



Occurrence of *Eimeria* infection and associated factors in peri-urban rabbit farming systems of Kinshasa, Democratic Republic of Congo: a cross-sectional study

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Abstract

Rabbit production is expanding in peri-urban areas of Kinshasa, but information on *Eimeria* infection remains limited. This cross-sectional study assessed *Eimeria* oocyst positivity and associated host factors in rabbits from selected peri-urban farms and described management and biosecurity practices reported by farmers. A structured questionnaire was administered to 50 rabbit farmers, while coprological examination was conducted on 158 rabbits from five farms. Fecal samples were examined using flotation and McMaster techniques to detect and quantify *Eimeria* oocysts. Overall, 139/158 rabbits were positive, corresponding to a positivity of 88.0% (95% CI: 82.0–92.2). Positivity was highest in weaned (95.4%) and growing rabbits (91.7%) and lower in reproductive females (61.1%) and males (20.0%). Because of sparse cells and quasi-separation, associations were assessed using Firth penalized logistic regression. Reproductive females and males showed lower odds of positivity than growing rabbits, whereas no significant difference was observed between weaned and growing rabbits. Differences were also observed among sampled farms, although farm and geographical effects could not be separated because only one farm was investigated per commune. These findings indicate frequent *Eimeria* infection in the investigated rabbit farms and highlight physiological category as an important host-related correlate of positivity. Larger multilevel studies incorporating species identification and systematic clinical assessment are needed to characterize infection determinants and disease significance more precisely.

Keywords: *Eimeria* spp.; oocyst positivity; rabbit farming; epidemiology; associated factors; peri-urban farming; Democratic Republic of Congo

Résumé

La production cunicole connaît une expansion dans les zones périurbaines de Kinshasa, mais les données relatives aux infections à *Eimeria* restent limitées. Cette étude transversale a évalué la positivité des lapins aux *oocystes d'Eimeria*, les facteurs liés à l'hôte associés à cette positivité, ainsi que les pratiques d'élevage et de biosécurité rapportées par les éleveurs dans certaines exploitations périurbaines. Un questionnaire structuré a été administré à 50 éleveurs de lapins, tandis qu'un examen coprologique a été réalisé sur 158 lapins provenant de cinq exploitations. Les échantillons fécaux ont été examinés au moyen des techniques de flottation et de McMaster afin de détecter et de quantifier les *oocystes d'Eimeria*. Au total, 139 lapins sur 158 se sont révélés positifs, correspondant à une positivité de 88,0 % (IC à 95 % : 82,0–92,2). La positivité était plus élevée chez les lapereaux sevrés (95,4 %) et les lapins en croissance (91,7 %), et plus faible chez les femelles reproductrices (61,1 %) et les mâles (20,0 %). En raison de faibles effectifs dans certaines catégories et d'un phénomène de quasi-séparation, les associations ont été évaluées à l'aide d'une régression logistique pénalisée de Firth. Les femelles reproductrices et les mâles présentaient des odds de positivité plus faibles que les lapins en croissance, tandis qu'aucune différence statistiquement significative n'a été observée entre les lapereaux sevrés et les lapins en croissance. Des différences ont également été observées entre les exploitations échantillonnées. Toutefois, les effets propres aux exploitations et ceux liés à la localisation géographique n'ont pas pu être distingués, puisqu'une seule exploitation a été étudiée dans chaque commune. Ces résultats indiquent une fréquence élevée de positivité aux *oocystes d'Eimeria* dans les élevages cunicoles étudiés et soulignent l'importance de la catégorie physiologique comme facteur lié à l'hôte associé à cette positivité. Des études multilevel de plus grande envergure, intégrant l'identification des espèces d'*Eimeria* et une évaluation clinique systématique, sont nécessaires pour caractériser plus précisément les déterminants de l'infection et sa signification pathologique.

Mots-clés: *Eimeria* spp. ; positivité aux oocystes ; élevage cunicole ; épidémiologie ; facteurs associés ; élevage périurbain ; République démocratique du Congo

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1. Introduction

Rabbit production is increasingly promoted in tropical and subtropical regions as a sustainable source of high-quality animal protein, owing to the species' high reproductive rate, short production cycle and efficient feed conversion (Bhat et al., 1996; Pakandl, 2013). In sub-Saharan Africa, cuniculture contributes to food security and income generation, particularly in urban and peri-urban areas where land availability is limited and demand for animal protein is rising (Lebas et al. 2010; Mayotte, 2017).

Despite these advantages, the productivity of rabbit farming systems remains strongly constrained by infectious and parasitic diseases. Among these, coccidiosis is recognized as one of the most economically significant parasitoses affecting domestic rabbits worldwide (Lebas et al., 1997; Oncel et al., 2011). The disease is caused by several protozoan species of the genus *Eimeria*, which parasitize the intestinal tract and, in the case of *Eimeria stiedae*, the liver. Clinical and subclinical infections are associated with diarrhea, impaired growth, poor feed conversion efficiency and, in severe cases, high mortality rates, particularly in young animals (El-Akabawy et al., 2004; Sivajothi et al., 2014; Lebas et al., 1997).

The epidemiology of rabbit coccidiosis is closely linked to management practices and environmental conditions. High stocking density, inadequate hygiene, contaminated feed and water, and insufficient veterinary supervision are well-documented associated factors that facilitate the transmission and persistence of *Eimeria* oocysts in rabbit farms (Fagbohoun, 2006; Djago et al., 2011; Cherwon et al. 2020). In tropical climates, elevated temperature and humidity further favor oocyst sporulation and survival in the environment, increasing the risk of infection and reinfection (Lebas et al., 2010).

Several studies conducted in Africa and other tropical regions have reported high prevalence rates of rabbit coccidiosis, often exceeding 70%, highlighting the endemic nature of the disease in poorly supervised production systems (Fagbohoun, 2006; Cherwon et al., 2020; Jaouzi et al., 2006). However, in the Democratic Republic of Congo, and particularly in the city of Kinshasa, epidemiological data on rabbit coccidiosis remain scarce despite the rapid expansion of cuniculture in peri-urban settings. To date, no study has specifically investigated *Eimeria* infection in peri-urban rabbit production systems in Kinshasa, despite

the rapid expansion of this sector and its importance for urban food security.

Despite the growing importance of rabbit production in peri-urban areas of the Democratic Republic of Congo, epidemiological information on rabbit coccidiosis remains extremely limited. In Kinshasa, no previous study has systematically documented the occurrence of *Eimeria* infection under smallholder peri-urban production conditions, despite the potential impact of this parasitosis on animal health and farm productivity. Establishing baseline epidemiological data is essential for improving parasite surveillance and developing effective control strategies adapted to local farming systems.

Therefore, this cross-sectional study aimed to (i) estimate the occurrence of *Eimeria* infection in rabbits from selected peri-urban farms in Kinshasa, (ii) quantify oocyst shedding intensity, (iii) examine associations between *Eimeria* positivity and host-related characteristics, and (iv) describe management and biosecurity practices reported by rabbit farmers.

2. Material and methods

2.1. Study area

The study was conducted in five peri-urban communes of Kinshasa, Democratic Republic of Congo: Ngaliema, Matete, Mont-Ngafula, Selembao, and Lemba. Kinshasa is located at approximately 309 m above sea level (4°23' S, 15°26' E) on the left bank of the Congo River. The region is characterized by a tropical humid climate with a long rainy season from September to mid-May and a dry season from mid-May to August, with mean annual temperatures ranging between 22.5 and 25 °C. These climatic conditions are favorable to the sporulation and persistence of *Eimeria* oocysts (Lebas et al. 2010).

2.2. Study design and farm selection

A cross-sectional study was conducted between June and July 2025, corresponding to the early dry season. Of the 50 farms included in the questionnaire survey, five farms, one from each study commune, were selected for the coprological component. These farms were selected on the basis of accessibility, farmer consent, and feasibility of fecal sampling and were not intended to constitute a statistically representative sample of all rabbit farms in Kinshasa. Consequently, coprological estimates and associated-factor analyses primarily refer to the five investigated farms.

2.3. Questionnaire survey

A structured questionnaire comprising 56 questions was administered through face-to-face

interviews. It consisted primarily of closed-ended questions and was pre-tested on a small number of farmers prior to data collection to ensure clarity and consistency. The information collected included farmers' socio-demographic characteristics, housing systems, stocking density, hygiene and sanitation practices, feeding and watering management, use of anticoccidial drugs, and access to veterinary services.

2.4. Animals and fecal sampling

A total of 158 rabbits from five selected farms were included in the coprological investigation. Each rabbit constituted an individual sampling unit, and one fecal sample was collected separately from each animal. The sampled population comprised 87 weaned rabbits, 48 growing rabbits, 18 reproductive females, and 5 reproductive males. The number of rabbits sampled per farm was 35 in Ngaliema, 25 in Matete, 29 in Lemba, 37 in Selembao, and 32 in Mont-Ngafula.

Fresh fecal samples (approximately 10 g per animal) were collected individually at approximately 6:00 a.m., before routine cage cleaning and feeding. Samples were collected using disposable gloves, placed in individually labeled plastic bags, and maintained at 4–10 °C during transportation to the laboratory. All samples were delivered within 6 h of collection and processed on the same day.

Clinical signs were not systematically recorded during sampling. Consequently, detection of *Eimeria* oocysts was interpreted as evidence of *Eimeria* infection and oocyst shedding rather than clinical coccidiosis.

2.5. Coprological analysis

Fecal samples were processed using standard flotation techniques with saturated sodium chloride solution (40%). Samples were sieved prior to analysis to remove debris. After dilution, the mixture was allowed to stand for 5 minutes, then passed three times through a 1 mm mesh sieve. Quantification was performed using the McMaster technique. Approximately 2 g of feces were diluted in flotation solution to a final volume of 28 mL, corresponding to a multiplication factor of 100.

All coprological analyses were conducted at the Veterinary Clinics Laboratory of Gombe (Kinshasa, Democratic Republic of Congo). The sampling sites were located within a radius of less than 10 km from the laboratory, ensuring rapid transport (within 6 hours) and minimal alteration of samples prior to analysis.

Oocysts per gram (OPG) were calculated as:

$$OPG = N \times 100$$

where N is the number of oocysts counted in the McMaster chamber.

Species-level identification and sporulation procedures were not performed.

2.6. Statistical analysis

Eimeria oocyst positivity was expressed as the proportion of positive animals among those examined, with 95% confidence intervals (95% CI) calculated using the Wilson score method. Oocyst counts were summarized using the median, interquartile range (IQR), and minimum–maximum because of their expected right-skewed distribution.

Associations between *Eimeria* positivity and candidate explanatory variables were initially examined using univariate analyses. Crude odds ratios (cORs) with 95% CIs were calculated, and Fisher's exact test was used where expected cell counts were small. Variables with $p < 0.20$ in the univariate assessment were considered for multivariable analysis.

Inspection of contingency tables revealed sparse cells and zero counts in several combinations of study site and physiological category, indicating a risk of quasi-separation and unstable maximum-likelihood estimates. Consequently, Firth's bias-reduced penalized logistic regression was used for multivariable analysis. Adjusted odds ratios (aORs) and corresponding 95% CIs were reported. Statistical significance was defined as a two-sided $p < 0.05$.

Because only one farm was sampled within each commune, farm and site effects were completely confounded and could not be estimated separately. Furthermore, the small number of farms ($n = 5$) precluded reliable estimation of a farm-level random effect. Site-related associations were therefore interpreted cautiously as differences among the investigated farms rather than independent geographical effects.

Statistical analyses were performed using Minitab Statistical Software version 17 (Minitab LLC, State College, PA, USA) and Python. Descriptive and contingency-table analyses were conducted in Minitab 17. Additional data processing and statistical computations were performed in Python using NumPy and SciPy. Because sparse cells and quasi-separation were identified, multivariable associations were estimated using a Firth bias-reduced penalized logistic regression implemented in Python. Statistical significance was defined as a two-sided $p < 0.05$.

3. Results

3.1. Characteristics of rabbit farmers and production systems

The survey revealed that 70% of rabbit farmers were male and 30% female. Most respondents (60%) had university-level education. All farms operated under intensive production systems. Housing structures were mainly wooden (40%), wire mesh, brick or metal. Although 80% of farmers reported daily cage cleaning, hygiene was often inadequate due to poor manure management, overcrowding and insufficient ventilation.

Overall, rabbit populations were largely dominated by weaned and growing animals across all sites, whereas adult reproductive males were poorly represented.

3.2. Feeding, watering and health management practices

Rabbits were mainly fed commercial concentrate feeds (provende), distributed ad libitum. Most farmers also provided green forages, including sweet potato leaves, elephant grass, carrot tops, banana leaves, Panicum spp. and Stylosanthes spp. Water was primarily supplied from the public distribution network and provided daily.

All surveyed farmers reported previous occurrence of coccidiosis-like health problems in their farms. Only 20% reported regular access to veterinary services, while anticoccidial use was irregular and largely empirical.

3.3. Eimeria oocyst positivity

Overall, 139 of the 158 rabbits examined were positive for Eimeria oocysts, corresponding to an overall positivity of 88.0% (95% CI: 82.0–92.2) (table 1). Positivity was high across the five investigated farms, ranging from 75.7% in Selebmbao to 96.6% in Lemba. According to physiological category, weaned and growing rabbits showed the highest positivity (95.4% and 91.7%, respectively), whereas substantially lower proportions were observed in reproductive females (61.1%) and reproductive males (20.0%). The particularly wide confidence interval observed for reproductive males (95% CI: 3.6–62.4) reflects the very small number of animals in this category (n = 5).

Table 1. Eimeria oocyst positivity according to study site and physiological category

Variable	Category	Positive (n)	Negative (n)	Total (n)	Positivity (%)	95% CI
Study site	Ngaliema	33	2	35	94.3	81.4–98.4
	Matete	21	4	25	84.0	65.3–93.6
	Lemba	28	1	29	96.6	82.8–99.4
	Selebmbao	28	9	37	75.7	59.9–86.6
	Mont-Ngafula	29	3	32	90.6	75.8–96.8
Physiological category	Weaned rabbits	83	4	87	95.4	88.8–98.2
	Growing rabbits	44	4	48	91.7	80.4–96.7
	Reproductive females	11	7	18	61.1	38.6–79.7
	Reproductive males	1	4	5	20.0	3.6–62.4
Overall	—	139	19	158	88.0	82.0–92.2

3.4. Oocyst excretion levels

Quantitative oocyst counts were available for 45 individual fecal samples, with nine observations from each of the five investigated farms. Oocyst shedding showed substantial within- and between-farm variability, with values ranging from 0 to 33,200 OPG. The highest individual count was recorded in Mont-Ngafula (33,200 OPG), followed by Lemba (29,700 OPG) and Ngaliema (26,000 OPG).

Median OPG values were 3,800 in Ngaliema, 0 in Matete, 2,300 in Selebmbao, 3,800 in Mont-Ngafula, and 0 in Lemba when all quantitative observations, including zero counts, were considered. The corresponding interquartile ranges were 1,300–4,600, 0–0, 0–2,800, 0–6,400, and 0–1,300 OPG, respectively. Considerable within-farm heterogeneity was observed, particularly in Ngaliema, Mont-Ngafula, and Lemba, where isolated animals showed markedly elevated oocyst counts (figure 1).

Despite these descriptive differences, the overall distribution of OPG did not differ significantly among the five investigated farms (Kruskal–Wallis $H = 8.19$, $p = 0.085$). Accordingly, the observed between-farm variation in oocyst shedding rather than evidence of a statistically significant site effect.

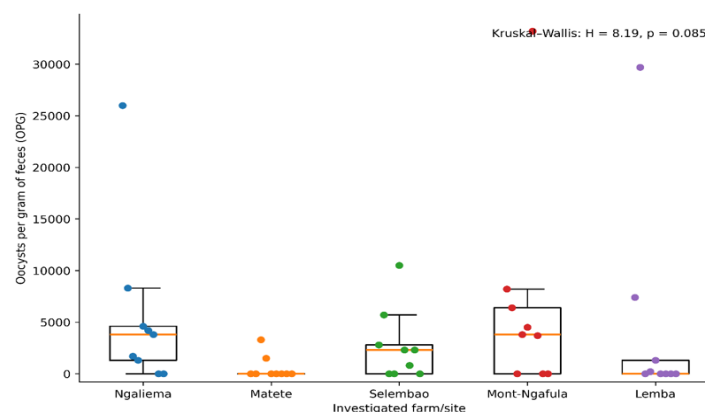


Figure 1. Distribution of Eimeria oocyst counts among rabbits from the five investigated farms

Individual observations are shown together with the median and interquartile range (IQR). Nine quantitative observations were available per farm ($n = 45$). Differences among farms were assessed using the Kruskal–Wallis test ($H = 8.19$, $p = 0.085$). OPG, oocysts per gram of feces.

3.5. Associated factors of *Eimeria* infection

3.5.1. Univariable analysis of factors associated with *Eimeria* positivity

Univariable analyses were performed to examine the association of study site and physiological category with *Eimeria* oocyst positivity. Positivity was generally high across the investigated farms, ranging from 75.7% in Selembao to 96.6% in Lemba. The relatively small number of negative observations within several sites resulted in imprecise effect estimates and wide confidence intervals.

A clearer pattern was observed according to physiological category. Weaned and growing rabbits showed similarly high positivity (95.4% and 91.7%, respectively), whereas substantially lower proportions were observed among reproductive females (61.1%) and reproductive males (20.0%). These results indicated that physiological category was more strongly associated with *Eimeria* positivity than the descriptive differences observed among farms.

Variables showing evidence of association in the univariable analysis were considered in the multivariable analysis. Because several categories contained few negative animals and reproductive males were poorly represented ($n = 5$), sparse-data bias and potential separation were specifically considered when fitting the final model.

Table II. Univariate analysis of factors associated with *Eimeria* oocyst positivity

Variable	Category	Positive / Total	Positivity (%)	Crude OR	95% CI	p-value
Study site	Lemba	28/29	96.6	1.00	Reference	—
	Ngaliema	33/35	94.3	0.59	0.05–6.85	1.000
	Matete	21/25	84.0	0.19	0.02–1.80	0.170
	Selembao	28/37	75.7	0.11	0.01–0.94	0.034
	Mont-Ngafula	29/32	90.6	0.35	0.03–3.52	0.614
Physiological category	Growing rabbits	44/48	91.7	1.00	Reference	—
	Weaned rabbits	83/87	95.4	1.89	0.45–7.91	0.454
	Reproductive females	11/18	61.1	0.14	0.04–0.58	0.007
	Reproductive males	1/5	20.0	0.02	0.002–0.26	0.001

Crude odds ratios (cORs) were calculated using Lemba and growing rabbits as reference categories for study site and physiological category, respectively. Two-sided Fisher's exact tests were used where appropriate because of small cell counts. Variables or

categories associated with $p < 0.20$ were considered for subsequent multivariable assessment. OR, odds ratio; CI, confidence interval.

3.5.2. Firth penalized logistic regression

Because of the high overall positivity and sparse observations in several site and physiological-category strata, conventional maximum-likelihood logistic regression was considered susceptible to sparse-data bias and quasi-separation. A Firth penalized logistic regression model was therefore used to obtain more stable estimates of the associations between *Eimeria* positivity, study site, and physiological category.

After simultaneous adjustment for study site and physiological category, reproductive females showed substantially lower odds of *Eimeria* positivity than growing rabbits (aOR = 0.06, 95% CI: 0.01–0.36, $p = 0.002$). Reproductive males also showed lower odds (aOR = 0.012, 95% CI: 0.001–0.14, $p < 0.001$). In contrast, no evidence of a difference was observed between weaned and growing rabbits (aOR = 0.90, 95% CI: 0.19–4.34, $p = 0.900$).

Among study sites, Selembao showed lower adjusted odds of positivity relative to Lemba (aOR = 0.07, 95% CI: 0.006–0.71, $p = 0.025$), whereas the comparisons involving Ngaliema, Matete, and Mont-Ngafula were not statistically significant. However, these site estimates should be interpreted cautiously because only one farm was investigated within each commune. Consequently, the study design does not permit separation of farm-specific variation from geographical effects (table III).

Table III. Firth penalized logistic regression analysis of factors associated with *Eimeria* oocyst positivity

Variable	Category	Adjusted OR	95% CI	p-value
Study site	Lemba	1.00	—	—
	Ngaliema	0.75	0.06–8.90	0.821
	Matete	0.19	0.02–2.02	0.167
	Mont-Ngafula	0.45	0.04–4.88	0.508
	Selembao	0.07	0.006–0.71	0.025
Physiological category	Growing rabbits	1.00	—	—
	Weaned rabbits	0.90	0.19–4.34	0.900
	Reproductive females	0.06	0.01–0.36	0.002
	Reproductive males	0.012	0.001–0.14	<0.001

. ORs are mutually adjusted for study site and physiological category. Lemba and growing rabbits were used as reference categories.

Because several site-by-category combinations contained zero events or non-events and some physiological categories had small sample sizes, conventional maximum-likelihood logistic regression was considered susceptible to sparse-data bias and

quasi-separation. A Firth penalized logistic regression model was therefore used to obtain more stable estimates of the associations between study site, physiological category, and *Eimeria* oocyst positivity.

The *Eimeria* oocyst positivity by site, with corresponding 95% confidence intervals, is illustrated in [figure 2](#).

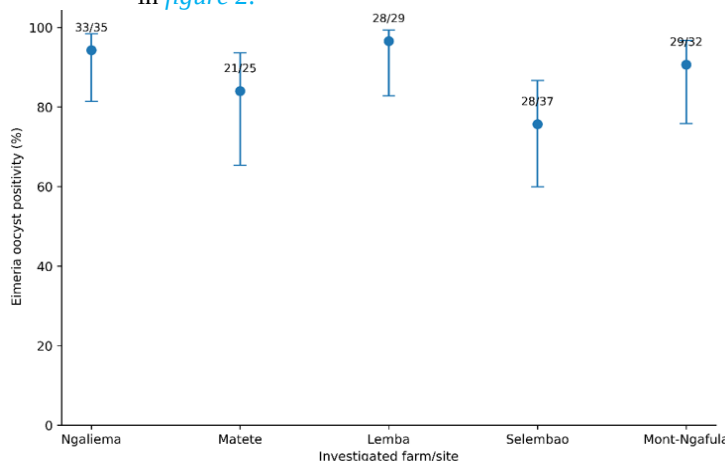


Figure 2. *Eimeria* oocyst positivity according to study site

Points represent the proportion of rabbits positive for *Eimeria* oocysts, and error bars indicate 95% confidence intervals calculated using the Wilson score method. Numbers above the estimates indicate positive/examined rabbits.

A forest plot summarizing the adjusted odds ratios obtained from the Firth penalized logistic regression model is presented in [figure 3](#).

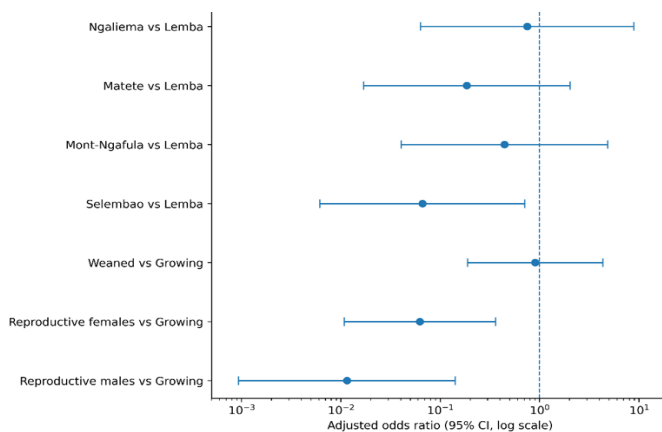


Figure 3. Forest plot of adjusted odds ratios for factors associated with *Eimeria* oocyst positivity

Points represent adjusted odds ratios obtained from Firth penalized logistic regression; horizontal bars indicate 95% confidence intervals. The vertical line at OR = 1 represents the null value. Lemba and growing rabbits were used as reference categories.

4. Discussion

This study revealed a high frequency of *Eimeria* infection in the investigated peri-urban rabbit farms of Kinshasa, with 139/158 rabbits (88.0%) positive for

oocysts. Comparable high infection frequencies have been reported in tropical rabbit production systems, although estimates vary with husbandry, population structure, diagnostic methods, and sampling design ([Fagbohoun, 2006](#); [Jaouzi et al., 2006](#); [Djago et al., 2011](#); [Okumu et al., 2014](#); [Yin et al., 2016](#)). Given the non-probabilistic sampling and limited farm coverage, however, the present estimate primarily characterizes the investigated farms rather than the wider rabbit population of Kinshasa.

Physiological category showed the clearest association with infection. Positivity was 95.4% in weaned and 91.7% in growing rabbits, compared with 61.1% in reproductive females and 20.0% in males. Adjusted analyses similarly indicated lower odds in reproductive animals, whereas weaned and growing rabbits did not differ significantly. Greater susceptibility of young rabbits has been related to developing immunity, weaning stress, dietary transition, and increased exposure to infective oocysts ([El-Akabawy et al., 2004](#); [Pakandl, 2013](#); [Sivajothi et al., 2016](#)), while repeated exposure may promote partial immunity in adults ([Pakandl, 2013](#); [Lopes et al., 2024](#)). Nevertheless, the estimate for reproductive males should be interpreted cautiously because only five animals were examined.

Oocyst shedding was highly heterogeneous, ranging from 0 to 33,200 OPG among the 45 samples with quantitative data. Such variability may reflect differences in host age, immunity, exposure, husbandry, and *Eimeria* species ([Djago et al., 2011](#); [Pakandl, 2013](#); [Cherwon et al., 2020](#)). However, OPG distributions did not differ significantly among farms (Kruskal–Wallis $H = 8.19$, $p = 0.085$). High individual counts therefore indicate substantial oocyst shedding but cannot alone establish environmental contamination or disease severity ([Pakandl, 2013](#)).

Positivity varied from 75.7% in Selembao to 96.6% in Lemba. Although adjusted analysis indicated lower odds in Selembao than Lemba, site effects require particular caution. Spatial heterogeneity in *Eimeria* infection may reflect differences in management, sanitation, population structure, or exposure ([Okumu et al., 2014](#); [Yin et al., 2016](#)), but each commune was represented by only one farm in the present study. Farm and geographical effects therefore cannot be separated.

The farm survey documented irregular anticoccidial use and regular veterinary access in only 20% of respondents. Husbandry and sanitation practices are recognized contributors to *Eimeria*

transmission (Fagbohoun, 2006; Djago et al., 2011; Pakandl, 2013; Cherwon et al., 2020), but these variables were not established here as independent predictors of individual infection and should therefore remain contextual rather than causal explanations.

Importantly, the findings represent *Eimeria* infection rather than clinical coccidiosis. Rabbit *Eimeria* species differ substantially in pathogenicity and tissue tropism (Lebas et al., 1997; Pakandl, 2013), and clinical expression may include diarrhea, growth impairment and mortality, particularly in young rabbits (El-Akabawy et al., 2004; Sivajothi et al., 2014). Because species identification and systematic clinical assessment were not performed, neither oocyst positivity nor OPG can independently establish clinical disease severity (Pakandl, 2013).

The principal limitations are the convenience sampling, restricted farm coverage, within-farm clustering, sparse observations in some physiological categories, absence of species identification and clinical assessment, and cross-sectional design. Future studies should combine broader probability-based sampling, longitudinal and multilevel approaches, and molecular identification of *Eimeria*, while formally evaluating management determinants previously implicated in transmission (Djago et al., 2011; Pakandl, 2013; Cherwon et al., 2020). Despite these limitations, the study provides baseline evidence of frequent *Eimeria* infection in the investigated farms and identifies physiological category as an important host-related correlate.

5. Conclusion

This cross-sectional study documented frequent *Eimeria* infection in rabbits from five investigated peri-urban farms in Kinshasa, with an overall oocyst positivity of 88.0% (139/158). Weaned and growing rabbits showed the highest positivity, whereas reproductive animals had substantially lower odds of infection, supporting physiological category as an important host-related correlate. Oocyst shedding was highly variable among individual rabbits, reaching 33,200 OPG, although OPG distributions did not differ significantly among farms.

Farm-level differences should be interpreted cautiously because only one farm was investigated per commune, preventing separation of farm and geographical effects. Likewise, the management practices documented by questionnaire provide

contextual information but were not established as independent determinants of infection. Because *Eimeria* species and clinical signs were not systematically characterized, the findings represent infection and oocyst shedding rather than confirmed clinical coccidiosis. Larger, probability-based and longitudinal studies incorporating farm-level clustering, species identification, and clinical assessment are needed to clarify the epidemiology and disease significance of *Eimeria* infection in rabbit production systems in Kinshasa.

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Conflict of Interest

The authors declare that they have no competing financial or non-financial interests related to this study.

Ethical Considerations

This was an observational study involving a questionnaire survey and non-invasive collection of naturally voided rabbit feces. No experimental intervention, invasive procedure, or deliberate exposure of animals was performed. Fecal sampling was conducted with the permission of the farm owners and with due consideration for animal welfare. Formal ethical approval was not obtained for the study.

Consent for publication

Authors declare that the manuscript does not contain any individual person's data in any form (including any individual details, images or videos). No consent to publish is required

Competing Interests

The authors have no relevant financial or non-financial interests to disclose."

They also declare that they have no conflict of interest.

Author contributions

R.K.: contributed to conception and design, and in drafting the article.

A.A.: contributed to Analysis and interpretation of data and in reviewing critically for significant intellectual content.

G.C.: contributed to acquisition of data.

A.T.: has supervised the study and gave the final approval of the version to be submitted and any revised version.

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