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Research Report

PREVALENCE OF HELMINTH EGGS IN CAT FECES CONTAMINATING PUBLIC AREAS IN SURABAYA

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ABSTRACT

Helminthiasis can be transmitted from animals to humans (zoonosis). Helminthiasis can cause cutaneus larva migrants, visceral larva migrant, and occular larva migrants. Cats are the most easily animals can found in public areas. cats have a habit of defecating in areas, such as dusty soil, gardens, sand pits, trash cans, and even children's playgrounds. Proximity of human life with a stray cats is one of the potential that can helminthiasis transmited to humans. The purpose of this study was to assess the prevalence of helminth eggs (species and number) observed in cat feces contaminating public areas in Surabaya. Cross-sectional study have been observations cats existense and examination laboratory of 180 cat fecal samples were collected from canteens, markets, villages, schools, and parks across 5 areas in Surabaya. Helminth eggs present in fecal samples were identified using direct smear, sedimentation, and flotation methodes, and quantified as fecal egg count (eggs per gram of feces) with McMasster method. The test results positive for helminthiasis if found one or more types of helminth eggs in fecal samples. Helminth eggs were present in 68 (37.8%) of the 180 cat fecal samples contaminating public areas in Surabaya. Results of chi-squared analysis confirmed the prevalence of helminth eggs in cat fecal samples contaminating canteen, markets, villages, schools, and parks in Surabaya ($p > 0.05$). The species causing environmental contamination included Ancylostoma sp. eggs, Toxocara cati eggs, and Toxascaris leonina eggs. The level of environmental contamination, as assessed using ANOVA, was 200 eggs per gram of feces.

Keywords: *prevalensi, helminthiasis, cats feces, helminth eggs, public areas*

ABSTRAK

Kecacingan merupakan penyakit yang dapat menular dari hewan kepada manusia (zoonosis). Penyakit kecacingan dapat mengakibatkan cutaneus larva migran, visceral larva migran, dan occular larva migran. Kucing merupakan salah satu hewan yang saat mudah ditemukan di tempat umum. kucing memiliki kebiasaan buang air besar di berbagai daerah, seperti tanah berdebu, kebun, lubang pasir, tempat sampah, dan bahkan taman bermain anak-anak. Kedekatan kehidupan manusia dengan kucing liar merupakan potensi yang dapat menularkan penyakit kecacingan kepada manusia. Tujuan dari penelitian ini adalah untuk mengetahui prevalensi telur cacing (jenis dan menghitung jumlah telur cacing) dari pengamatan feses kucing yang mencemari lingkungan di berbagai tempat umum di Surabaya. Penelitian crossectional mengamati keberadaan kucing liar dan melakukan pemeriksaan laboratorium terhadap 180 feses kucing dikumpulkan dari beberapa tempat yaitu kantin, pasar, perkampungan, sekolah dan taman dari lima wilayah di Surabaya. Feses kucing diperiksa dengan metode natif, sedimentasi dan apung, dan dilanjutkan menghitung jumlah telur (telur per gram feses) menggunakan metode McMasster. Hasil uji dinyatakan positif helminthiasis apabila ditemukan 1 jenis atau lebih telur cacing pada sampel feses. Hasil penelitian menunjukkan bahwa kandungan telur cacing pada feses kucing yang mencemari area publik di kota Surabaya sebesar 37,8% atau 68 sampel positif dari 180 sampel yang diamati. Hasil analisis chi square didapatkan $p > 0,05$

menunjukkan, telur cacing pada feses kucing telah mencemari lingkungan kantin, pasar, perumahan, sekolah dan taman di berbagai wilayah Surabaya. Pencemaran lingkungan disebabkan oleh telur Ancylostoma sp., telur Toxocara cati dan telur Toxascaris leonina. Serta hasil ANOVA menunjukkan jumlah pencemaran lingkungan oleh telur cacing sebesar 200 telur per gram feses.

Kata kunci: *prevalensi, kecacingan, feses kucing, telur cacing, tempat umum*

INTRODUCTION

Cats often live in close proximity to humans and are common in the environment, both as pets and as stray animals. Cats live in public places and have a habit of defecating in areas, such as dusty soil, gardens, sand pits, trash cans, and even children's playgrounds. Increase environmental contamination levels by feces and zoonotic eggs can caused by environmental factors and increasing cat populations.[1]

Environmental contamination by helminth eggs can transmit helminthiasis among animals as well as from animals to humans (zoonosis). Even today, helminthiasis affects many Indonesians, particularly children,[2] and the prevalence of helminths in Indonesians is reportedly 28.12%.[3] Cats can transmit helminths, such as *Toxocara cati*, *Toxascaris leonina*, *Dipylidium caninum*, *Spirometra mansoni*, *Ancylostoma tubaeforme*, *Ancylostoma braziliense*, *Gnathostoma spinigerum*, *Strongyloides* sp., *Taenia taeniaeformis*, *Capillaria* sp., *Trichuris* sp., and *Physaloptera* sp., to humans, causing hemintheasis.[4]

Helminthiasis in humans caused by transmission from cats include cutaneous larva migrans caused by *Ancylostoma* sp. and *Strongyloides* sp.; visceral larva migrans and ocular larva migrans caused by *Toxocara cati*, *Toxascaris leonine*, and *Gnathostoma spinigerum*; and sparganosis caused by *Spirometra mansoni*.[4]

According to the World Health Organitation,[5] helminths can transmitted to humans through soil and water contaminated with high levels of helminth eggs. Helminth eggs develop in the soil into infective stages that can be transmitted to humans or animals acting as reservoirs. Helminth eggs can also contaminate food and water resources of human and animal consumption or can be directly ingested through contaminated soil by children on playgrounds. In addition, transdermal transmission occurs for infective helminth stages that can actively penetrate the skin after direct contact with contaminated feces or soil. Thus, it is necessary to increase public awareness regarding potential diseases arising from the contamination by helminth eggs.

On the basis of the abovementioned problems, this study was performed to determine the level of environmental contamination by helminth eggs present in the digestive tract of cats in various public places in Surabaya. The aim of this study was to provide information on the potential transmission of diseases due to helminth eggs present in cat feces contaminating public areas in Surabaya.

MATERIAL AND METHOD

Research design was cross-sectional, with two types of data collected as results of the examination of fecal samples in the laboratory and observations cats existense at the site of feces collection. Samples were examined at the Parasite Laboratory Faculty of Veterinary Medicine of the Universitas Airlangga. In total, 180 fecal samples[7] in soil were collected from several public places, including markets, villages, parks, canteens, and schools, within North Surabaya, East Surabaya, South Surabaya, West Surabaya, and Central Surabaya. The study was conducted for 4 months, from March to June, 2017.

Direct Smear Method

Fecal specimens were collected using the tip of a glass stirrer and smeared onto a glass microscope slide. One to two drops of water were added and mixed well using a glass stirrer. A coverslip was placed over the mixture. The smear was then examined under a light microscope at 100× magnification.[6]

Sedimentation Method

Fecal samples was made into a suspension at a ratio of 1 part feces to 10 parts water and filtered through a tea strainer before placing in a conical centrifuge tube. The suspension was centrifuged at 1500 rpm for 5 minutes. The supernatant was discarded, and the sediment resuspended in water and centrifuged again for 5 min. This process was performed several times until the supernatant was clear. The final supernatant was discarded, leaving a small amount of sediment. The sediment was stirred, and a sample was removed using a Pasteur pipette. The sediment was placed on a glass microscope slide and covered with a coverslip. The sample was examined under a microscope at 100× magnification.[6]

Flotation Method

After the examination of fecal samples using the sedimentation method, the sediment was diluted with saturated brown sugar solution to 1 cm below the top of the conical centrifuge tube. The mixture was centrifuged at 1500 rpm for 5 min. Brown sugar solution was used because it has a low viscosity and a higher specific gravity (1.20) than the organisms within the sample; thus, the helminth eggs floated to the top.[10] Following centrifugation, the conical tube was placed on a tube rack, and brown sugar solution was slowly added until the surface of the solution showed a convex form. A coverslip was gently placed on

the top of the tube and left for 2 minutes. The coverslip was removed and placed on a glass microscope slide, which was examined under a microscope at 100× magnification.[6]

McMaster Method

For samples positive for helminth eggs, helminth eggs were counted using the McMaster method. Briefly, up to 2 g of feces were weighed, crushed, and 28 mL of saturated sugar solution was added. The sample was filtered into a glass scale. A pipette was used to transfer the sample, filling the chambers of the McMaster slide. The sample was allowed to settle for 2–3 minutes until the eggs floated to the surface. The McMaster slide was placed under a microscope at 100× magnification. The number of helminth eggs within the grid areas (0.5 mL of solution) was counted. The average number of eggs in each grid area was multiplied by 60 to obtain the number of eggs per gram of feces.[6]

Data Analysis

The prevalence of parasites was calculated in terms of positive samples using the following formula:

Prevalence = (n positive samples/n samples examined) × 100

Data were analyzed using IBM SPSS 24.0 followed by chi-squared analysis to assess the regional difference in eggs numbers, which possibly affect the helminth eggs in cat feces contaminating public areas in Surabaya. ANOVA was used to assess the level of environmental contamination by helminth eggs per gram of feces in various public places in Surabaya.

RESULT AND DISCUSSION

Eggs of several species of helminths, including nematodes, such as *Ancylostoma* sp., *Toxocara cati*, and *Toxascaris leonine*, were detected in cat feces contaminating public areas in Surabaya.

The detected helminth eggs were identified by comparing the morphology and measurements of eggs with those previously reported.[7,4,8] Helminth eggs were measured using the OptiLab ImageRaster program.

Figure 1 presents eggs of *Ancylostoma* sp. These eggs were 62.8–66.4 × 43.2–46.2 µm in size, oval-shaped, with a thin wall consisting of 2 layers, and contained 2–8 blastomers. This is consistent with the description by Taylor,[8] who reported eggs of *Ancylostoma* sp. to be oval-shaped, 56–75 × 34–47 µm in size, and containing 2–8 blastomers. *Toxocara cati* eggs were 62.4–64.5 × 73.8–74.9 µm in size, slightly rounded, with slightly mottled brownish wall, and were surrounded by thick layers of albumin. This is in accordance with the description by Subekti,[9] who reported that the egg diameter of *Toxocara cati* was 65–75 µm, the egg was slightly rounded, and had a slightly mottled wall. *Toxascaris leonina* eggs were oval-shaped, with a smooth wall, and measured 75–85 × 75 µm.[9]

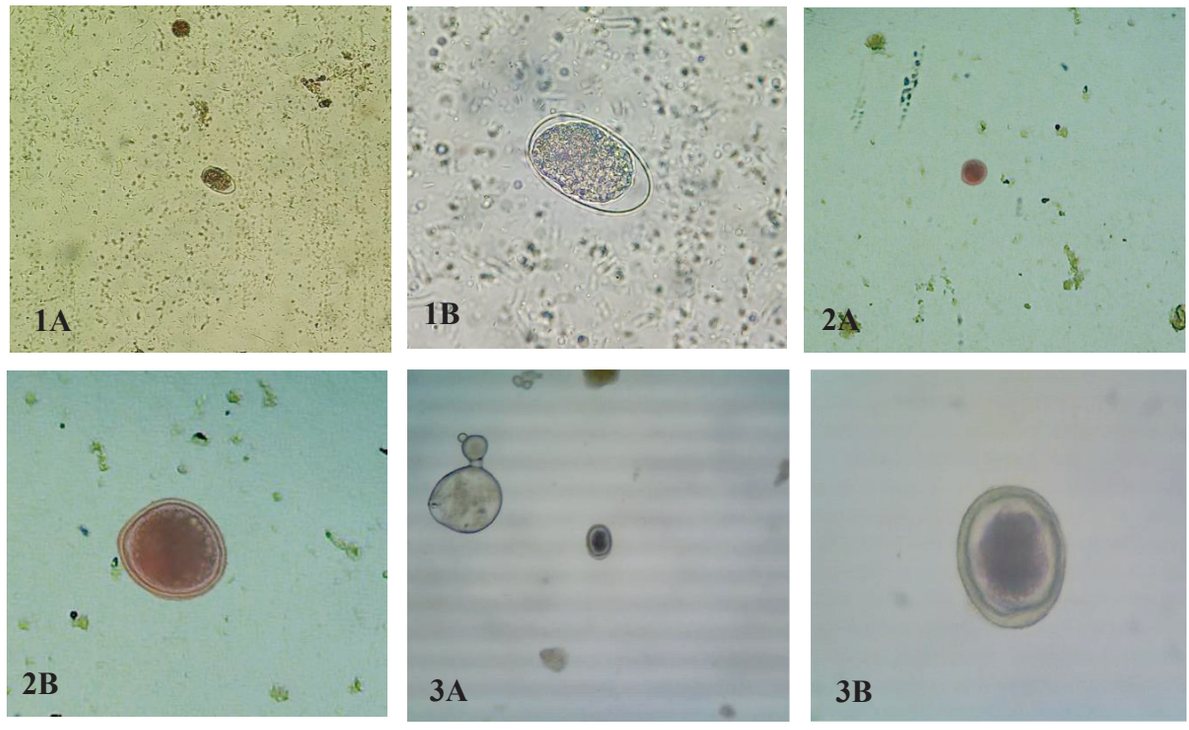

Figure 1. Egg of helminths contaminating the environment in public places in Surabaya. (1). *Ancylostoma* sp. eggs. (2). *Toxocara cati* eggs. (3). *Toxascaris leonine* eggs (A). 100× magnification (B). 400× magnification.

Ancylostoma sp. was the most common type of helminth detected in the studied public areas in Surabaya. In the 180 fecal samples tested, *Ancylostoma* sp. was the single source of contamination in 42 samples, and was present in combination with other types of helminth in 5 samples. *Toxocara cati* was the single source of contamination in 17 samples and was present with other types of helminth in 4 samples. *Toxascaris leonina* was the single source of contamination in 4 samples and was present with another type of helminth in 1 sample.

Interestingly, only helminths of the nematoda class were detected, and no cestoda class eggs were found. This may be due to the resistance of cestoda class eggs to environmental factors. Moreover, cestoda helminths infecting cats may not reproduce; therefore, cestoda eggs contained in the proglottid would not be detected in cat feces. The results of this study are similar to those reported by Tun et al,[10] who examined fresh cat feces contaminated with eggs of hookworms, *Toxocara* sp., *Trichuris* sp., *Spirometra*, and *Ascaris*. They also reported the presence of hookworm, *Ascaris* sp., and *Toxocara* sp eggs in contaminated soil samples.[10] Helminth infections commonly diagnosed in cats are *Ancylostoma* sp. and *Toxocara* sp.[4]

Presence of Helminth Eggs in Cat Feces Contaminating Public Areas in Surabaya

Laboratory examination using the direct smear, sedimentation, and flotation methods of 180 cat fecal samples collected from various public places in Surabaya, including markets, villages, parks, canteens, and schools, in North Surabaya, East Surabaya, South Surabaya, West Surabaya, and Central Surabaya from March to June 2017 as summarized in Table 1 and Table 2.

Table 1. Presence of helminth eggs in cat feces contaminating public areas in Surabaya

Result	Number of Samples	Percentage (%)
Positive	68	37.8
Negative	112	62.2
Total	180	100

Based on the number of fecal samples positive for helminth eggs, the level of environmental contamination was 37.8%.

Table 2. Types of helminth eggs identified in cat feces contaminating public areas in Surabaya

Type of Helminth Eggs	Positive Samples	Percentage (%)
Ancylostoma sp.	42/180	23.3
Toxocara cati	17/180	9.5
Toxascaris leonina	4/180	2.2
Ancylostoma sp. and *Toxocara cati*	4/180	2.2
Toxocara cati and *Toxascaris leonine*	1/180	0.6
Total	68/180	37.8

Chi-squared analysis of data obtained from samples collected from various areas, including North Surabaya, East Surabaya, South Surabaya, West Surabaya, and Central Surabaya revealed no significant difference ($p > 0.05$) among the various areas of Surabaya in terms of the prevalence of helminth eggs. These findings indicate that various areas across Surabaya are contaminated with helminth eggs from cat feces. Contamination levels and the species of helminth eggs that contaminate the environment in various areas in Surabaya are summarized in Table 3.

The results of chi-square analysis of data obtained from samples collected from various public places (canteens, markets, villages, schools, and parks) in Surabaya indicated no significant differences ($p > 0.05$) among the various public places in terms of environmental contamination by helminth eggs. The canteens, markets, villages, schools, and parks in Surabaya had the same levels of environmental contamination by helminth eggs from cat feces. The levels of environmental contamination by helminth eggs from cat feces at different collection sites are listed in Table 4.

The prevalence of helminth eggs in cat feces contaminating public areas in Surabaya (37.8%) is greater than the reported prevalence of helminth infections in a certain pet shops in Surabaya city (30.7%).[16] However, the prevalence is less than that in the feces of dogs culled for consumption and stray cats in Surabaya, as reported by Subekti,[11] who reported a helminth infection prevalence of 63.9%. This difference may be due to the face that this

Table 3. Prevalence of helminth eggs in cat feces contaminating public areas in Surabaya

Area of Surabaya	Contamination by Helminth Eggs	Type of Helminth		
		***Ancylostoma* sp.**	***Toxocara Cati***	***Toxascaris Leonina***
North	12/36 (33.3%)	+	+	−
East	18/36 (50.0%)	+	+	+
South	14/36 (38.8%)	+	+	+
West	12/36 (33.3%)	+	+	−
Central	12/36 (33.3%)	+	−	−
Total	68/180 (37.8%)			

study examined the prevalence of helminth infections in pet cat, who may have received antihelmintics. Wastomi[12] observed gastrointestinal helminths in cats, reporting the presence of eggs in stray cat feces contaminating public areas in Surabaya.

The helminth eggs found in cat feces in Surabaya could be transmitted to humans (zoonosis) and animals. Eggs of *Ancylostoma* sp. were the most common helminth detected in our samples. Infective eggs can penetrate the skin in humans and produce hives called cutaneous larva migrans.[13] Environmental contamination is also caused by *Toxocara cati* and *Toxascaris leonina*. *Toxocara* sp. eggs develop into an infective stage, and infective eggs can be ingested by humans, causing visceral larval migrans as well as diarrhea and vomiting. Ocular larval migrans may also occur due to infection of *Toxocara* sp., and this can cause permanent eye damage in humans.[14]

Prevalence of Helminth Eggs in Cat Feces Contaminating Public Areas in Surabaya

The results of the ANOVA analysis comparing various public areas (canteens, markets, villages, schools, and parks) in Surabaya to the level of environmental contamination by helminth eggs from cat feces revealed an F-arithmetic value < F critical value, showing no real difference between the various public areas in Surabaya and the level of contamination by helminth eggs. Canteens, markets, villages, schools, and parks in Surabaya showed the same environmental contamination levels by helminth eggs from cat feces. Results of the McMaster calculation of environmental contamination by helminth eggs from cat feces in public areas in Surabaya are summarized in Table 5.

The prevalence may vary according to the life cycle of the genus of helminth, the presence of paratenic hosts, the number of eggs produced by females, (200–6000 eggs/day), the host immune status, and the helminth egg resistance to environmental factors.[15] Contamination by helminth eggs in canteens, markets, villages, schools, and parks in Surabaya may be affected by various factors, such as population density, open surface area, poor environmental hygiene, waste available for cats to feed on, presence of possible paratenic hosts, species of helminths present, and the immune status of the cats against helminth infections.

Table 5. Number of helminth eggs in cat feces contaminating public areas in Surabaya

Public Area in Surabaya	Eggs per Gram
Canteens	180[a] ± 91.6
Markets	205[a] ± 101.8
Villages	196[a] ± 147.7
Schools	226[a] ± 88.8
Parks	189[a] ± 91.1
Mean	200 ± 105.9

The areas selected for sampling in this study were places, where humans, particularly children, are in close contact with contaminated soil and water. The risk for contamination by helminth eggs from cat feces should be minimized by raising awareness regarding helminthiasis. Environmental and personal hygiene should be maintained, particularly after handling animals. Disposal of cat feces should be encouraged, and their population should be controlled via good cat care. Healthy cat food and timely antihelmitics doses should be provided to maintain the health of cats. These measures will help in preventing the transmission of helminths in humans and animals.

CONCLUSION

Our findings indicate that the prevalence of helminth eggs in cat feces has contaminated canteens, markets, villages, schools, and parks in public areas of Surabaya, with zoonotic helminth eggs of *Ancylostoma* sp., *Toxocara cati*, and *Toxascaris leonina*, at a contamination level of 200 eggs/g of feces.

Table 4. Presence of helminth eggs in cat feces contaminating different public areas sample of collection

Type of Helminth	Number and Percentage of Helminth Eggs in Public Areas				
	Canteens	Markets	Villages	Schools	Parks
Single Contamination					
Ancylostoma sp.	7/36 (19.5%)	8/36 (22.2%)	10/36 (27.7%)	8/36 (22.2%)	9/36 (25.0%)
Toxocara cati	3/36 (8.3%)	4/36 (11.1%)	3/36 (8.3%)	3/36 (8.3%)	4/36 (11.1%)
Toxascaris leonina	1/36 (2.7%)	1/36 (2.7%)	0/36 (0%)	2/36 (5.5 %)	0/36 (0.0%)
Mixed Contamination					
Ancylostoma sp. + *Toxocara cati*	1/36 (2.7%)	1/36 (2.7%)	2/36 (5.5%)	0/36 (0.0%)	0/36 (0.0%)
Toxocara cati + *Toxascaris leonina*	1/36 (2.7%)	0/36 (0.0%)	0/36 (0.0%)	0/36 (0.0%)	0/36 (0.0%)
Total	36.1%	38.8%	41.6%	36.1%	36.1%

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