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PREVALENCE OF Eimeria spp. INFECTION IN BROILER FARMING (Gallus domesticus) IN KALIBARU DISTRICT, BANYUWANGI REGENCY

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Abstract. Coccidiosis is one of the most detrimental parasitic diseases in the poultry industry, particularly affecting broilers. This disease is caused by protozoa of the genus *Eimeria*, which infect the intestinal tract and may lead to growth disorders, decreased production performance, and even death. Kalibaru Subdistrict, Banyuwangi Regency, is an area with rapid development of broiler farming but still faces disease challenges such as coccidiosis. This study aimed to determine the prevalence of *Eimeria* spp. infection in broilers (*Gallus domesticus*) in Kalibaru Subdistrict. The research was conducted descriptively using a cross-sectional approach. Fecal samples were collected from five broiler farms located in five different villages. A total of 75 samples were collected and examined using the flotation method to detect oocysts. Identification was carried out microscopically based on the morphology and size of the oocysts. The results showed that all fecal samples were positive for *Eimeria* spp., with an infection prevalence of 100%. The observed oocysts were oval to round in shape, with double-layered walls, and some had undergone sporulation. The identified *Eimeria* spp. oocysts varied in size, categorized into large, medium, and small groups. The species identified included *Eimeria maxima*, *Eimeria mitis*, and *Eimeria praecox*. Infections were detected across all study locations, including Kalibaru Wetan, Kalibaru Kulon, Kalibaru Manis, Kebonrejo, and Banyuanyar. These findings indicate that *Eimeria* spp. infection is a serious issue in broiler farming in the area. Therefore, increased vigilance is necessary through improvements in farm management, implementation of biosecurity, application of the all-in all-out system, and routine education for farmers and farm workers. Further studies using molecular approaches are recommended for more specific species identification and more accurate control strategies.

Keywords: broiler, *Eimeria* spp., prevalence, coccidiosis, Kalibaru

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Introduction

Broilers are a type of poultry that is specifically cultivated to produce meat and as a source of animal protein (Aspari et al., 2024). Broiler livestock businesses have grown rapidly in the community, especially in East Java. Broilers have the advantage of rapid growth and

better feed conversion efficiency compared to other types of chickens. Broiler production will continue to increase in line with the increasing consumption of broiler meat (Simanjuntak, 2018). Along with the increase in broiler production, various livestock health challenges have also emerged, one of which is coccidiosis.

Coccidiosis is a disease that attacks the digestive tract in chickens. The disease is caused by Eimeria spp. infection which causes inflammation of the intestinal wall, wounds or ulcerations, damage to the structure of the intestinal villi so that it can inhibit growth and reduce feed efficiency in poultry. Eimeria spp. infection is associated with high mortality rates and slow weight gain, thus having a major impact on the economic sector in poultry farming (Geetha & Palanivel, 2018; Patas, 2022).

The environment often found in broiler farms, such as damp cage conditions, poor ventilation, accumulation of dirt, and poor hygiene, provide great opportunities for Eimeria spp. to breed and infect poultry. The losses caused by Eimeria spp. infections can economically hamper the progress of chicken farming because they reduce protein production from animals (Rumapea et al., 2023). As conveyed by Pawestri et al. (2020) in their study on economic losses in livestock caused by coccidiosis in Central Java province in 2018 reached a total of 3.3 trillion rupiah. This high economic impact is in line with the high prevalence of coccidiosis spread across various countries. The prevalence of coccidiosis is found throughout the world. Liao et al. (2024) noted that 546 out of 634 chickens in China, 86.12% of whom had coccidiosis. Wondimu et al. (2019) reported in their research related to the prevalence of coccidiosis in Ethiopia of 42.2% with a higher prevalence in male chickens compared to female chickens. The prevalence of coccidiosis in Indonesia itself is quite diverse, in Sleman it is 16%, in Bandar Lampung it is 20%, in Jimbaran Bali it is 43.8%, and in Tabanan Bali it is 31.1% (Halidazia, 2015; Yulian, 2017; Simamora et al., 2017). Until now there has been no research on the prevalence of coccidiosis in the Banyuwangi Regency area, even though its location is close to Bali and is a livestock traffic route from Java to Bali or vice versa. This is quite worrying considering that coccidiosis is a parasitic disease that can cause serious damage to the digestive tract of chickens, such as bleeding, diarrhea, decreased appetite, dehydration, and in severe cases can cause death. Subclinical coccidiosis infections can also reduce feed efficiency and slow growth, thus having a direct impact on farmer profits.

This condition is becoming increasingly important to note because East Java is one of the provinces that has great potential for cultivating broiler chickens, supported by a broiler population per head in East Java Province of 493,647,833 (BPS, Directorate General of Animal Husbandry and Animal Health, 2022).

Based on data from the Banyuwangi Regency Agriculture Service (2020), the broiler population in Kalibaru District is 165,000. Broiler farms in Kalibaru District still use traditional cages and pay little attention to cleanliness. The cages are rarely cleaned so they look dirty with feces piling up and mixed with fallen feed. Kalibaru is located at the foot of Mount Raung with an altitude of around 300-400 meters above sea level. The average rainfall in Kalibaru ranges from 1850 to 1900 mm (Central Statistics Agency of Banyuwangi Regency, 2024).

Parasite infections are influenced by geographical factors, climate, and seasons of an area throughout the year. Humid environmental conditions can trigger the sporulation process of Eimeria spp. oocysts which cause the oocysts to be infective (Wirawan et al., 2024). Ekawasti & Martindah (2019) stated that Eimeria spp. oocysts can sporulate optimally at air humidity between 70-100% and temperatures of 21-32°C. The broiler population in Kalibaru District reaches 3000-8000. Kalibaru District has the potential to be an optimal location for the transmission of Eimeria spp. infections in poultry due to climate factors, traditional chicken farming methods and lack of attention to cage cleanliness and the absence of previous research

on the prevalence of Eimeria spp. infections in Kalibaru District, Banyuwangi Regency. Based on the background above, researchers want to know the prevalence and identify Eimeria spp. parasites detected in broiler feces (Gallus domesticus) in Kalibaru District, Banyuwangi Regency. Research on this prevalence needs to be conducted to determine the level of infection spread, providing basic data for disease control. Through this research, it is expected to provide a deeper understanding of Eimeria spp. infection in broilers, in addition the results of this study are expected to contribute to the development of prevention and control strategies for coccidiosis in the field, so as to improve animal welfare and livestock productivity.

Methods

The design of this study was descriptive, where the sample was not given any treatment. This study used a cross-sectional study method (Setia, 2016). The population of this study was broilers (Gallus domesticus) obtained from five farms in the Kalibaru District, Banyuwangi Regency, taking these five areas can represent the prevalence in one sub-district because it represents the boundaries of the area, namely the central, northern, eastern, western, and southern parts. The samples used in this study were broiler feces specimens collected from five farms, each farm was taken as many as three cages, so that there were a total of fifteen cages and five specimen collection points in each cage. Determination of the size of the broiler feces sample to determine the broiler population in Kalibaru District used the calculating proportion formula (Adhikari, 2021). The prevalence that previously existed in the study (Ekawasti et al., 2021) Java Island showed a prevalence rate of 24%. The calculating proportion formula used in this study is as follows:

$$N = \frac{4 \times P \times QN}{d^2}$$

Description: N = sample size, P = prevalence, Q = 100 – P, d = Standard error (15%). The following is the calculation of the minimum number of specimens from each farm:

$$N = \frac{4 \times 24 \times (100 - 24)}{(10)^2}$$

$$N = \frac{96 \times 76}{100}$$

$$N = 72$$

The minimum specimen that must be obtained in one farm is a feces specimen. The total number of feces specimens to be collected from the five locations is 72. The materials used are broiler feces specimens, saturated sugar solution, plastic spoons, 8×13 cm plastic clips, hand soap, 70% alcohol (ONEMED®), spirits, immersion oil, ice gel packs, microscope tissue, object glass (7101 OneLab, ONEMED®), cover glass (20x20 mm, OneLab, ONEMED®), plastic cups, 50 ml centrifuge tubes (IWAKI®), 15 ml centrifuge tubes (IWAKI®), dropper pipettes (ONEMED®), masks (Sensi Convex Mask®), gloves (ONEMED Latex Examination Gloves®). The tools used were a CX43 trinocular microscope (OLYMPUS®), 500 ml Erlenmeyer flask, 500 ml Beaker glass, 1000 ml measuring cup, filter, ose, Bunsen, centrifuge (Dynamica®), 50 ml centrifuge tube rack, 15 ml centrifuge tube rack, cool box, hot plate (HENHERR®), magnetic stirrer, Vortex (Thermo®)

Results and Discussion

The Presence of Eimeria spp. Infection in Broiler Chickens in Kalibaru District

Identification of Eimeria spp. oocysts using the Floating Method with the Loop Technique. This method utilizes the difference in specific gravity between parasite eggs or oocysts and flotation solutions, so that the parasites can float to the surface and are easier to observe under

a microscope, then observed using a trinocular microscope with a magnification of 400x. The results of the examination found Eimeria spp. oocysts based on the identification key from the research of Mares et al., (2023). The results of the examination after being observed using a microscope obtained Eimeria spp. oocysts which microscopically appear to have an oval to oblong shape with layered walls, and vary in size. Two main forms of oocysts were identified in the examination results, namely oocysts that have not undergone sporulation (non-sporulated) and those that have undergone sporulation (perfect sporulation). Non-sporulated oocysts appear as round or oval structures with smooth double walls, and have a homogeneous granular appearance on the inside, without sporocysts. This indicates that the oocysts are in the early stages of development and are not yet infective as presented in Figure 1.

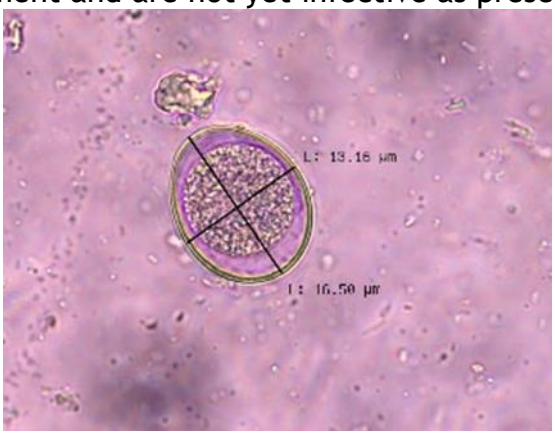

Figure 1. Non-sporulated Eimeria spp. oocysts at 400× magnification..

In this image, the oocyst appears oval in shape with a smooth, double-layered wall, and displays a homogeneous granular structure that has not yet developed into sporocysts due to the absence of internal differentiation. The oocyst is relatively large, measuring approximately 13.16 µm × 16.50 µm, and is most likely *Eimeria maxima* (Mares et al., 2023). The presence of a clearly defined and symmetrical oocyst wall indicates a mature oocyst that has not yet undergone sporulation. The identification results of *Eimeria spp.* oocysts that have undergone sporulation in broiler feces can be observed in Figure 2.

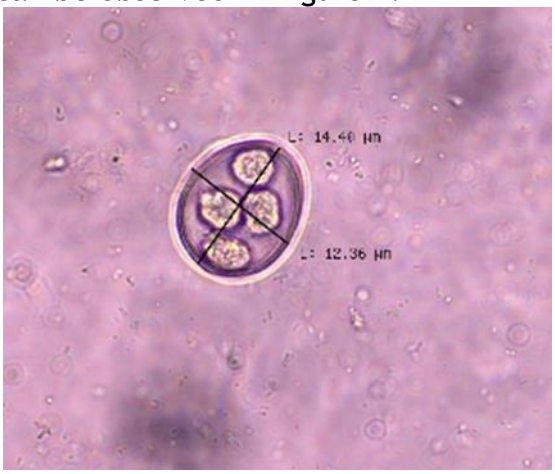

Figure 2. Sporulated Eimeria spp. oocysts at 400× magnification.

characterized by the presence of four sporocysts, each containing two sporozoites. The oocyst appears round in shape, measuring approximately 14.40 µm × 12.36 µm, indicating a relatively small to medium size and is most likely a sporulated oocyst of *Eimeria mitis* or *Eimeria praecox* (Mares et al., 2023). A typical finding observed is the smooth and transparent oocyst wall, along with clearly defined internal structures consisting of sporocysts with neatly

arranged sporozoites. The results of the prevalence of *Eimeria spp*. infection in broilers in Kalibaru District are presented below. Other *Eimeria spp*. oocysts with different sizes can be seen in Figure 3.

Figure 3 Eimeria spp. oocysts measuring 11.78-12.96 µm × 12.41-13.79 µm.

This image shows several *Eimeria spp*. oocysts with predominantly round to oval shapes, surrounded by a clearly defined double-layered wall. The oocysts measure between 11.78–12.96 µm × 12.41–13.79 µm. A characteristic finding is the presence of a homogeneous granular internal structure, indicating that the oocysts are unsporulated. Based on the measurements, the identified *Eimeria spp*. are most likely *Eimeria mitis*, due to their relatively small size (<18.8 µm) (Olufemi et al., 2020).

Prevalence of Eimeria spp. Infection in Broiler Chickens in Kalibaru District

Based on research conducted in February - April 2025, data was obtained through microscopic observation of feces samples from broiler farms in five villages with a total of 75 samples, a prevalence of 100% was obtained. The prevalence of Eimeria spp. infection is calculated using the formula (Cevallos et al., 2024), namely:

$$\text{Prevalence} = \frac{\text{Number of broiler feces infected with Eimeria spp.}.}{\text{Total number of broiler fecal specimens}} \times 100\%$$

$$\text{Prevalence} = \frac{75}{75} \text{ x } 100\%$$

$$\text{Prevalence} = 100\%$$

The results of *Eimeria spp*. infection prevalence for each farm are presented in Table 5.

Table 1. Prevalence of *Eimeria spp*. infection in five broiler farms.

Farming	Number of Samples	Eimeria Positive	Prevalence (%)
A	15	15	100
B	15	15	100
C	15	15	100
D	15	15	100
E	15	15	100
Total	**75**	**75**	**100**

The prevalence of coccidiosis in broilers in Kalibaru was evenly distributed across the regions A: Kalibaru Kulon, B: Kalibaru Wetan, C: Kebonrejo, D: Banyuanyar, and E: Kalibaru Manis, with relatively similar findings of *Eimeria spp*. oocysts observed at all locations.

Discussion

Identification based on the flotation method showed that Eimeria spp. infection with infective (sporulated) and non-infective (non-sporulated) oocysts was spread throughout all samples obtained from five villages in Kalibaru District. These results indicate that the infection is widespread and shows a high endemicity character in the area. The high prevalence can be caused by the high density of the chicken population, the fast maintenance cycle, and the potential for oocyst accumulation due to inadequate cage sanitation (Liao et al., 2024). Eimeria spp. is known to be able to survive for a long time in the environment outside the host's body, even in relatively extreme environmental conditions, so its widespread presence in all samples is something that deserves serious attention in livestock management (Chapman et al., 2013). Microscopic identification of Eimeria spp. oocysts found in broilers can be seen in the morphology of the oocysts which have a double-layered outer protective oocyst wall and are clearly visible and have an oval, round or elliptical shape.

Eimeria spp. Parasites is one of the causative agents of coccidiosis that has a significant impact on the health and productivity of poultry, especially broiler chickens. Infection by Eimeria spp. not only causes damage to the intestinal mucosa which has an impact on nutrient absorption, but can also reduce feed efficiency, increase mortality rates, and cause economic losses in small and large-scale farms (Blake et al., 2020; Blake & Tomley, 2014). Studies on the distribution and prevalence of Eimeria spp. are important for mapping potential infection risks and formulating more effective control strategies, especially in areas with high chicken population densities such as Kalibaru District. The results of microscopic examination of 75 broiler chicken feces samples from five farms in Kalibaru District showed that all samples were positive for identified Eimeria spp. oocysts. This indicates that Eimeria spp. infection actually occurs and is widespread in broilers (Gallus domesticus) in the area. The identified oocysts showed two forms of development, namely oocysts that had undergone sporulation (sporulated) and those that had not undergone sporulation (non-sporulated). The presence of both forms indicates that the parasite's life cycle is actively taking place in the cage environment, with conditions that support the oocyst sporulation process to become infective. The morphology of the oocysts, including layered walls, oval or round shapes, and granular structures inside, are in accordance with the characteristics of the Eimeria species that have been reported in the study by Mares et al. (2023). Clinically, chicken feces containing oocysts show a color change to dark brown, yellow-orange, or reddish, and are often accompanied by white mucus. These symptoms support the assumption that the infection has caused digestive tract disorders, in accordance with the classic symptoms of coccidiosis due to Eimeria spp. infection. (Blake & Tomley, 2014). The percentage of broilers infected with Eimeria spp. in five villages was 100%. These findings strengthen the evidence that Eimeria spp. is a real endemic disease agent in the broiler farming environment in Kalibaru District, and has the potential to cause serious impacts on broiler health.

The prevalence results in this study, which were 100% in all broiler chicken samples in Kalibaru District, are in line with research by Prakashbabu which showed that the prevalence of Eimeria spp. is greatly influenced by the poultry production system and regional characteristics. The study involved 240 farms in India and found that 79.4% of farms in the northern region and 76% in the southern region were positive for Eimeria spp., with higher prevalence found in large-scale commercial broiler farms. This confirms that intensive maintenance systems and high population densities are the main risk factors driving the high

prevalence of Eimeria spp. The results showed that the intensity of Eimeria spp. infection in broiler chickens in five villages in Kalibaru District varied, with the highest value in Kalibaru Wetan and the lowest in Banyuanyar. This variation is influenced by different chicken population densities, maintenance management, and cage sanitation. The high intensity in Kalibaru Wetan is related to the intensive maintenance system without optimal biosecurity, which triggers oocyst accumulation and increases the risk of reinfection (Liao et al., 2024). In contrast, low-intensity villages have better sanitation and pen management. Therefore, continuous efforts are needed in controlling coccidiosis, such as improving sanitation, litter rotation, vaccination, and rational use of anticoccidials.

A similar study by Fatoba in KwaZulu-Natal Province, South Africa, also supports these findings, where the prevalence of Eimeria spp. was recorded at 46.3% in broilers and 59.5% in native chickens. Although lower than the results of this study, the study emphasized that infection is widespread even in chickens that do not show clinical symptoms, and prevalence can increase in environmental conditions that support oocyst sporulation, such as high humidity and poor ventilation. The fact that high prevalence was found in various rearing systems indicates that Eimeria spp. are able to survive in various types of farming environments, both commercial and traditional.

Theoretically, the overpopulation of Eimeria spp. oocysts in the pen environment can be explained by the interaction between environmental factors, parasite biology, and husbandry management. Eimeria spp. oocysts. have the ability to develop into an infective form (sporulation) within 24–48 hours in a moist and warm environment, such as on the floor of a cage that is not cleaned regularly. Accumulation of feces that are not handled properly contributes to an increase in the number of infective oocysts in the environment, which ultimately creates a cycle of repeated infections between individuals in a cage population. The absence of a cage rest system (all-in all-out) also increases the opportunity for ongoing infestation.

The age of the chicken and population density are the main contributors to the high risk of Eimeria spp. infection. Modern broiler chickens that are kept for a short time, around 31–37 days, do not have enough time to form an adequate immune system against Eimeria infection, so they are more susceptible to attacks by the parasite, especially in the early to middle stages of life. This risk increases if the environment supports the oocyst sporulation process, such as a temperature of 25–30°C and high humidity. In addition, high chicken density facilitates the spread of sporulated oocysts through contaminated litter, accelerating fecal-oral transmission. Damp cage conditions and suboptimal ventilation worsen the situation, because they allow oocysts to survive for a long time and cause continuous reinfection. In these conditions, control measures such as vaccination become less effective if not accompanied by good sanitation practices and a disciplined maintenance system, including routine population regulation and litter management.

In addition, Attree also highlighted the importance of controlling stress in chickens, such as from high temperatures, beak trimming, and feed restrictions, because stress can reduce the chicken's immune response to infection. The high prevalence and intensity of infection in this study can be explained as the result of the accumulation of suboptimal cage management, tropical environmental conditions, and fast maintenance cycles that do not give enough time for chickens to develop natural immunity to Eimeria spp. The results of this study provide an important picture of the condition of Eimeria spp. infection in Kalibaru District, although there are several limitations that need to be considered. First, the identification of Eimeria spp. was carried out only based on the microscopic morphology of oocysts without molecular confirmation, so that the species involved could not be specifically ascertained. Second, this

study was cross-sectional and only described one observation time point, which did not reflect the dynamics of infection throughout the maintenance cycle. Third, no measurements were made of environmental factors such as cage temperature and humidity that could affect the level of oocyst sporulation. Further research with a longitudinal approach and molecular analysis is highly recommended to obtain a more comprehensive epidemiological picture.

Conclusion

Broiler chickens (Gallus domesticus) in Kalibaru District, Banyuwangi Regency were infected with Eimeria spp. The prevalence rate of Eimeria spp. infection in broiler chickens in Kalibaru District was recorded at 100%, indicating that this infection is widespread and a serious problem in broiler farming in the area. Therefore, continuous control efforts are needed, such as improving cage sanitation, regulating population density, and administering anticoccidials or vaccines appropriately. Increasing farmers' knowledge about the life cycle of Eimeria spp. is also important to break the chain of transmission in the future.

Suggestion

Improved implementation of biosecurity and cage management is needed, especially in terms of cage floor cleanliness, feces management, and maintenance rotation (all-in all-out system) to break the life cycle of Eimeria spp. Specific identification of Eimeria spp. types through a molecular approach is needed to obtain more accurate mapping and support species-based control programs. Socialization and training for local farmers on the importance of sanitation and environmental control are highly recommended as long-term prevention efforts. Further research with a longitudinal design and measurement of environmental parameters such as temperature and humidity is recommended to evaluate infection dynamics throughout the broiler chicken maintenance cycle.

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