, *Toxocara spp.*, and *Dipylidium spp.* species. and documented in Figure 1.

TABLE 1: Proportion of helminthiasis in dogs by sex and age in Gunung Kidul Regency

	Number of dogs			proportion of helminthiasis disease	
	examined	infected	healthy	%	χ^2
Sex					
Male	34	5	29	14.70	.916
Female	19	3	16	15.78	
Total	53	8	45		
Age					
< 1 year	18	4	14	22.22	.463
1-5 year	31	4	27	12.90	
> 5 year	4	0	4	0.00	
Total	53	8	45		

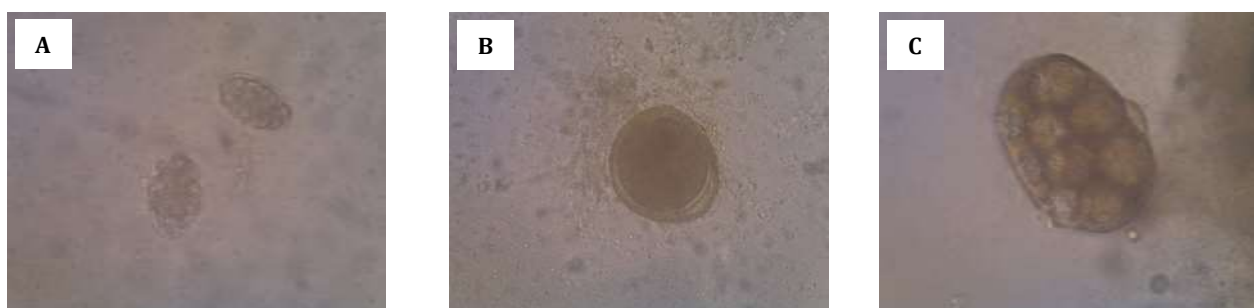


FIGURE 1: (A) *Ancylostoma spp.*, (B) *Toxocara spp.* and (C) *Dipylidium spp.* objective magnification 40x.

Hematological Parameters

52 dog blood samples were examined by auto hematology analyzer. The results of the examination of PCV, hemoglobin, total erythrocytes and total leukocytes (Mean±SEM) for the infected and healthy dog groups are shown in Table 2. The values of PCV, Hb and Total Erythrocyte are known to be lower in the infected dog group compared to the healthy dog group.

Total leukocytes, neutrophils and eosinophils were lower in the infected dog group compared to the healthy dog group. However, basophils, lymphocytes, monocytes and platelets showed an increase in the infected dog group compared to the healthy dog group.

Questionnaire and data analysis

The results of the questionnaire survey to determine the maintenance and health status of dogs are shown in Table 3. The results showed that six of the eight dogs infected with helminthiasis in this study were known to have never been given deworming drugs before (11.32%), while two

infected dogs had been given deworming drugs, although the administration of deworming was two months earlier. Six of the eight dogs infected with helminthiasis were given daily food such as rice, vegetables and leftovers from the dog's owner (11.32%), and five of eight dogs infected with helminthiasis were given tap water (9.43%).

TABLE 2: Hematological parameter values of infected (n=8) and healthy dogs (n=44) Mean±SEM.

	Infected Group	Healthy Group	References**
Haemoglobin (g/dL)	13.45±0.92	14.07±0.44	12-18
TEC (x 10 ⁶ /ul)	6.45±0.32	6.75±0.19	5.5-8.5
Hematocrit (%)	44.17±2.52	44.48±1.33	37-55
MCV (fl)	68.42±2.22	66.19±1.12	60-77
MCH (pg)	20.71±0.68	20.91±0.35	19.5-26
MCHC (%)	30.30±0.79	31.63±0.28	30-38
TLC (x 10 ³ /ul)	15.76±1.46	16.68±0.84	6-17
Netrofil (%)	60.25±3.53	60.95±1.30	60-77
Eosinofil (%)	8.06±1.85	8.22±0.74	2-10
Basofil (%)	0.03±0.18	0.01±0.00	0-1
Limfosit (%)	25.62±3.43	24.87±1.24	12-30
Monosit (%)	6.02±0.60	5.94±0.31	3-10
Trombosit (x 10 ³ /ul)	228.00±33.87	215.36±19.50	200-500

* Significance level P>0.05.

**Larry Patrick Tilley, Francis W.K. Smith, Jr. (2016). Blackwell's five-minute Veterinary Consult: Canine and Feline 6th Edition. Ames, Iowa: Blackwell

TABLE 3: Results of a questionnaire survey with dog owners regarding the maintenance and health status of dogs

	n=53		χ^2
	Positive	%	
Deworming			
Never wormed	6	11.32	.697
Wormed	2	3.77	
unknown	0	0.00	
Vaccination history			
Unvaccinated	4	7.55	.129
Vaccinated	4	7.55	
unknown	0	0.00	
Diet			
Combination home cooked diet and leftover	6	11.32	.543
Combination home cooked diet and dry food	1	1.89	
Dry food	1	1.89	
Frequency of eating			
1 time per day	0	0.00	.205
2 time per day	4	7.55	
> 2 time per day	4	7.55	
Source of drinking water			
Tap water	5	9.43	.355
boiled water	3	5.66	

DISCUSSION

The presence of helminths infection in dogs is influenced by many factors, especially in the dog population group under investigation. As an example. roaming, proprietary, shelter-dwelling, or bred dogs. In fact, a dog's different living environments can significantly increase the risk of contracting various diseases, including helminthiasis (17). The proportion of dogs in Gunung Kidul Regency infected with helminths based on examination of feces samples was 15.09%. Several studies that have been conducted in Indonesia show a higher prevalence of helminthiasis cases, including in Lareh Sago Halaban District, West Sumatra (2012) 57.14% and Bali 9-34% (2017), 38.36% (2019). Nonetheless, the prevalence of helminthiasis is shown to be lower as in North Jakarta City 0.31% (2020) compared to the prevalence of this study (9,18-21).

In Java, the prevalence of *Ancylostoma spp.* in dogs from Yogyakarta, Central Java and West Java were 92.31%, 88.64%, 92.5% respectively (10).

In this study, five dogs were single infected with *Ancylostoma spp.*, one dog was single infected with *Dipylidium spp.*, one dog was single infected with *Toxocara spp.* and one dog was double infected with *Ancylostoma spp.* and *Toxocara spp.* In the study, the parasitic infection of *Ancylostoma spp.* and *Toxocara spp.* were found to infect dogs more in Gunung Kidul Regency. The same thing was found in several previous studies that *Ancylostoma spp.* and *Toxocara canis* infections were more commonly found in dogs that were released free or not in cages (18,20,22).

Sex did not show a significant effect ($p>0.05$) based on the Chi-Square test on cases of helminths infection. However, the data shows that cases of helminths infection in female dogs have a higher percentage than male dogs. The proportion of helminthiasis in males is 14.70% and females is 15.78%. Another study reported cases of *Toxocara canis* infection showing no significant effect between sex and cases of *Toxocara canis* infection (13,19).

The proportion of helminthiasis against age in the group (< 1 year, 1-5 years and > 5 years) was 22.22%, 12.90% and 0.00%, respectively. Based on age, it appears that the percentage of helminthiasis cases in dogs from young to adult has a higher helminthiasis incidence rate than old age, although the Chi-Square test shows that the age factor is not significantly associated with helminth infections. The same was reported in a study by Loyola-Suárez *et al.*, (23) that age did not show significant results with the factor of worm infection in dogs. However, in another study, *T. canis* infection was more commonly found in dogs < 12 months of age compared to dogs over the age of one year (17).

To determine the significance of the hematological data in the group of dogs infected with helminthiasis and the group of healthy dogs, the Independent T-Test statistical test was used. The results of the hematological examination showed that the PCV, Hb and total erythrocyte values were lower in the infected dog group compared to the healthy dog group. However, there was no significant difference ($P>0.05$) in the parameters of PCV, Hb and total erythrocytes in the infected and healthy dogs. The PCV, Hb and total erythrocyte values were not significantly different between the infected and healthy groups. Case reports regarding *Diphyliidium caninum* infection in young dogs showed that blood parameters such as total erythrocytes, total leukocytes, neutrophils, lymphocytes and eosinophils were still within normal limits. (24).

The total leukocyte value appeared to be higher in the healthy dog group than the infected dog group, although there was no significant difference (>0.05). However, the mean total leukocytes of the two groups of dogs were still within the normal reference limits. Neutrophils and eosinophils appeared to decrease, while basophils, lymphocytes, monocytes and platelets showed an increase in the infected dog group compared to the healthy dog group. In the parameters of neutrophils, eosinophils, basophils, lymphocytes, monocytes and platelets, these two groups also showed no significant difference (>0.05). The same thing was also shown in the research by Qadir *et al.*, (25), that the total leukocyte parameter values were all normal, except for eosinophils and lymphocytes. An increase in eosinophils has been considered an indicator of parasitic infection. However, the relationship between the function of eosinophils on parasitic infections is still being questioned. Several studies have shown an increase in eosinophils due to a secondary infection, other than the parasite itself (26,27).

It is very important to know the maintenance and health status of the dog from the information provided by the dog owner. Information on deworming status, vaccination status, nutritional sources given daily, number or frequency of feeding and quality of drinking water sources are important to track so that the dog's health can be maintained. Deworming program has not yet been fully implemented in Gunung Kidul Regency. The percentage of dogs that have not been dewormed and infected with helminthiasis is 11.32% (six out of eight dogs). Regular deworming program will improve dog health and reduce zoonotic risk to humans (1,22,28).

Deworming is also given by some dog owners only before vaccination—not because of the routine program (29).

CONCLUSION

The proportion of helminthiasis in Gunung Kidul Regency in this study was found to be 15.09%. Risk factors such as age and gender did not show significant results in this study. However, the data in this study showed that helminthiasis infection cases were more common in dogs from young to adulthood and worm infections in female dogs had a higher percentage than male dogs. Factors such as regular deworming need to be improved so that they can protect dogs from helminthiasis infection and reduce the potential for zoonoses in Gunung Kidul Regency.

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