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Prevalence Of *Eimeria* Spp. Infection In Broiler Farming (*Gallus Domesticus*)

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Abstract

Coccidiosis remains one of the most economically significant parasitic diseases affecting broiler production worldwide. This study aimed to determine the prevalence of Eimeria spp. infection and identify the morphological characteristics of oocysts detected in broiler chickens raised in Kalibaru District, Banyuwangi Regency, Indonesia. A cross-sectional study was conducted using 75 fecal samples collected from five commercial broiler farms. Samples were examined using the flotation technique followed by microscopic identification based on oocyst morphology and morphometric measurements. The results revealed that all examined samples were positive for Eimeria spp, resulting in a prevalence rate of 100%. Both sporulated and non-sporulated oocysts were observed, indicating active parasite transmission within the farming environment. Morphological observations suggested the presence of multiple Eimeria species, including E. tenella, E. necatrix, E. maxima, E. acervulina, E. praecox, and E. mitis. These findings contribute to regional disease surveillance and support the development of evidence-based biosecurity and coccidiosis control strategies.

INTRODUCTION

The poultry industry plays a pivotal role in ensuring global food security by providing an affordable and efficient source of animal protein. Among poultry commodities, broiler chickens (*Gallus domesticus*) are the most widely produced due to their rapid growth rate, high feed conversion efficiency, and relatively short production cycle. The increasing demand for poultry meat has stimulated intensive broiler farming systems worldwide, particularly in developing countries where poultry production contributes significantly to economic growth and household livelihoods (Chaiban et al., 2020; Erdaw & Beyene, 2022; Abadula et al., 2022; Attia et al., 2022; Ahmed Osman et al., 2025). However, the intensification of poultry production has also increased the vulnerability of broiler flocks to infectious diseases, especially parasitic infections that compromise productivity and animal welfare.

One of the most economically important parasitic diseases affecting poultry is coccidiosis, a gastrointestinal disease caused by protozoan parasites of the genus

Eimeria (Jilo et al., 2022; Ahmad et al., 2023; Tirfie & Lulie, 2024). The disease is characterized by intestinal epithelial destruction, impaired nutrient absorption, reduced weight gain, poor feed conversion efficiency, diarrhea, and, in severe cases, mortality. Beyond its direct impact on animal health, coccidiosis imposes a substantial economic burden on the poultry sector through production losses, treatment expenses, and preventive control measures. Recent estimates suggest that global economic losses attributable to coccidiosis exceed several billion dollars annually, highlighting its persistent threat to commercial poultry production (Blake et al., 2020; Rahmani et al., 2024; Mathis et al., 2025; Muñoz-Gómez et al., 2025).

The epidemiology of *Eimeria* infection is strongly influenced by environmental conditions, management practices, stocking density, and biosecurity implementation (López-López et al., 2022; Gazzonis et al., 2022; Kassaw et al., 2025; Disfani et al., 2025). Oocysts excreted in feces can survive for extended periods under favorable environmental conditions and become infective after sporulation. High humidity, inadequate ventilation, poor litter management, and the accumulation of fecal material create ideal conditions for sporulation and transmission. Consequently, intensive broiler production systems frequently experience recurrent coccidiosis outbreaks despite the availability of anticoccidial drugs and vaccines (Martins et al., 2022; Mathis et al., 2025; Crescent, 2025).

Previous studies have demonstrated considerable variation in the prevalence of avian coccidiosis across geographical regions. In China, epidemiological investigations reported prevalence rates exceeding 80% in broiler farms, indicating widespread circulation of *Eimeria* spp. despite vaccination programs (Diao et al., 2022; Liao et al., 2024; Liu et al., 2024). Studies conducted in Ethiopia documented prevalence levels above 40%, with significant associations between infection and management-related risk factors. Similar findings have been reported in several Asian and African countries, suggesting that coccidiosis remains endemic in many poultry-producing regions. These findings emphasize that environmental suitability and farm management practices are critical determinants of infection dynamics (Araújo et al., 2024; Coppola et al., 2025).

In Indonesia, research on poultry coccidiosis has primarily focused on several regions, including Yogyakarta, Lampung, and Bali, where prevalence rates ranging from 16% to 43.8% have been reported. Although these studies provide valuable insights into the distribution of *Eimeria* infections, the available evidence remains geographically fragmented and insufficient to represent the broader epidemiological situation in East Java, one of Indonesia's largest poultry-producing provinces (Fadilah et al., 2022). This limitation is particularly important because East Java contributes substantially to national broiler production and serves as a major livestock transportation corridor connecting Java and Bali. The continuous movement of poultry and poultry-related products potentially facilitates the dissemination of parasitic pathogens across regions (Shaji et al., 2023; Ipara et al., 2024).

Kalibaru District, Banyuwangi Regency, represents a particularly relevant setting for investigating *Eimeria* infections. The district possesses a substantial broiler population and is characterized by environmental conditions favorable for oocyst survival and sporulation. Located in a mountainous area with relatively high rainfall and humidity, Kalibaru provides ecological conditions that may facilitate the persistence and transmission of *Eimeria* spp. Furthermore, observations indicate that many broiler farms in the area still employ conventional management systems with limited sanitation practices, increasing the likelihood of environmental contamination and repeated infection cycles (Gentile et al., 2024; Acheampong,

2024). Despite these risk factors, no epidemiological study has specifically examined the prevalence of *Eimeria* infection in broiler farms within Kalibaru District.

There is a lack of empirical evidence in this realm which is a huge research gap. Previous research has been mostly focused on other areas of Indonesia and epidemiological data of Banyuwangi Regency is not yet available. As a result, stakeholders are not provided with accurate baseline information to help in the design of evidence-based prevention and control programs. Furthermore, the majority of previous studies have been limited to reporting the prevalence of disease and not taking into account local environmental factors and farm management conditions which could affect the dynamics of infection in newly established poultry production sites.

This study is novel because it provides epidemiological evidence for the first time on the prevalence of Eimeria spp. infection in broiler chickens in Kalibaru District, Banyuwangi Regency, which has not been explored before, even though it is a strategic location for poultry production in the region. This study documents the prevalence of Eimeria infections in broiler farms from several different villages after studying these farms in different environmental and management settings, which are typical to the region. The results will be useful to add to the epidemiological literature on poultry coccidiosis in Indonesia and will serve as scientific basis for targeted biosecurity, surveillance, and disease-control measures.

This study was thus carried out to find out the prevalence of infection with Eimeria spp. and to identify the morphological characteristics of the Eimeria oocysts found in the broiler chickens of Kalibaru District, Banyuwangi Regency. The study has theoretical and practical implications, as it helps build the knowledge base about the epidemiology of coccidiosis in the region, and gives baseline information for sustainable poultry health management and productivity improvement programmes.

METHODS

Research Design

This study employed a quantitative descriptive design using a cross-sectional approach to investigate the prevalence of *Eimeria* spp. infection in broiler chickens (*Gallus domesticus*) in Kalibaru District, Banyuwangi Regency, East Java, Indonesia. A cross-sectional design was considered appropriate because it enables the assessment of disease prevalence within a defined population at a specific point in time without manipulating the study environment (Bergeri et al., 2022; Savitz & Wellenius, 2023). This design has been widely applied in epidemiological investigations of parasitic infections due to its effectiveness in estimating disease burden and identifying patterns of distribution within animal populations.

Study Area and Research Context

The research was conducted between February and April 2025 in Kalibaru District, Banyuwangi Regency, East Java, Indonesia. Kalibaru is located in a mountainous area at the foothills of Mount Raung, characterized by high annual rainfall ranging from approximately 1,850 to 1,900 mm and relatively high humidity levels. These environmental conditions are recognized as favorable for the sporulation and survival of *Eimeria* oocysts, thereby increasing the risk of coccidiosis transmission in poultry production systems.

Five broiler farms located in five different villages Kalibaru Wetan, Kalibaru Kulon, Kalibaru Manis, Kebonrejo, and Banyuanyar were selected to represent the geographical distribution of broiler farming activities across the district. The selected farms reflected the dominant production systems in the region, which are

characterized by conventional management practices, relatively high stocking densities, and varying levels of biosecurity implementation.

Sampling and Data Collection

The target population consisted of broiler chickens raised in commercial farms within Kalibaru District. Sample size determination followed the prevalence estimation formula commonly used in epidemiological studies, incorporating a previously reported prevalence rate of 24% from studies conducted on Java Island and a precision level of 15% (Adhikari, 2021). Based on these calculations, a minimum sample size of 72 fecal specimens was required.

To improve representativeness, a total of 75 fecal samples were collected from five broiler farms. Each farm contributed samples from three different poultry houses, and five sampling points were established within each house. Fresh fecal specimens were collected using sterile plastic spoons and placed into labeled plastic containers. All samples were stored in a cool box and transported to the laboratory for parasitological examination.

The detection of *Eimeria* spp. was performed using the flotation method with a saturated sugar solution. This technique is commonly employed for the identification of protozoan oocysts because it exploits differences in specific gravity between parasite structures and flotation media, allowing oocysts to concentrate on the surface of the solution (Zajac & Conboy, 2021). Microscopic observations were conducted using an Olympus CX43 trinocular microscope at 400× magnification. Species identification was based on morphological characteristics, including oocyst shape, wall structure, sporulation status, and morphometric measurements, following the identification criteria proposed by Mares et al. (2023).

Data Analysis

The prevalence of *Eimeria* spp. infection was calculated by dividing the number of positive samples by the total number of examined samples and multiplying the result by 100. The prevalence formula recommended in epidemiological studies was applied to estimate the proportion of infected chickens within the sampled population (Cevallos-Gordon et al., 2024). Descriptive statistical analysis was used to summarize prevalence rates and morphological characteristics of the detected oocysts. The findings were presented in the form of percentages, tables, and photomicrographic images illustrating representative oocyst morphology.

Validity and Reliability

Several procedures were implemented to ensure the validity and reliability of the findings. First, all samples were collected using standardized sampling procedures across all farms to minimize collection bias. Second, microscopic examinations were conducted using calibrated laboratory equipment and standardized flotation protocols. Third, species identification relied on internationally recognized morphological keys and morphometric criteria to improve diagnostic consistency (Mares et al., 2023). To reduce observer bias, repeated observations were performed on representative samples, and oocyst measurements were verified through multiple microscopic examinations. These procedures enhanced the credibility and reproducibility of the prevalence estimates reported in this study.

RESULTS AND DISCUSSION

This section presents the findings of the study concerning the occurrence of *Eimeria* spp. infection in broiler chickens raised in Kalibaru District, Banyuwangi Regency. The results are organized into four main sections. First, the distribution of samples collected from the study area is presented. Second, the prevalence of *Eimeria* spp.

infection is reported. Third, the morphological characteristics of detected oocysts are described. Finally, morphometric observations and species identification are presented to provide a comprehensive overview of *Eimeria* spp. circulating within the broiler production systems investigated.

Distribution of Samples

A total of 75 fecal samples were collected from five broiler farms located in five villages of Kalibaru District, namely Kalibaru Wetan, Kebonrejo, Banyuanyar, Kalibaru Kulon, and Kalibaru Manis. Sampling was conducted proportionally across the study area to represent the geographical distribution of broiler farming activities in the district.

Table 1. Distribution of Fecal Samples Collected from Broiler Farms

Village	Number of Farms	Number of Samples
Kalibaru Wetan	1	15
Kebonrejo	1	15
Banyuanyar	1	15
Kalibaru Kulon	1	15
Kalibaru Manis	1	15
Total	5	75

Source: Primary data collected from broiler farms in Kalibaru District, February–April 2025.

The sampling distribution shows that each village contributed an equal number of specimens. This distribution ensured balanced representation across all selected study sites and allowed prevalence estimation at the district level.

Prevalence of *Eimeria* spp. Infection

Microscopic examination using the flotation technique revealed the presence of *Eimeria* spp. oocysts in all examined samples. No negative samples were identified during laboratory observation.

Table 2. Prevalence of *Eimeria* spp. Infection in Broiler Chickens

Variable	Value
Total samples examined	75
Positive samples	75
Negative samples	0
Prevalence (%)	100

Source: Primary data from microscopic examination, 2025

The prevalence analysis demonstrated that all examined broiler chickens were infected with *Eimeria* spp., resulting in a prevalence rate of 100%. This finding indicates that coccidial infection was present throughout the study area and occurred consistently across all sampled farms.

The prevalence rate observed in this study represents complete detection of *Eimeria* spp. oocysts among examined specimens. Positive samples were identified in all five villages included in the study, suggesting widespread environmental contamination and continuous parasite circulation within broiler production systems in Kalibaru District.

Table 3. Distribution of Positive Samples by Village

Village	Samples Examined	Positive Samples	Prevalence (%)
Kalibaru Wetan	15	15	100

Kebonrejo	15	15	100
Banyuanyar	15	15	100
Kalibaru Kulon	15	15	100
Kalibaru Manis	15	15	100
Total	75	75	100

Source: Primary data from microscopic examination, 2025.

The uniform prevalence observed across all villages indicates that *Eimeria* infection is not restricted to a specific location. Instead, the infection appears to be distributed homogeneously throughout the broiler farming environment in Kalibaru District.

Morphological Characteristics of Non-Sporulated Oocysts

Microscopic observation identified numerous non-sporulated *Eimeria* spp. oocysts. These structures appeared oval to elliptical in shape with smooth double-layered walls. The internal contents consisted of homogeneous granular material without visible sporocysts.

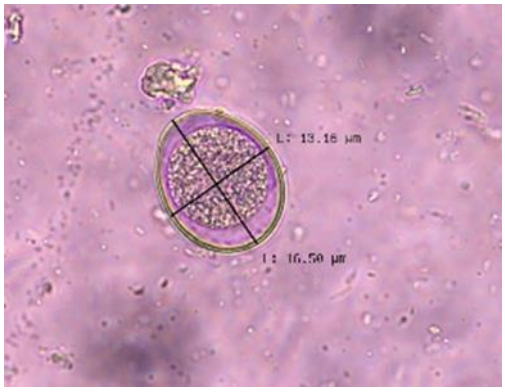

Figure 1. Non-sporulated Eimeria spp. Oocyst at 400× Magnification

Source: Microscopic examination of broiler fecal samples, 2025

Morphometric measurement showed dimensions of approximately 13.16 µm × 16.50 µm. The observed morphology corresponded to descriptions reported for *Eimeria maxima*. The absence of sporocysts confirmed that these oocysts had not yet reached the infective stage. The presence of non-sporulated oocysts indicates active shedding of parasite stages into the environment. These immature forms represent a reservoir that may become infective following sporulation under favorable environmental conditions.

Morphological Characteristics of Sporulated Oocysts

Sporulated oocysts were also detected during microscopic examination. These oocysts represented the infective stage of the parasite and displayed typical characteristics of the genus *Eimeria*.

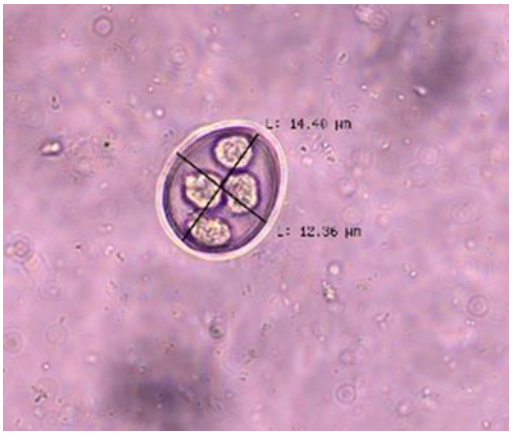

Figure 2. Sporulated *Eimeria* spp. Oocyst at 400× Magnification

Source: Microscopic examination of broiler fecal samples, 2025

The observed oocyst possessed four sporocysts, each containing two sporozoites. Measurements indicated dimensions of approximately 14.40 µm × 12.36 µm. The transparent oocyst wall allowed clear observation of internal structures. The occurrence of sporulated oocysts demonstrates that environmental conditions in the broiler houses supported successful sporulation and parasite development. Their presence confirms that infective stages were circulating within the production environment during the study period.

Morphometric Characteristics and Species Identification

Detailed morphometric examination revealed variation in oocyst size and shape among detected specimens. These variations suggested the presence of multiple *Eimeria* species.

Figure 3. Morphometric Variation of *Eimeria* spp. Oocysts

Source: Microscopic examination of broiler fecal samples, 2025

Several oocysts measured between 11.78–12.96 µm in width and 12.41–13.79 µm in length. These relatively small dimensions were consistent with the characteristics of *Eimeria mitis* reported in previous studies.

Table 4. Morphometric Characteristics of Observed Oocysts

Figure	Width (µm)	Length (µm)	Morphology	Probable Species
Figure 1	13.16	16.50	Oval, non-sporulated	*E. maxima*
Figure 2	14.40	12.36	Round, sporulated	*Eimeria* spp.

Figure 3	11.78–12.96	12.41–13.79	Round, non-sporulated	*E. mitis*

Source: Primary morphometric measurements, 2025

Morphological identification further indicated the occurrence of several *Eimeria* species within the sampled broiler populations. Based on oocyst morphology, wall structure, sporulation characteristics, and morphometric measurements, the detected species included *E. tenella*, *E. necatrix*, *E. maxima*, *E. acervulina*, and *E. praecox*.

Table 5. Identified *Eimeria* Species in Broiler Chickens

Identified Species
Eimeria tenella
Eimeria necatrix
Eimeria maxima
Eimeria acervulina
Eimeria praecox
Eimeria mitis

Source: Morphological identification based on microscopic examination and morphometric analysis, 2025

The identification of multiple *Eimeria* species indicates a diverse coccidian population within broiler farms in Kalibaru District. The coexistence of sporulated and non-sporulated oocysts, together with the detection of several species, demonstrates active parasite transmission and continuous environmental contamination across the study area. The findings revealed that *Eimeria* spp. infection was present in all sampled broiler farms, resulting in a prevalence rate of 100%. Morphological and morphometric analyses confirmed the occurrence of multiple *Eimeria* species, while the presence of both infective and non-infective oocysts indicated ongoing parasite development and circulation within broiler production systems in Kalibaru District.

Epidemiological Significance of Eimeria spp. Infection in Broiler Production Systems

The present study provides the first epidemiological evidence of *Eimeria* spp. infection in broiler chickens in Kalibaru District, Banyuwangi Regency, Indonesia. The findings reveal extensive circulation of coccidian parasites throughout the study area, as demonstrated by the universal detection of *Eimeria* oocysts in all examined samples. Although coccidiosis has long been recognized as one of the most economically important parasitic diseases in poultry production, epidemiological information from eastern regions of Java remains limited. Consequently, this study contributes novel baseline data regarding the occurrence and distribution of *Eimeria* spp. within a broiler-producing region that has not previously been investigated.

The exceptionally high prevalence observed in this study indicates that *Eimeria* infection has become deeply established within local broiler production systems. This finding is consistent with previous investigations conducted in regions characterized by intensive poultry production. Liao et al. (2024) reported prevalence rates exceeding 86% among broiler farms in China despite the implementation of anticoccidial vaccination programs. Similarly, Wondimu et al. (2019) documented widespread coccidiosis in commercial poultry operations in Ethiopia, while Fatoba et al. (2020) identified substantial infection rates among broiler and indigenous chicken populations in South Africa. The prevalence reported in the present study exceeds those reported in most previous investigations, suggesting that environmental and

management-related factors in Kalibaru District may create particularly favorable conditions for parasite persistence and transmission.

Several contextual factors may explain the widespread occurrence of infection. The study area is characterized by relatively high rainfall and humidity, environmental conditions known to promote sporulation and survival of *Eimeria* oocysts. Previous experimental studies have demonstrated that oocysts sporulate most efficiently under humid conditions with adequate oxygen availability and temperatures ranging from approximately 20°C to 30°C (Pavić et al., 2022; Latif et al., 2025; Arranz-Solís et al., 2023). Such environmental conditions increase the probability that non-sporulated oocysts deposited in poultry litter will develop into infective stages capable of initiating new infections. The continuous exposure of broiler chickens to infective oocysts creates a cycle of reinfection that may persist throughout the production period.

The detection of both sporulated and non-sporulated oocysts further supports the interpretation that active parasite transmission is occurring within broiler houses. Non-sporulated oocysts represent recently shed developmental stages, whereas sporulated oocysts indicate successful environmental maturation and infectivity. The coexistence of these developmental stages suggests that the complete life cycle of *Eimeria* spp. is continuously maintained within the farming environment. Similar observations have been reported by Iqbal et al. (2022) and Tomazic et al. (2025), who emphasized that the simultaneous presence of infective and non-infective oocysts is a hallmark of endemic coccidiosis in intensive poultry systems. Rather than reflecting isolated infection events, the findings indicate persistent environmental contamination and ongoing transmission dynamics.

Another important finding concerns the apparent diversity of *Eimeria* species detected through morphometric and morphological examination. The identification of *E. tenella*, *E. necatrix*, *E. maxima*, *E. acervulina*, *E. praecox*, and *E. mitis* suggests that broiler chickens in Kalibaru District are exposed to multiple pathogenic and subclinical coccidian species simultaneously. Previous molecular investigations have shown that mixed-species infections are common in commercial poultry production and may increase disease complexity due to species-specific pathogenic mechanisms (Blake et al., 2020; Mares et al., 2023; Reid et al., 2024). The coexistence of several *Eimeria* species may result in cumulative damage to different intestinal segments, thereby reducing nutrient absorption efficiency and compromising growth performance even when clinical symptoms are not severe.

The occurrence of multiple species is particularly important from an epidemiological perspective because pathogenicity varies substantially among *Eimeria* species. *Eimeria tenella* and *Eimeria necatrix* are generally regarded as highly pathogenic and are frequently associated with hemorrhagic lesions and elevated mortality rates. In contrast, species such as *E. mitis* and *E. praecox* often cause subclinical infections that reduce feed conversion efficiency and weight gain without producing obvious clinical signs. Previous studies have demonstrated that subclinical coccidiosis may generate economic losses comparable to those caused by acute outbreaks because reductions in productivity often remain undetected until cumulative production losses become substantial (Blake et al., 2020). Consequently, the species diversity observed in this study highlights the need for comprehensive surveillance strategies that address both clinical and subclinical infections.

The findings also provide theoretical contributions to the epidemiology of poultry coccidiosis in tropical environments. Existing epidemiological models suggest that disease occurrence is influenced by the interaction between host susceptibility, parasite biology, and environmental conditions. The present study supports this

framework by demonstrating that favorable climatic conditions combined with conventional production practices may facilitate widespread parasite persistence. The results reinforce ecological theories emphasizing the role of environmental reservoirs in sustaining protozoan transmission cycles. From this perspective, poultry litter functions not only as a substrate for waste accumulation but also as an ecological niche supporting the development and dissemination of infective oocysts.

From a practical standpoint, the findings underscore the importance of strengthening biosecurity and farm management practices. The universal detection of infection across all sampling sites suggests that conventional control measures may be insufficient to interrupt transmission. Effective prevention requires an integrated approach that combines litter management, environmental sanitation, population density regulation, vaccination, and rational anticoccidial use. Previous studies have shown that reliance on chemoprophylaxis alone may contribute to the emergence of anticoccidial resistance, reducing long-term control effectiveness. Consequently, sustainable coccidiosis management should prioritize preventive measures targeting environmental contamination rather than relying exclusively on therapeutic interventions.

The practical implications extend beyond individual farm productivity. Broiler production constitutes a major component of regional food security and agricultural development in Indonesia. Persistent coccidiosis infections can reduce feed efficiency, increase production costs, and diminish profitability among poultry producers. By providing epidemiological evidence of extensive *Eimeria* circulation, this study offers valuable information for veterinarians, extension officers, and policymakers responsible for livestock health management. The findings may serve as a foundation for district-level surveillance programs and evidence-based interventions aimed at improving poultry health and production efficiency.

The novelty of this study lies not only in documenting the first prevalence data from Kalibaru District but also in linking environmental conditions, management characteristics, and parasite occurrence within a previously unexplored poultry production area. While previous Indonesian studies have reported coccidiosis prevalence in regions such as Bali, Yogyakarta, and Lampung, information from Banyuwangi Regency has remained unavailable. This study therefore expands the geographical coverage of poultry coccidiosis research in Indonesia and contributes new evidence regarding disease distribution within a strategic livestock transportation corridor connecting Java and Bali.

Several limitations should be acknowledged when interpreting the findings. First, species identification relied exclusively on morphological and morphometric observations. Although these methods remain widely used in parasitological studies, overlapping oocyst characteristics among species may reduce identification accuracy. Molecular approaches such as polymerase chain reaction (PCR) and sequencing provide more reliable species differentiation and would strengthen future epidemiological investigations. Second, the cross-sectional design captured infection status at a single time point and therefore could not evaluate temporal fluctuations in prevalence or infection intensity throughout the production cycle. Third, environmental variables such as temperature, litter moisture, ventilation quality, and stocking density were not quantitatively measured, limiting the ability to statistically assess risk factors associated with infection occurrence.

Future research should address these limitations by incorporating molecular diagnostics, longitudinal monitoring, and quantitative environmental assessments. Studies evaluating oocyst counts, infection intensity, and production performance

would provide a more comprehensive understanding of the economic consequences of coccidiosis in broiler systems. Comparative investigations between farms implementing different biosecurity strategies would also be valuable for identifying management practices associated with reduced infection risk. Furthermore, integrating epidemiological surveillance with molecular characterization could improve understanding of species diversity, transmission pathways, and potential anticoccidial resistance patterns within Indonesian poultry populations.

CONCLUSION

This study demonstrates that *Eimeria* spp. infection is highly prevalent among broiler chickens in Kalibaru District, Banyuwangi Regency, with all examined samples testing positive for oocysts. The detection of both sporulated and non-sporulated oocysts, together with the identification of multiple *Eimeria* species, indicates active parasite circulation and widespread environmental contamination within local broiler production systems. These findings contribute to the epidemiological understanding of poultry coccidiosis by providing the first baseline evidence from an understudied poultry-producing region in East Java. From a theoretical perspective, the study reinforces the role of environmental suitability and management practices in sustaining *Eimeria* transmission dynamics.

Practically, the results highlight the urgent need for strengthened biosecurity measures, improved litter management, and integrated coccidiosis control programs to reduce infection pressure and production losses. Nevertheless, the study is limited by its reliance on morphological identification and its cross-sectional design, which restrict species confirmation and temporal analysis. Future studies should incorporate molecular diagnostic approaches, longitudinal monitoring, and quantitative risk-factor assessments to generate a more comprehensive understanding of *Eimeria* epidemiology and support sustainable poultry health management.

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