Knowledge and self-reported practices of animal health workers regarding abortion-associated zoonoses in two regions of Burkina Faso

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Abstract

Background: Abortion-associated zoonoses may expose animal health workers to infectious materials. This study assessed their knowledge and self-reported practices in two regions of Burkina Faso.
Methods: A cross-sectional descriptive and analytical survey was conducted from April to May 2024 among 150 animal health workers selected through two-stage random sampling in Kadiogo and Djôrô. Data were collected using an anonymous, self-administered KoboToolbox questionnaire. Associations between satisfactory knowledge and sociodemographic or professional characteristics were assessed using Chi-square or Fisher's exact tests at a 5% significance level.
Results: Overall, 52/150 participants (34.7%) had satisfactory knowledge. Knowledge was associated with professional category and years of experience ($p < 0.001$), but not with age or gender. Satisfactory knowledge was observed in 100% of veterinarians, 76.9% of advanced animal health technicians and 3.3% of animal health technicians. In suspected cases, 56.7% reported requesting laboratory diagnosis; 76.7% reported using protection before handling abortion materials and

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73.3% reported handwashing with disinfectant afterward. Management of confirmed cases varied between diseases.
Conclusion: Important knowledge gaps and heterogeneous self-reported practices persist, especially among paraprofessionals. Targeted training, standardized biosafety guidance and improved access to diagnosis are needed within a One Health framework.

Keywords: Abortion-associated zoonoses; animal health workers; knowledge; preventive practices; Burkina Faso

Connaissances et pratiques déclarées des professionnels de santé animale sur les zoonoses associées aux avortements dans deux régions du Burkina Faso

Résumé

Contexte : Les zoonoses associées aux avortements exposent les professionnels de santé animale à des risques infectieux. Cette étude a évalué leurs connaissances et leurs pratiques déclarées dans deux régions du Burkina Faso.
Méthodes : Une enquête transversale descriptive et analytique a été menée d'avril à mai 2024 auprès de 150 professionnels sélectionnés par échantillonnage aléatoire à deux degrés dans le Kadiogo et le Djôrô. Un questionnaire KoboToolbox anonyme et auto-administré a été utilisé. Les associations entre le niveau de connaissance et les caractéristiques sociodémographiques et professionnelles ont été étudiées par les tests du Chi-deux ou exact de Fisher au seuil de 5 %.
Résultats : Au total, 52/150 participants (34,7 %) avaient un niveau de connaissance satisfaisant. Celui-ci était associé à la catégorie professionnelle et à l'ancienneté ($p < 0,001$), mais pas à l'âge ni au genre. Un niveau satisfaisant concernait 100 % des docteurs vétérinaires, 76,9 % des techniciens supérieurs d'élevage et 3,3 % des agents techniques d'élevage. En cas de suspicion, 56,7 % privilégiaient le diagnostic de laboratoire ; 76,7 % déclaraient se protéger avant manipulation des produits d'avortement et 73,3 % se laver les mains avec un désinfectant. Les conduites en cas de confirmation variaient selon les maladies.
Conclusion : Des lacunes importantes de connaissances et des pratiques hétérogènes persistent, surtout chez les paraprofessionnels. Des formations ciblées, des protocoles de biosécurité et un meilleur accès au diagnostic sont nécessaires dans une approche One Health.

Mots clés : Zoonoses associées aux avortements ; professionnels de santé animale ; connaissances ; pratiques préventives ; Burkina Faso

Introduction

Livestock production is a major component of livelihoods and the national economy in Burkina Faso, where the livestock population includes large numbers of cattle, small ruminants, pigs and poultry (1). According to the World Health Organization, a zoonosis is a disease or infection naturally transmissible from vertebrate animals to humans (2). In the present study, the term “abortion-associated zoonoses” refers to zoonotic infections capable of causing abortion or other reproductive losses in livestock and of exposing humans, particularly animal health workers, through contact with infected animals, aborted fetuses, placentas, reproductive fluids or contaminated environments (3,4). This operational definition distinguishes zoonotic abortifacient infections from non-zoonotic causes of abortion.

Based on their epidemiological relevance and the content of the survey instrument, disease-specific analyses focused on brucellosis, leptospirosis, toxoplasmosis, campylobacteriosis, Q fever, listeriosis, salmonellosis, chlamydiosis due to Chlamydia abortus, and Rift Valley fever. Brucellosis is among the five priority zoonotic diseases identified in Burkina Faso (5), and previous studies have documented the circulation of brucellosis (6), toxoplasmosis (7) and Rift Valley fever (8) in livestock. These findings support the relevance of reproductive zoonoses to animal production and occupational health, although they do not by themselves quantify the human disease burden.

Animal health workers occupy a key position at the animal-human interface and may be exposed during obstetrical procedures, abortion investigations and handling of infectious materials. Evidence on their preparedness in Burkina Faso remains limited, whereas studies in other settings have identified important gaps in knowledge and preventive practices related to zoonotic infections and livestock abortions (4,9). This study therefore aimed to assess the knowledge and self-reported practices of animal health workers regarding abortion-associated zoonoses in two regions of Burkina Faso and to explore, through bivariate analysis, the sociodemographic and professional factors associated with satisfactory knowledge.

I. Material and methods

I.1. Description of the study area

A cross-sectional survey was conducted from April to May 2024 in two administrative territories of Burkina Faso corresponding to the current Kadiogo and Djôrô regions (Figure 1). At the time of data collection, these territories were referred to as the Centre and South-West regions, respectively. To avoid ambiguity, the current names Kadiogo and Djôrô are used throughout the manuscript. Livestock production is predominantly semi-intensive in Kadiogo, whereas pastoral and transhumant systems are common in Djôrô. Both regions include public veterinary services and private veterinary practices; veterinary clinics are concentrated in Kadiogo.

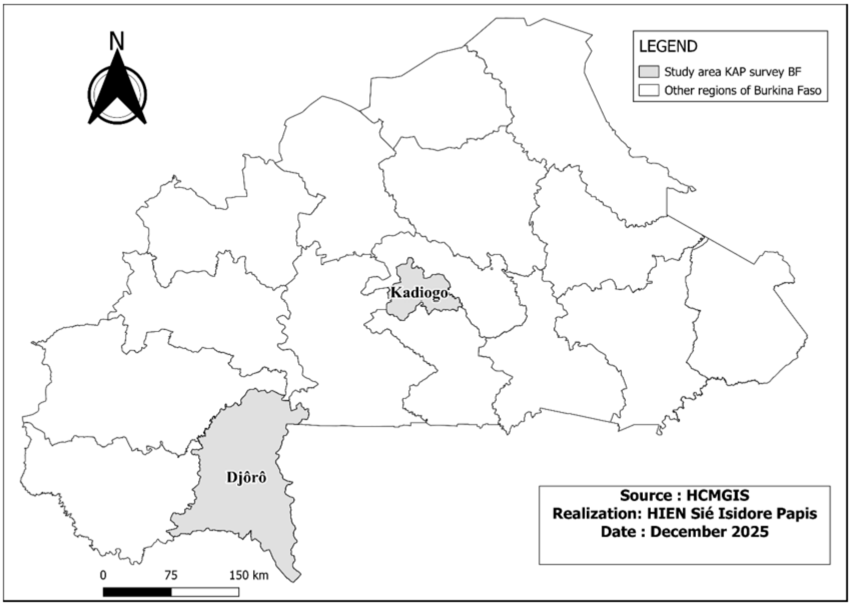

Figure 1: Location of the Kadiogo and Djôrô regions included in the study, Burkina Faso, 2024.

I.2. Definitions and scope of the study

For this study, abortion-associated zoonoses were operationally defined as zoonotic infections that can be associated with abortion or reproductive losses in livestock and that may expose humans during contact with infected animals or abortion materials (2–4). Disease-specific occurrence and practice questions were restricted to nine conditions: brucellosis, leptospirosis, toxoplasmosis, campylobacteriosis, Q fever, listeriosis, salmonellosis, chlamydiosis (Chlamydia abortus) and Rift Valley fever. Trypanosomiasis had been included in the original questionnaire as an exploratory reproductive-disease item; because the item did not distinguish zoonotic from non-zoonotic Trypanosoma species, it was excluded from the disease-specific analyses and interpretation presented here.

I.3. Sampling

Among the 13 administrative regions existing at the time of data collection, each region was assigned a number from 1 to 13 and two regions were selected by simple random lottery. The selected territories correspond to the current Kadiogo and Djôrô regions. Official lists obtained from the Ministry in charge of Livestock contained 137 animal health workers in Kadiogo and 130 in Djôrô (N = 267). The initial sample size was calculated using the Schwartz formula (10): $n_0 = Z^2p(1-p)/d^2$, with Z = 1.96 for a 95% confidence level, p = 0.50 as the expected proportion of animal health workers with satisfactory knowledge of abortion-associated zoonoses, and d = 0.08 as the absolute precision. This yielded $n_0 \approx 150$.

$$n_0 = Z^2 \times p\,(1 - p) / d^2$$

No design effect, finite-population correction or non-response inflation was applied in the original calculation. A finite-population correction would have reduced the minimum required sample, whereas the study retained the more conservative sample of 150 participants. All 150 selected participants submitted analysable questionnaires. Allocation was proportional to regional workforce size (77 in Kadiogo and 73 in Djôrô) but not stratified by professional category. Within each region, participants were selected by simple lottery from numbered official lists. These design features and their implications for representativeness are acknowledged in the limitations.

I.4. Data collection

Data were collected using a structured, anonymous and self-administered questionnaire deployed through KoboToolbox. Before the main survey, the questionnaire was pre-tested among 20 animal health workers (10 from each study region) who were not included in the final sample, and wording was adjusted where necessary. A survey link was then sent to the 150 randomly selected participants, who completed and submitted the questionnaire electronically.

The questionnaire covered sociodemographic and professional characteristics, knowledge of abortion-associated zoonoses and self-reported preventive and case-management practices, following the conventional organization of knowledge-attitudes-practices survey domains (12). Knowledge items assessed the definition of zoonoses, recognition of abortion-associated zoonoses, affected animal species, causal agents, clinical signs, routes of transmission to humans and potential severity in humans. Disease-specific questions addressed brucellosis, leptospirosis, toxoplasmosis, campylobacteriosis, Q fever, listeriosis, salmonellosis, chlamydiosis and Rift Valley fever. Table I presents the knowledge questions and scoring rules. The instrument also recorded reported frequency of occurrence, protective measures during handling of abortion materials and intended responses to suspected or confirmed cases.

I.5. Data analysis

Knowledge was scored using nine questions comprising several component items (Table I). Each correctly answered component received 1 point and each incorrect or "don't know" response received 0 points, giving a maximum total score of 72. Using modified Bloom cut-off points, scores below 60% were considered low, 60–79% fair and ≥80% good; for the binary association analysis, participants scoring at least 60% were classified as having satisfactory knowledge (11). Because the maximum score was 72, the integer threshold for satisfactory knowledge was ≥44 points.

Data were analyzed in R software, version 3.5.2. Descriptive statistics were expressed as counts and percentages. Bivariate associations between satisfactory knowledge and gender, age group, professional category and years of professional experience were assessed using Pearson's Chi-square test with continuity correction when appropriate, or Fisher's exact test when assumptions were not met. Statistical significance was set at $p < 0.05$. Self-reported practices were summarized descriptively; no multivariable model or factor analysis of practices was performed.

I.6. Ethical considerations

The study was conducted in accordance with current ethical guidelines and the advice of the Health Research Ethics Committee (decision number 2024-03-74). Furthermore, prior to completing the questionnaire, each participant was informed of the study's objectives, the voluntary nature of their participation in the study, and the confidentiality of the data collected. Verbal consent was obtained from each participant before the questionnaire was administered.

Table I: Knowledge questions and scoring rules used to assess animal health workers' knowledge of abortion-associated zoonoses.

N°	Questions	Score for an incorrect answer	Score for a correct answer	Total score
1	In your opinion, do abortion-associated zoonoses exist?	0	1	1
2	If yes, what is an abortion-associated zoonosis?	0	1	1
3	Can you name five abortion-associated zoonoses?	0	1	5
4	Can you correctly classify each of 15 candidate conditions as an abortion-associated zoonosis or not?	0	1	15
5	Can you identify the animal species affected by the listed conditions?	0	1	10
6	Can you identify the type (virus, bacterium, parasite) and name of the causal agent?	0	1	10
7	Can you identify clinical signs associated with these diseases?	0	1	10
8	Can you identify routes by which humans may acquire these infections?	0	1	10
9	Can you identify the potential severity of these infections in humans?	0	1	10

II. Results

Sociodemographic characteristics of participants

The 150 participants comprised 77 (51.3%) animal health workers from Kadiogo and 73 (48.7%) from Djôrô. Most were male (88.7%) and 54.0% were aged 26–35 years. Animal health technicians represented 61.3% of respondents, advanced animal health technicians 26.0%, and veterinarians 12.7%. Overall, 58.0% had five years or less of professional experience (Table II).

Bivariate analysis of factors associated with knowledge of abortion-associated zoonoses

Among the 150 respondents, 52 (34.7%) demonstrated satisfactory knowledge of abortion-associated zoonoses. This included all 19 veterinarians (100%), 30 of 39 advanced animal health technicians (76.9%) and 3 of 92 animal health technicians (3.3%).

Table II: Sociodemographic and professional characteristics of animal health workers in the study area, Burkina Faso, 2024.

Variables	Number	Percentage
Administrative region		
Kadiogo	77	51.33
Djôrô	73	48.67
Age (in years)		
18–25	8	5.33
26–35	81	54.00
36–45	51	34.00
46–59	10	6.67
Employment category		
Animal health technician	92	61.33
Advanced animal health technician	39	26.00
Veterinarian	19	12.67
Gender		
Female	17	11.33
Male	133	88.67
Professional experience (in years)		
5 and lower	87	58.00
6 to 10	33	22.00
11 to 15	20	13.33
16 to 20	8	5.33
Over 20	2	1.33

In bivariate analysis, satisfactory knowledge was significantly associated with professional category and years of professional experience (both $p < 0.001$). No statistically significant association was observed with gender ($p = 0.385$) or age group ($p = 0.753$) (Table III). The association with professional experience was not monotonic and should not be interpreted as a simple linear increase in knowledge with seniority.

Table III: Bivariate factors associated with satisfactory knowledge of abortion-associated zoonoses among animal health workers, Burkina Faso, 2024.

Variables	No. of participants	Number and percentage (%) of participants with a satisfactory level of knowledge	p-value
Gender			
Female	17	8 (47.06)	0.385
Male	133	44 (33.92)	
Age			
18 – 25 years old	8	4 (50)	
26 – 35 years old	81	28 (34.57)	
36 – 45 years old	51	16 (31.37)	0.753
46 – 59 years old	10	4 (40)	
Type of workers			
Animal health technician	92	3 (3.26)	
Advanced animal health technician	39	30 (76.92)	< 0.001
Veterinarian	19	19 (100)	
Professional experience			
Less than 1 year	12	10 (83.33)	
1 – 5 years	75	18 (24)	
6 – 10 years	33	8 (24.24)	< 0.001
11 – 15 years	20	10 (50)	
16 – 20 years	8	5 (62,5)	
More than 20 years	2	1 (50)	

For most selected abortion-associated zoonoses, a large proportion of respondents selected "don't know" when asked about frequency of occurrence in their practice area (69.3%–78.0% for leptospirosis, toxoplasmosis, campylobacteriosis, Q fever, listeriosis, salmonellosis, chlamydiosis and Rift Valley Fever). Brucellosis had the lowest proportion of "don't know" responses (36.0%); 31.3% reported encountering it sometimes, 21.3% often and 11.3% rarely (Table IV).

Self-reported preventive and case-management practices regarding abortion-associated zoonoses

When an abortion-associated zoonosis was suspected, 56.7% of respondents reported that they would request laboratory diagnosis, 30.7% would provide symptomatic treatment, 30.0% would slaughter the animal, 10.0% did not know what action to take and 4.0% would keep the animal in the herd. Before handling abortion materials, 76.7% reported using protective measures, whereas 16.0% reported handling aborted fetuses with bare hands and 7.3% did not know which precautions to take. After handling, 73.3% reported washing their hands with disinfectant before showering, 18.7% used water only and 8.0% did not know the appropriate procedure.

Table IV: Reported frequency of occurrence of selected abortion-associated zoonoses according to participants (%, n = 150)

Abortion-associated zoonosis	Don't know*	Rarely**	Sometimes***	Often****	Always*****	TOTAL
Brucellosis	36.00	11.33	31.33	21.33	0.00	100%
Leptospirosis	76.67	16.67	2.67	4.00	0.00	100%
Toxoplasmosis	78.00	16.00	4.00	2.00	0.00	100%
Campylobacteriosis	78.00	17.33	2.00	2.67	0.00	100%
Q fever	78.00	19.33	1.33	1.33	0.00	100%
Listeriosis	77.33	18.00	2.67	2.00	0.00	100%
Salmonellosis	69.33	8.00	8.00	11.33	3.33	100%
Chlamydiosis	76.67	20.67	1.33	1.33	0.00	100%
Rift Valley Fever	76.67	19.33	1.33	2.67	0.00	100%

*Don’t know: No knowledge about the frequency of the disease; **Rarely: Encountering the disease once every 2 years; ***Sometimes: Encountering the disease once a year; ****Often: Encountering the disease twice a year and *****Always: Encountering the disease during all periods of the year

Reported responses to a confirmed case varied by disease. Slaughter and carcass destruction was the most frequently selected response for brucellosis (69.3%), leptospirosis (48.0%), toxoplasmosis (44.0%), campylobacteriosis (37.3%), Q fever (38.7%), listeriosis (36.0%), salmonellosis (40.7%) and chlamydiosis (35.3%). For Rift Valley fever, slaughter followed by consumption (36.7%) was the most frequently selected response, followed by “don’t know” (32.7%) and slaughter with carcass destruction (28.0%). These findings demonstrate marked heterogeneity in reported case-management responses (Table V).

Table V: Self-reported preventive and case-management practices regarding abortion-associated zoonoses, Burkina Faso, 2024.

Variables	Number (Frequency in %)
Management in the face of suspected abortion-associated zoonosis	
Perform a laboratory diagnosis	85 (56.67)
Provide symptomatic treatment	46 (30.67)
Slaughter the animal	45 (30)
Don't know *	15 (10)
Keep the animal in the herd	6 (4)
Precautions taken for handling animals in case of abortion	
Protect yourself before handling	115 (76.67)
Handling aborted fetuses with bare hands without protection	24 (16)
Don't know	11 (7.33)
Procedure to follow at the end of handling an aborted fetus	
Wash your hands with disinfectant before taking a shower	110 (73.33)
Wash your hands with water only, without disinfectant	28 (18.67)
Don't know	12 (8)
Procedure to follow for confirmed cases of brucellosis	
Slaughter and destruction of the carcass	104 (69.33)
Slaughter and consumption of the carcass	27 (18)
Don't know	17 (11.33)
Keep the animal in the herd	2 (1.33)
Procedure to follow for confirmed cases of leptospirosis	
Slaughter and destruction of the carcass	72 (48)
Don't know	44 (29.33)
Slaughter and consumption of the carcass	33 (22)
Keep the animal in the herd	1 (0.67)
Procedure to follow for confirmed cases of toxoplasmosis	
Slaughter and destruction of the carcass	66 (44)
Don't know	44 (29.33)
Slaughter and consumption of the carcass	35 (23.33)
Keep the animal in the herd	4 (2.67)
No response	1 (0.67)
Procedure to follow for confirmed cases of campylobacteriosis	
Slaughter and destruction of the carcass	56 (37.33)
Don't know	32 (34.67)
Slaughter and consumption of the carcass	37 (24.67)
Keep the animal in the herd	5 (3.33)
Procedure to follow for confirmed cases of Q fever	
Slaughter and destruction of the carcass	58 (38.67)
Don't know	50 (33.33)
Slaughter and consumption of the carcass	38 (25.33)
Keep the animal in the herd	4 (2.67)

Variables	Number (Frequency in %)
Procedure to follow for confirmed cases of listeriosis	
Slaughter and destruction of the carcass	54 (36)
Don't know	51 (34)
Slaughter and consumption of the carcass	36 (24)
Keep the animal in the herd	9 (6)
Procedure to follow for confirmed cases of salmonellosis	
Slaughter and destruction of the carcass	61 (40.67)
Slaughter and consumption of the carcass	41 (27.33)
Don't know	40 (26.67)
Keep the animal in the herd	9 (5.33)
Procedure to follow for confirmed cases of chlamydiosis	
Slaughter and destruction of the carcass	53 (35.33)
Don't know	50 (33.33)
Slaughter and consumption of the carcass	41 (27.33)
Keep the animal in the herd	5 (3.33)
No response	1 (0.67)
Procedure to follow for confirmed cases of Rift Valley Fever	
Slaughter and consumption of the carcass	55 (36.67)
Don't know	49 (32.67)
Slaughter and destruction of the carcass	42 (28)
Keep the animal in the herd	4 (2.67)

**Don't know : respondent reported not knowing the procedure to follow. Percentages for suspected-case management sum to more than 100% because multiple actions were reported. One response was missing for the toxoplasmosis and chlamydiosis management items.*

III. Discussion

This study found that only about one-third of participating animal health workers had satisfactory knowledge of abortion-associated zoonoses. Professional category showed the strongest gradient: all veterinarians and most advanced animal health technicians met the knowledge threshold, compared with very few animal health technicians. This pattern is consistent with findings from Nigeria, where veterinarians demonstrated higher zoonosis-related knowledge than paraprofessionals (9). Cherry et al. similarly documented incomplete knowledge of transmission routes for several livestock abortion-associated zoonoses among large-animal veterinarians in the United States (4). These comparisons support the need for training that is differentiated according to professional responsibilities and baseline competencies.

Professional experience was also associated with knowledge, although the distribution across experience groups was not monotonic. The finding should therefore be interpreted as heterogeneity between experience categories rather than as evidence that knowledge necessarily increases with seniority. Age and gender were not associated with satisfactory knowledge. Because the analysis was bivariate, residual confounding by professional category, training history, service assignment or access to continuing education cannot be excluded.

Self-reported practices showed both encouraging elements and important inconsistencies. More than half of respondents reported seeking laboratory confirmation for a suspected case, and approximately three-quarters reported using protection before handling abortion materials and disinfecting their hands afterward. Comparable variation in preventive behaviors among animal health professionals has been reported in Nigeria and Australia (9,19). Standard precautions emphasize hand hygiene, appropriate personal protective equipment and risk-based infection-control procedures for veterinary personnel (21–23). However, the substantial dispersion of responses to confirmed cases in the present study suggests a need for clearer disease-specific guidance and easier access to diagnostic support.

The high frequency of "don't know" responses regarding occurrence of most selected diseases should not be interpreted as absence of disease. It may instead reflect limited clinical recognition, infrequent laboratory confirmation or uncertainty about etiologic diagnosis. Diagnostic investigations of livestock abortions often fail to identify a definitive cause; previous laboratory studies reported etiologic diagnoses in only a proportion of submitted cases (14–18). Strengthening abortion-event investigation and laboratory referral pathways could therefore improve both surveillance and the practical knowledge of field personnel.

The study addresses preparedness of the animal-health workforce at an important animal-human interface, but it did not measure human infection, seroprevalence or clinical outcomes. Accordingly, the results cannot be used to estimate the burden of zoonotic disease in humans. Their One Health relevance lies primarily in identifying occupational knowledge and practice gaps that could affect early recognition, safe handling and referral of potentially zoonotic abortion events, areas where collaboration between veterinary and public-health services is important (25).

Study limitations

This study has several limitations. Its cross-sectional design does not establish causal relationships. Data were self-reported through an online, self-administered questionnaire and may therefore be affected by recall, comprehension and social-desirability biases. Only two regions were included, and the original sample-size calculation did not incorporate a design effect, finite-population correction or professional-category stratification; consequently, national generalization should be cautious. Although all selected participants completed the survey, the professional groups were unequally represented. The analysis of factors associated with knowledge was bivariate and did not adjust for potential confounding, while practices were analysed descriptively only. Finally, no human-health data, biological sampling or laboratory verification of participants' reported disease occurrence or occupational infections were included.

Conclusion

The study identified substantial knowledge gaps regarding abortion-associated zoonoses among animal health workers in the two surveyed regions of Burkina Faso, with marked differences by professional category and professional experience. Although protective behaviors such as use of protection during abortion-material handling and post-handling hand hygiene were frequently reported, responses to suspected and confirmed cases were heterogeneous. These findings support targeted continuing education, particularly for paraprofessionals, together with standardized biosafety and case-management guidance and strengthened access to diagnostic services. Such measures may improve occupational protection and veterinary surveillance at the animal-human interface within a One Health framework.

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Conflict of interest

The authors declare no conflict of interest.

Author Contributions

The design and the implementation of the research were conducted by S.I.P.H, L.A.T, A.D.S, M.S, N.D.D, L.D.D and RBA. Data collection in the field was conducted by S.I.P.H, A.D.S, L.A.T. Statistical analysis and interpretation of the results were performed by S.I.P.H, A.D.S, L.A.T. The manuscript was drafted by S.I.P.H and M.S. All authors contributed to review of the manuscript and approved the final version.

Data availability

The data supporting the findings of this study are available from the corresponding author, Sié Isidore Papis HIEN, upon reasonable request and subject to the confidentiality commitments made to participants.

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