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Knowledge, Attitude and Practices Relevant to Disease Reporting and Prevention Among Public and Private Veterinarians in Plateau State, Nigeria

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ABSTRACT

Veterinarians serve an important role in timely disease reporting, which helps monitor early warning signs of disease outbreaks so that informed decisions can be made to mitigate them. An online questionnaire was developed and distributed via veterinarians' social media platforms in Plateau State to assess their knowledge, attitude, and practices relevant to disease reporting and prevention and practices relevant to disease reporting and prevention from May 2nd to June 1st, 2023. In total, 29 (18.7%) of 155 veterinarians completed the survey across 3 out of the 17 Local Government Areas of the State. The majority were males (62%), married (76%), with a general type of practice (52%), practicing for 11-20 years (55%), and Government employees (83%). A majority (97%) of the veterinarians knew they were required to report diseases, but only 41% each knew whom to report to and the types of diseases they were required to report. The respondents' knowledge of the Nigerian seven listed priority transboundary animal diseases ranged from 97% for avian influenza to 66% for both peste des petits ruminants and Newcastle disease. Respondents' attitudes and practices toward disease diagnosis revealed that 69% each reported diagnosing diseases based on clinical signs and confirmatory diagnosis at the reference laboratory at the National Veterinary Research Institute. In comparison, 86% of respondents demonstrated practical use of personal protective equipment when handling animals to prevent zoonotic disease transmission. There is a need for increased awareness among veterinarians on disease reporting in Plateau State, Nigeria.

Keywords: Attitude, Disease prevention, Disease reporting, Knowledge, Practices, Nigeria

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Data Availability

Data supporting the findings are available from the corresponding author on reasonable request.

Introduction

Animal diseases pose serious threats to public health globally, especially through emerging and re-emerging

zoonoses, with approximately 75% of emerging diseases of animal origin (Ng and Sargeant, 2013). At least 250 zoonoses were listed as emerging and re-emerging

zoonoses during the last 70 years (Grace *et al.*, 2012). Human beings are infected globally, especially through emerging and re-emerging zoonoses, with approximately 75% of emerging diseases of animal origin pathogens emerging from wildlife (Woodhouse *et al.*, 2005; Morand *et al.*, 2014). Concerted efforts by stakeholders in the human health, animal health, and environmental sectors require a multisectoral approach to control or eradicate diseases effectively.

Veterinarians play crucial roles in food security and safety, emerging infectious diseases, environmental health, zoonotic and non-zoonotic disease surveillance, prevention and control, global health security, and basic and applied medical research (Pappaioanou, 2003). In the animal health sector, veterinarians engage in both active and passive surveillance, which is a crucial step in preventing and controlling zoonoses by early detection of infections and outbreaks, including notifications of outbreak locations. Veterinarians also play a role through timely disease reporting, which monitors early warning signs of disease outbreaks so that actions can be taken to mitigate them.

The Nigerian animal disease reporting platform, the National Animal Disease Information and Surveillance (NADIS) system, was developed by the Federal Department of Livestock of the Federal Ministry of Livestock Development (FMLD), formerly in the Federal Ministry of Agriculture and Food Security (FMAFS), to facilitate disease reporting in real time. Prompt disease reporting to competent authorities in the local government areas (LGAs), States, National and International communities will give policymakers a direction for action.

This study was conducted to assess the knowledge, and practices (KAP) of public and private practicing veterinarians on disease reporting and prevention practices, attitude, and practices (KAP) of public and private practicing veterinarians regarding disease reporting and prevention in Plateau State, Nigeria.

Materials and methods

Study location

The survey was carried out in Plateau State, Nigeria, which is located in the North-Central geopolitical zone of Nigeria. It lies between latitudes 9°10' North and longitudes 9°45' East, having a total land area of 30,913 km². Plateau State shares geographic boundaries with four of the thirty-six States of the Federation: Bauchi, Kaduna, Nasarawa, and Taraba States at its North-Eastern, North-Western, South-Western, and South-Eastern boundaries, respectively. It comprises seventeen Local Government Areas (LGAs). Plateau State is the 12th-largest State in Nigeria, with a population of about 3.2 million people.

Study Design

This study was a cross-sectional survey that utilized a convenience sampling approach among public and private veterinarians in Plateau State. A public or private veterinarian is defined as a Veterinary Council of Nigeria (VCN) licensed veterinarian who is employed by the Government (Federal or State) or is self-employed, respectively, to treat animal diseases in a clinical setting.

At the time of this survey, there were 258 participants of the Nigerian Veterinary Medical Association (NVMA), Plateau State chapter, on its social media platform (WhatsApp), the majority were from the National Veterinary Research Institute (NVRI), Vom, and the Faculty of Veterinary Medicine/Veterinary Teaching Hospital, University of Jos (FVM/VTH UniJos).

Inclusion criteria included public and private veterinarians working in Plateau State, and those working outside the State were excluded from the study.

Sample size

Sample size was calculated using Epi Info 7 with a power of 95% and an error of 5% for a population of 258 veterinarians, yielding a total of 155.

Survey questionnaire description

Kobo Toolbox software (kobo.humanitarianresponse.info) was used for the online survey. The survey included 19 questions that were divided into four sections: demographics, education, knowledge, and attitudes about disease reporting and disease prevention practices. The reliability of the instrument was assessed using Cronbach's alpha coefficient. The instrument yielded a Cronbach's alpha value of 0.788, indicating good internal consistency (Taber, 2018).

Knowledge, attitudes, and practices on disease reporting were assessed by asking the respondents to tick appropriate responses to specific questions and statements such as whether they were required to report animal diseases encountered during their clinical practices, who to report the animal diseases encountered to, types of animal diseases required to report, and knowledge of Nigerian priority animal diseases.

To assess the respondents' KAP on reportable animal diseases and disease diagnosis and disease prevention practices, lists of diseases and/or options were available: those that required reporting, those that did not, and activities, respectively, for respondents to select from.

Survey questionnaire dissemination

The survey link was distributed to respondents through the social media platforms of the NVMA Plateau State chapter, Association of Veterinary Research Officers (AVRO), NVRI, and the FVM UniJos WhatsApp groups for a period of one month from May 2nd to June 1st, 2023.

Data analysis

Data obtained from the survey were subjected to descriptive statistical analysis through the use of Kobo Toolbox software, Microsoft Excel, QGIS®, and the results were presented in tables, charts, and a map. The items in the domain of knowledge, attitudes, and practices were scored by a method adopted from Ghali-Mohammed *et al.* (2025), with some modifications. A modified formula-scoring approach was adopted for the multiple-response knowledge item, whereby correct selections were rewarded (+1) and incorrect selections penalized (−1), to reduce the effect of indiscriminate guessing. More precisely, knowledge of Nigeria's priority transboundary diseases was assessed using a multiple-response question consisting of twelve disease options, of which seven were correct, and five were

incorrect distractors; respondents were instructed to select the correct options. Respondents' knowledge about disease reporting, attitudes and practices towards disease diagnosis, and attitudes and practices about disease prevention were scored and graded on a 10-, 5-, and 5 -point scale, respectively. Scores were then converted to percentages. Those that scored $\geq 50\%$ were considered to have "satisfactory" knowledge, attitudes and practice, while those that scored $< 50\%$ were graded as having "unsatisfactory" knowledge, attitudes and practice.

Results

Forty-one (41) [26.5%] respondents out of the one hundred and fifty-five (155) veterinarians opened the survey link. Of these, seven (7) were not filled, three (3) were incompletely filled, and two (2) were filled

by respondents residing outside the State (Abuja and Lagos), resulting in a total of twelve (12) responses excluded from the study. We included 29 complete responses (18.7%) from public and private veterinarians practicing in Plateau State.

Respondents' demographics and characteristics

Table 1 showed that the majority of the respondents were males (62%), between the ages of 30-39 years old (41%), married (76%), Master's degree holders (41%), Government veterinary employees (83%), practicing for 11-20 years (56%), with a general type of practices (52%) involving small animal, large animal, avian and aquatic medicine and practiced in three (3) of the seventeen (17) LGAs of Plateau State (Fig. 1) with the majority practicing in Jos South (51%).

Table 1: Demographic characteristics of the respondents in Plateau State, Nigeria (n=29)

Characteristics	Category	Number	%
Sex	Male	18	62
	Female	11	38
Age	30-39	12	41
	40-49	11	38
	50-59	6	21
Marital status	Single	5	17
	Married	22	76
	Widowed	2	7
Additional qualification	MSc	12	41
	PhD	9	31
	Nil	8	28
Occupation	Government employee	24	83
	Private practice	5	17
Years practicing	1-10	10	34
	11-20	16	55
	20-30	4	14
Location of practice (LGA)	Jos North	15	51
	Jos South	13	45
	Kanke	1	3
Area of specialization	General	15	52
	Small animal	14	48

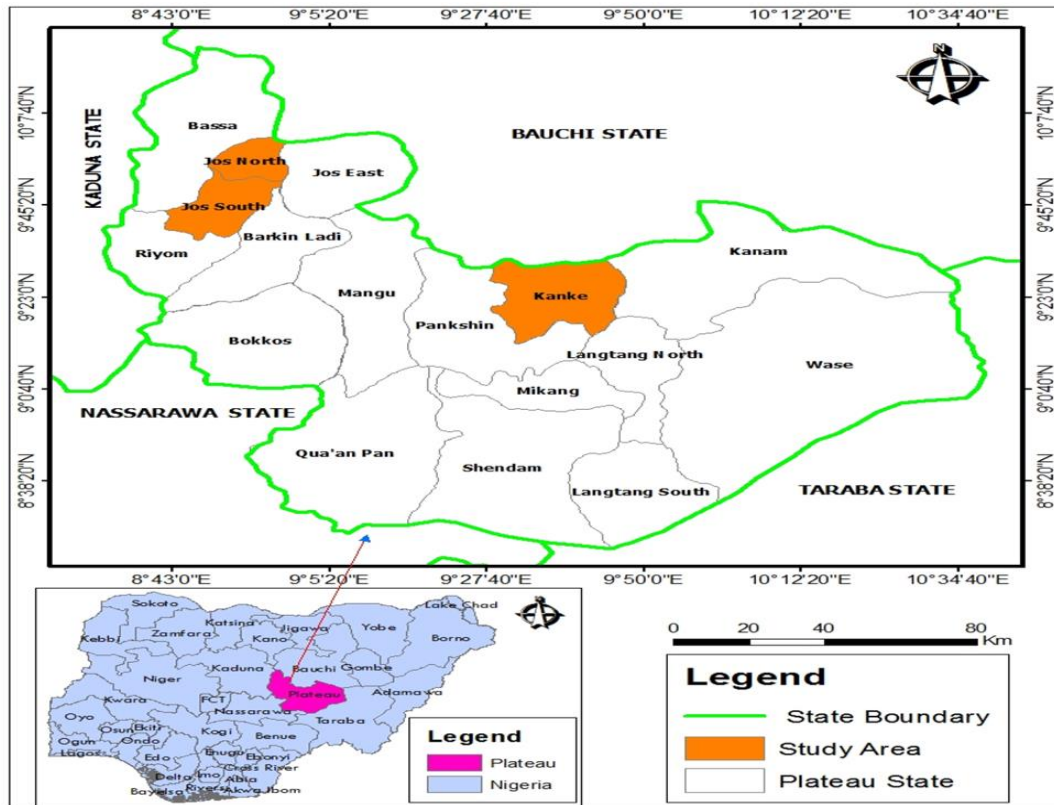


Figure 1: Map of Plateau State showing the location of the respondents who were administered questionnaires.

Knowledge about animal disease reporting and Nigeria's priority transboundary animal diseases

Among the twenty-nine (29) respondents, twenty-eight (28) [97%] knew they were required to report animal diseases; only twelve (12) [41%] out of the twenty-nine

(29) respondents knew the competent authority to contact and report animal diseases to (Figure 2). In contrast, twelve (12) [41%] were knowledgeable about the type of animal diseases to report (Table 2).

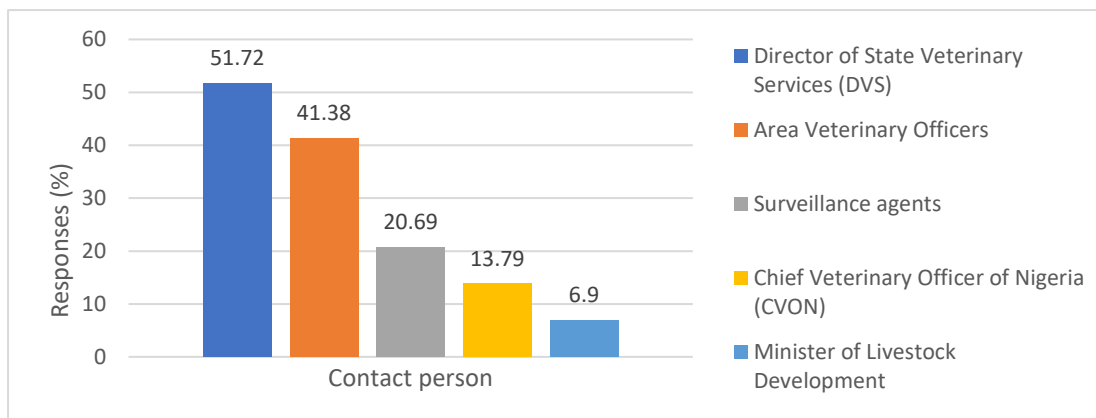


Figure 2: Respondents' responses on whom to submit disease reports in Plateau State, Nigeria

Table 2: Respondents' responses to the type of diseases they were required to report in Plateau State, Nigeria (n=29)

Type of disease	Number	Percentage (%)
Zoonotic diseases	14	48
Office of International Epizootics (OIE) listed diseases	14	48
World Organization for Animal Health (WOAH) listed diseases	12	41
Infectious diseases	11	38
All types of animal diseases	8	28

Respondents reported these responses on the Nigerian-listed priority TADs in the following descending order: 97% avian influenza, 93% rabies, 83% African swine fever, 72% foot and mouth disease, 69% contagious bovine pleuropneumonia, 66% for both Newcastle disease and peste des petits ruminants. However, 69% of reported monkeypox disease is not a Nigerian priority TAD (Figure 3).

Attitudes and practices of veterinarians towards disease diagnosis

Twenty (20) [69%] out of the twenty-nine (29) respondents each reported diagnosing diseases based on clinical signs and a confirmatory diagnosis at the reference laboratory at NVRI, while eighteen (18) [62%] diagnosed diseases based on basic laboratory diagnosis and five (5) [17%] based on clients/owner's words (Table 3).

Attitudes and practices of veterinarians towards disease prevention

The respondents used personal protective equipment (PPE) to protect themselves from contracting animal diseases. Twenty-five (86%) out of the twenty-nine made use of laboratory coats, while twenty-two (76%) always used gloves when examining and treating an animal (Table 4).

Description of scores for the outcomes obtainable by the respondents

The knowledge scores on disease reporting ranged from -1 to 10 out of a maximum obtainable score of 10, with a mean score of 3.94 ± 2.82 . Based on the adopted classification criterion, only 11 (37.9%) respondents demonstrated satisfactory knowledge. For attitude and practices regarding disease diagnosis, a large majority of respondents (82.8%) demonstrated satisfactory attitudes. Similarly, the scores for attitude and practices relating to disease prevention showed that most respondents (72.4%) demonstrated satisfactory attitudes (Table 5).

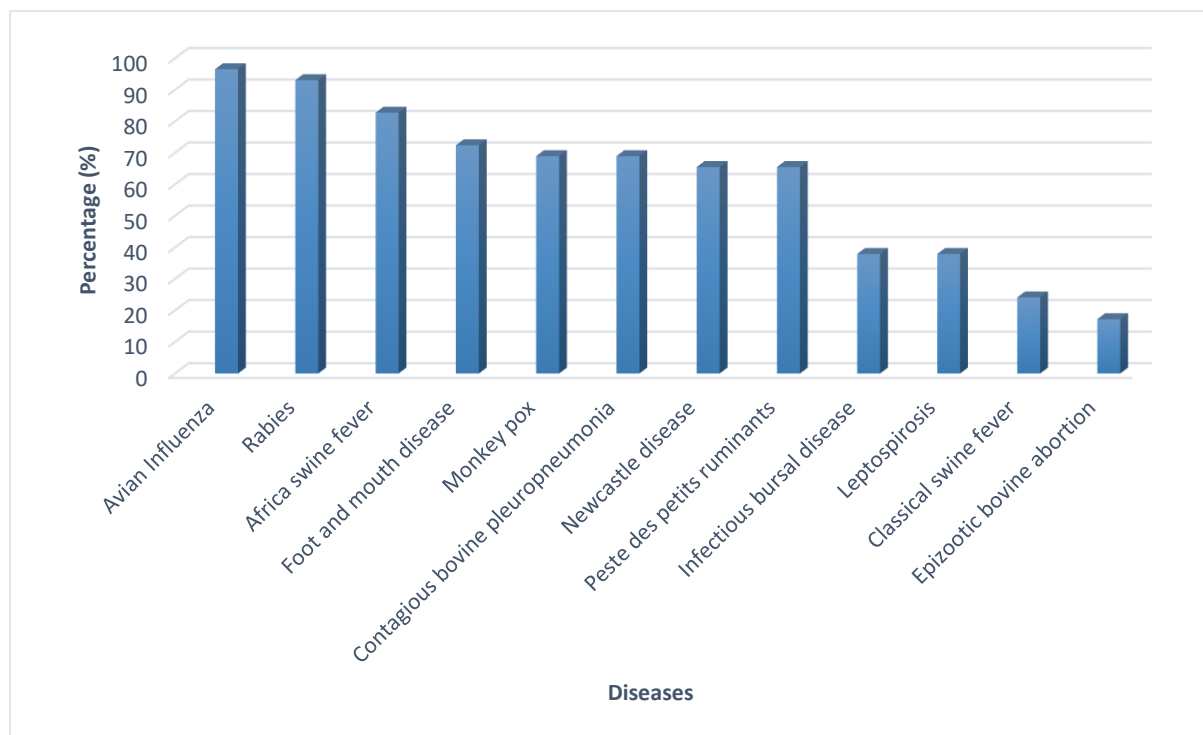


Figure 3: Respondents' responses to Nigeria's seven listed priority TADs in Plateau State, Nigeria

Table 3: Respondents' attitudes and practices towards disease diagnosis in Plateau State, Nigeria

Means of disease diagnosis	Percentage (%)
Based on clinical signs	69
Based on a confirmatory diagnosis in NVRI	69
Based on basic laboratory diagnosis	62
Based on the client/owner's words	17

Table 4: Attitudes and practices of veterinarians towards disease prevention in Plateau State, Nigeria

Type of practice	Percentage (%)
Use of a laboratory coat always	86
Use of gloves always	76
Use of gloves sometimes	24
Mostly use my hands and wash them immediately	17

Table 5: Description of scores for the outcomes obtainable by the respondents in Plateau State, Nigeria (n = 29)

Outcome	Minimum score obtained	Maximum score obtained	Mean $\pm$ SD	Maximum obtainable score	Satisfactory (%)	Unsatisfactory (%)
Knowledge on disease reporting	-1	10	3.94 $\pm$ 2.82	10	11 (37.9)	18 (62.1)
Attitudes & practices on disease diagnosis	2	5	4.24 $\pm$ 1.21	5	24 (82.8)	5 (17.2)
Attitudes & practices on disease prevention	0	5	3.88 $\pm$ 1.43	5	21 (72.4)	8 (27.6)

Discussion

This study observed low responses from veterinarians in the State, as only 18.7% of our sample size completed the questionnaire. The response rate by veterinarians obtained in this study is lower compared to the 27% reports of Venkat *et al.* (2019) in Arizona, United States of America (USA) and the 23.4% recorded by Habib and Alshehhi (2021) in the United Arab Emirate (UAE) while it is higher than the 8.6% obtained by Agrawal and Varga (2024) in Illinois, USA who conducted similar studies assessing the knowledge, attitudes and practices of veterinarians. This finding primarily represents a limitation due to the low response rate; it will also hinder effective communication between veterinary authorities/policymakers and animal healthcare systems, thereby weakening preparedness and early warning response in the event of a disease outbreak.

A majority of the survey respondents were males (62%), working in a general practice (52%) and Government veterinary employees (72%). This observation is contrary to the reports of Venkat *et al.* (2019) on zoonotic disease reporting among veterinarians in Arizona, USA, where the majority of the respondents were female (70%), specializing in small animal medicine (81%) and worked in the private practice (82%), also to the findings of Agrawal and Varga (2024) when assessing and comparing disease prevention knowledge, attitudes and practices among veterinarians in Illinois, USA where they also noted the majority of the respondents were females (64%) and working in clinical practice (88% companion animals and 12% bovine or swine) and only a few were Government officials (2.5%). The observed gender distribution probably reflects workforce demographics across countries. The high proportion of Government-employed veterinarians is advantageous for disease surveillance and reporting because Government veterinarians are generally responsible for implementing national animal disease surveillance programmes, investigating outbreaks, enforcing animal health regulations, and reporting notifiable diseases to state and national veterinary authorities. This may explain why respondents generally demonstrated satisfactory attitudes and practices towards disease diagnosis and prevention despite deficiencies in knowledge of disease reporting. In developed countries, veterinary services are predominantly delivered through private clinical practice, with Government veterinarians primarily

performing regulatory and surveillance functions (Venkat *et al.*, 2019; Agrawal and Varga, 2024).

The survey found that 97% of the respondents knew they were required to report animal diseases, but only 41% knew whom to contact to report them. The Area Veterinary Officers (AVOs) (and in some cases Local Government Veterinary Officers [LGVOs] when they are available) in the States are the first contact officers who receive disease notifications from surveillance agents, animal owners, community animal health workers (CAHW), para-veterinarians, private veterinarians, and private laboratories. The AVOs then report directly to the Zonal Veterinary Officers (ZVOs), who report to the State Disease Reporting Officer, who reports to the Director of Veterinary Services (DVS). The DVS also receives disease notifications from the National Veterinary Research Institute (NVRI) and the Veterinary Teaching Hospital (VTH) and then reports directly to the Federal Epidemiology Officer in the Federal Ministry of Livestock Development, who then reports to the Chief Veterinary Officer of Nigeria (CVON). The CVON then informs the Minister of Livestock Development, the International Organizations to which Nigeria is a member, including the Food and Agriculture Organization (FAO), the World Organization for Animal Health (WOAH), the African Union - International Bureau for Animal Research (AU-IBAR), amongst others. This reveals a significant disconnect between awareness of professional responsibility and practical knowledge of the reporting pathway. Although veterinarians recognize their legal and ethical obligation to report notifiable diseases, the inability of the majority to identify the appropriate reporting authority may substantially undermine the effectiveness of disease surveillance systems; this gap suggests that awareness alone is insufficient to ensure timely disease notification. Knowledge of the type of diseases to report was low (41%) for WAOH-listed diseases; however, 48% indicated OIE-listed diseases. This reveals that many respondents were not aware of the name change from the Office International des Épidémiologies (OIE) to World Organization for Animal Health (WOAH) that was announced in a press release on the 28th of May 2022, furthering the use of its new name and matching acronym.

The attitudes of veterinarians on the Plateau toward academic activities involving only veterinarians is worrisome, as only 17% of private practicing

veterinarians completed the questionnaire. Government Veterinary employees at the National Veterinary Research Institute and the Faculty of Veterinary Medicine/Veterinary Teaching Hospital, University of Jos, do not individually submit animal disease reports, but the different Units and Departments forward their reports to the Director, Veterinary Teaching Hospital and the Director, Diagnostics, respectively, who are responsible for ensuring that disease reports reach the Director of Veterinary Services of the State. This, however, is not the case for private-practicing veterinarians. It is most likely that they were unaware of the channels of disease reporting or have forgotten that they were required by law to give notification of diseases encountered in their clinical practices and to take lawful actions as stipulated in the Animal Diseases {control} Act 2022.

Knowledge about Nigeria's seven priority reportable TADs, which include avian influenza, Newcastle disease (NCD), rabies, African swine fever (ASF), contagious bovine pleuropneumonia (CBPP), foot and mouth disease (FMD) and peste de petit ruminantes (PPR) ranged from 97% for avian influenza to 66% for PPR. However, 69% included monkeypox and five other diseases that were not part of the list; all had responses. Nigeria, a member country of FAO and WOAH, has actively joined the FAO and OIE (2021) Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) to reduce the threat from priority TADs at a national level. The seven priority TADs for the Country were adopted and disseminated through the Frontline In-Service Veterinary Epidemiology Training (ISAVET) to build veterinarians' skills.

All the respondents were veterinarians located in three (3) out of the seventeen (17) Local Government Areas (LGAs) of the State. The NVRI is located in Jos South LGA, while the FVM/VTH, UniJos is located in Jos North LGA; these are the locations with the highest number of respondents. However, there are many private veterinary practices in these locations; with the low number of private veterinarians' responses in this survey, it is assumed that veterinarians in the NVRI and FVM/VTH, UniJos, were the majority of the respondents. Veterinarians in the service of the Plateau State Government were five (5) in number until recently; thirteen (13) were employed in 2025. These cannot serve the State effectively with its number of LGAs. This situation is similar to the report of Bolajoko *et al.* (2009) on the problems affecting the efficiency of the animal disease reporting system in Oyo State, Nigeria, which documented inadequate veterinary personnel and auxiliary staff in the State. However, the report was over two decades old, and Plateau State is still facing the same situation.

Regarding respondent's attitude and practices regarding disease diagnosis, the majority (69%) based their assessments on both clinical signs and confirmatory diagnosis at the reference laboratory at NVRI. This is a good practice to confirm the diagnosis of diseases in the laboratory. This is crucial for early detection, an accurate treatment plan, and public health surveillance.

Veterinarians' responses on disease prevention indicated that the majority (86%) always wear a lab coat and

gloves (76%) when handling animals during routine examinations or during treatment and other procedures. These are good practices that will protect the veterinarians and prevent the spread of zoonotic infections to themselves, families, and the general public at large.

Veterinarians' KAP score revealed that only 37.9% of the respondents had satisfactory knowledge of disease reporting, 82.8% demonstrated satisfactory attitudes and practices regarding disease diagnosis, and 72.4% demonstrated satisfactory attitudes and practices regarding disease prevention. This suggests considerable deficiencies in respondents' understanding of disease reporting procedures despite their professional background. Since disease reporting forms the cornerstone of effective surveillance systems, inadequate knowledge among veterinarians may delay outbreak detection, compromise disease control efforts, and weaken national surveillance programmes.

In this study, it was concluded that the majority of veterinarians knew they were required to report diseases to the relevant authorities, but only a few knew the type of diseases to report and the veterinary officer to contact. Also, the survey demonstrated that veterinarians were aware of the risks of zoonotic disease transmission and therefore used personal protective equipment to protect themselves when handling animals. Our study suggests the need for continuing education or refresher courses for veterinarians on prompt and timely disease reporting to relevant authorities and to update the veterinarians through short courses on the current trends in the veterinary sector, such as knowledge about priority reportable diseases in Nigeria.

Conflict of Interest

We declare no conflict of interest.

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Authors' Contributions

H. I. Dunka: conceptualisation, methodology, data analysis, writing
 N.H Moru: methodology, data analysis, validation
 R.R. Mairabo: methodology, data analysis, validation
 I. N. Nzelu: methodology, data analysis, validation
 E. G. Haruna: methodology, data analysis, validation
 T A. Delia: methodology, data analysis, validation
 U. U. Bashir: methodology, validation, supervision
 M.F. Ogo: conceptualisation, methodology, validation, supervision

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Appendix

Questionnaire link:

<https://ee.humanitarianresponse.info/x/SAMf9zpT>.