

Outbreak investigation



An outbreak investigation of a case of canine rabies in Ebonyi State Nigeria, 9th to 14th of April, 2022

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An outbreak investigation of a case of canine rabies in Ebonyi State Nigeria, 9th to 14th of April, 2022

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Abstract

Rabies is a vaccine-preventable neglected tropical disease. However, a sporadic outbreak of canine rabies is still being reported in some states of the country. The purpose of this study was to describe the outbreak investigation of a suspected case of canine rabies in Ebonyi State, Nigeria. On the 9th of April, 2022, a case of an unprovoked dog bite in a human suspected to be rabid was reported to the State Veterinary clinic Ebonyi State. We carried out a retrospective/prospective disease investigation by reviewing case reports of outbreaks of canine rabies in Nigeria between 2020 to the second quarter of 2022 from the Department of Veterinary Services, Federal Ministry of Agriculture and Rural Development (FDVS), Ebonyi State, Nigeria. We defined the case definition for a suspected case of canine rabies and constituted a rapid response team (RRT). The dog was an indigenous breed, with no history of rabies vaccination, two unprovoked dog bites (in humans) occurred on the 3rd and 7th of April 2022. The dog was captured on the 10th of April, 2022 and restrained to prevent a further unprovoked attack, however on the 11th of April, 2022 the suspected rabid dog died, whole head sample was collected and stored at a temperature of 4-5°C in a giostyle and transport to the National Veterinary Research Institute, (NVRI) Jos for Laboratory diagnosis, on the 14th of April, 2022 sample was confirmed positive for canine rabies by a fluorescent antibody test. In 2020, through 2021 (January to July) Nigeria reported 85 and 62 confirmed cases of canine rabies respectively, from 2021 and the second quarter of 2022 Ebonyi state reported two confirmed cases of canine rabies, at Abakaliki and Ebonyi LGAs of the state. Two suspected human rabid cases occurred in Abakaliki following an unprovoked bite from a confirmed rabid dog, victims are being treated at a hospital in the state. The current drive to eliminate rabies by 2030 may be possible through intersectoral communication between and within the tripartite subsector. Determine in-country burden of rabies in dogs, dog mediated human rabies, ascertain the

demography of dogs in Nigeria, improve the capacities of veterinary units to respond to panzootic and enhance screening of dogs for rabies at the various point in Nigeria. Veterinary units should establish surveillance points within the state to monitor the incidence of canine rabies which could serve as an early warning system for an outbreak of canine rabies. These measures should be complemented with public enlightenment campaigns on the risk of dog mediated rabies and the need to prevent them.

Introduction

Rabies was derived from the Latin word *Rabidus* which means *furious*, characteristic of canine rabies [1]. Rabies is a neurotropic virus of the genus *Lyssavirus*, family *Rhabdoviridae*, which causes rabies in animals and zoonoses [2]. It's a neglected tropical disease (NTD) responsible for economic losses of over 8.6 billion USD worldwide, and 59,000 human deaths, per annum [3]. In Africa, dog-mediated rabies accounts for over 21,476 human deaths per annum estimated at 1.34 million disability-adjusted life years (DALYs) [4,5]. It's estimated that about 40% of affected individuals are children under 15 years of age in developing countries (Africa and Asia), where 95% dog mediated human rabies cases occur [3,6]. Rabies viruses are classified into seven distinct lineages based on cross-reactivity and molecular analysis including classical rabies virus (RABV, genotype 1, serotype 1), Lagos bat virus (LBV, genotype 2, serotype 2), Mokola virus (MOKV, genotype 3, serotype 3), and Duvenhagevirus (DUVV, genotype 4, serotype 4). The European bat lyssaviruses (EBLV), are subdivided into two biotypes (EBLV1, genotype 5 and EBLV2, genotype 6) and the Australian bat lyssavirus (ABLV, genotype 7) [7,8]. Viruses of serotypes 2-4, EBLV and ABLV are referred to as rabies-related viruses [2]. Rabies has been found on every continent, except Antarctica [6]. In the United States, rabies viruses have been isolated in bats, raccoons, skunks, and foxes, however, most human cases of rabies result from dog bites [3,9].

There are two modes of rabies transmission; bite (by a rabid animal), non-bite transmission (scratches, abrasions, or open wounds that are exposed to saliva, aerosol or other potentially infectious material from a rabid animal), human to human infection is possible, but has not been documented [9]. In affected canid incubation and infective period varies, the latter depends on the type of virus, host and site of entry of agent, the infective period may span before the onset of clinical signs [1,2,10]. In dogs, cats and ferrets, shedding of the virus has been reported 10 days before the onset of the first clinical signs and persisted until death [10]. The clinical courses of rabies in canid are classified into 3 phases: prodromal phase: may last between 2 and 10 days affected dogs are nervous, frightened, agitated, hydrophobia, photophobia, may seek seclusion [1,9], furious phase: may last 2-3 days after onset of symptoms characterized by depraved appetite, unprovoked aggression, vocalization. The paralytic phase may last 1-2 days characterized by paralysis of the facial muscle, drooling of saliva, drop jaw, dyspnea, incoordination, and death [2,9,10]. Rabies is a vaccine-preventable disease, vaccination regimens are dependent on the burden or incidence of rabies within a geographical location. In Nigeria, the first shot of the canine rabies vaccine is given at 12 weeks, subsequently, a booster dose annually. In regions with a high risk of spillover infections a beta-herpes virus circulating with the vampire bat, *Desmodus rotundus*, could serve as an effective vector for a transmissible vaccine capable of reducing the risk of spread of rabies [11]. The purpose of this study was to describe the burden of rabies in Nigeria, and outbreak investigation of a case of suspected canine rabies in Ebonyi State, Nigeria to provide information necessary for public health action.

Methods

Case definition of a suspected case of canine rabies: dog of any age with or without a history of dog bites, stray with clinical symptoms of

hydrophobia, photophobia, depraved appetite, unprovoked aggression, vocalization, drooling of saliva, drop jaw, dyspnoea, nervous incoordination, and death associated with aforementioned clinical courses of infection.

Differential diagnosis of canine rabies: canine distemper, cerebral babesiosis, ehrlichiosis, pesticide poisoning, encephalitis in geriatric dogs and granulomatous encephalomyelitis [12].

Study area: Ebonyi State is located in the southeast of Nigeria on Latitude. 6°15'N, Longitude. 8°05'E, bordered by Enugu State to the west, Cross River State to the east, Benue and Abia State to the North and South [13]. Farming is the primary occupation of the people of Ebonyi State. Nigeria has an estimated dog population of about 5 million based on the population density of 1: 13 households [14-16]. There is a paucity of information on the demography of dogs in Ebonyi State, Nigeria.

Study design: we conducted a retrospective and prospective (on-sight) disease investigation by reviewing official publications on animal diseases from the Federal department of Veterinary services Abuja, Nigeria [17] from 2020 to April 2022, and line-list for outbreaks of canine rabies in Ebonyi State from the Department of Veterinary services Ebonyi State, Nigeria, from 9th to 14th of April 2022. We constituted a rapid response team (RRT), which comprised the Federal epidemiology officer from the Ministry of Agriculture, the Disease notification officer (DSNO) from the ministry of health, Regional disease investigation surveillance system evaluation (REDISSE) Veterinary officers, and the animal health desk officers of the Department of Veterinary services Ebonyi State. The sample collected was, (whole head) of suspected rabid dog, maintained at a temperature of 4-5°C stored in a Giostyle, and transported to the National Veterinary Research Institute, (NVRI) Jos for Laboratory diagnosis. A sample with laboratory number (VPD506-k9/22) was confirmed positive for Canine rabies by fluorescent antibody test on the 14th of April 2022.

Results

Descriptive findings: in 2020, through 2021 (January to July 2021), Nigeria reported 85 and 62 confirmed cases of canine rabies respectively (Figure 1), between 2021 and the second quarter of 2022 Ebonyi state have reported two confirmed cases of canine rabies, at Abakaliki and Ebonyi LGAs of the state, (Figure 2). On the 9th of April 2022, a client reported a case of a dog bite (human) to the State Veterinary clinic Abakaliki Ebonyi State, which occurred on the 7th of April 2022. Prospective disease investigation conducted showed that the dog was an indigenous breed, (Figure 3); further investigation showed that another case of dog bite (human) by the same dog occurred on the 3rd of April 2022 within the same community. The dog has no history of Vaccination against rabies and bites were unprovoked. The dog was captured on the 10th of April 2022 and restrained to prevent a further unprovoked attack, however on the 11th of April 2022 the suspected rabid dog died, a whole head sample was collected for confirmatory diagnosis. The sample was confirmed to be positive for Canine rabies. The two victims of the rabid dog bite were evacuated to the General hospital for further examination and possible post exposure prophylaxis (PEP) for human rabies.

Laboratory finding: whole head sample of suspected rabid dog with laboratory number (VPD506-k9/22) sent to National Veterinary research institute (NVRI), VOM, Jos was confirmed to be positive for canine rabies by fluorescent antibody test on the 14th of April 2022.

Environmental study findings: the Veterinary and human components of the outbreak response collected one suspected animal (dog) sample and two suspected human rabid patient were referred to the Hospital, as at the time of this study there was no information on the suspected human cases.

Discussion

Rabies has been known since 2000 BC, historical records from the Mesopotamian Codex of Eshnunna posited that when an individual is bitten by a rabid dog, the owner of such animal was to be fined [18]. Rabies is a vaccine-preventable viral zoonosis enzootic in 150 countries [6]. Globally, the economic cost of rabies is estimated at USD 8.6 billion, and 59,000 death per annum, furthermore, 40% of the population at risk of dog mediated rabies are children under the age of 15 in poor rural communities of Asia and Africa [3,6,9]. In Africa, an estimated 21,476 human deaths are reported annually due to dog-mediated rabies (36.4% of global human deaths), at a loss of 1.34 million disability-adjusted life years (DALYs) [5]. Dog bite is responsible for the highest single source of rabies zoonoses, it accounts for 99% of all human rabies cases [6,9]. Consequently, canine and human rabies can be prevented through the vaccination of dogs [3,6]. To ensure improved canine vaccination, vaccination coverage, stakeholders may adopt a multi-sectoral engagement across the tripartite sector, (human health, animal health, and environment), improve community sensitization, risk communication, and identification of high-risk clusters. To achieve this objective the World Health Organization (WHO) under its policy on "United against Rabies" targeted "Zero human deaths from dog-mediated rabies by 2030", which is in tandem with the third article of the United Nations Sustainable Development Goal (SDG), aimed at ending the burden of neglected tropical diseases (NTDs) by 2030. This resulted in the launch of the global health security agenda in February 2014 in response to the global threat of infectious diseases in an increasingly interconnected world, its main focus was to enhance country capacities to prevent, detect and respond to infectious diseases, and Promote multi-sectoral engagement and collaboration across the tripartite sectors. Since the prevention of rabies zoonoses may serve as an indicator to access the synergy between the tripartite sector [19], the

launch of the Global Rabies Framework in 2015 was hailed as proof that rabies can be eliminated across various settings by 2030 [4].

In Nigeria, despite the effort by the WHO through the animal health component of the regional disease investigation surveillance system evaluation (REDISSE II) project and the Federal Ministry of agriculture and rural development, the department of Veterinary services in securing, distribution of canine anti-rabies vaccines, organizing vaccination campaigns, across the 36 states and Federal capital territory (FCT), sporadic outbreak of rabies is still being reported. In 2020, and the second quarter of 2021, Nigeria reported 85 and 62 cases of canine rabies. The major challenge militating against canine vaccination campaigns in Nigeria during the period was insecurities in some regions of the country, coupled with the global pandemic of COVID-19 which effectively restricted movement, with skewed attention of resources focused on containment of the emerging pandemic of COVID-19, coupled with the paucity of information on the demography of canids in Nigeria; proliferation of stray dogs may have played a significant role in the increasing incidence of canine rabies. It's worthy of note that veterinarians in the public sector are the major drivers of vaccination campaigns vis-à-vis the development of micro plans, identifying underserved animal populations for vaccination prioritization. Unfortunately Veterinary units in south-eastern Nigeria are understaffed, as of the third quarter of 2019, there were 8600 veterinarians in Nigeria, 1,200 (14%) of these are in private practice [20], 1272 (15%) are Veterinarians in state public services across the 36 states and FCT (Figure 4), the southeast of Nigeria accounts for 55(4%) of the total veterinarians in state public services in Nigeria. It's worthy of note that there is no clear distinction between veterinarians in state public services and private veterinarian at the state level in Nigeria, the actual statistic of private veterinarian who practices in state may be lower, since they may still refer to same professional demography.

Conclusion

The current drive to eliminate rabies by 2030 may be possible through inter-sectoral communication between and within the tripartite subsector. Epidemiology units should determine in-country burden of canine rabies, dog mediated human rabies, ascertain the demography of dogs in Nigeria, with a view to improve the capacities of stakeholders to detect and respond to pandemics.

Recommendations: veterinary units should establish surveillance points within the state to monitor the incidence of canine rabies, which could serve as an early warning system for an outbreak of rabies. This should be complemented with public enlightenment campaigns on the risk of dog mediated rabies and the need to prevent them.

Competing interests

The author declares no competing interests.

Authors' contributions

Okoli SC wrote this manuscript. The author has read and agreed to the final manuscript.

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Figures

Figure 1: the burden of canine rabies in Nigeria from January to July 2021

Figure 2: the burden of canine rabies in Ebonyi State Nigeria from 2021 to the second quarter of 2022

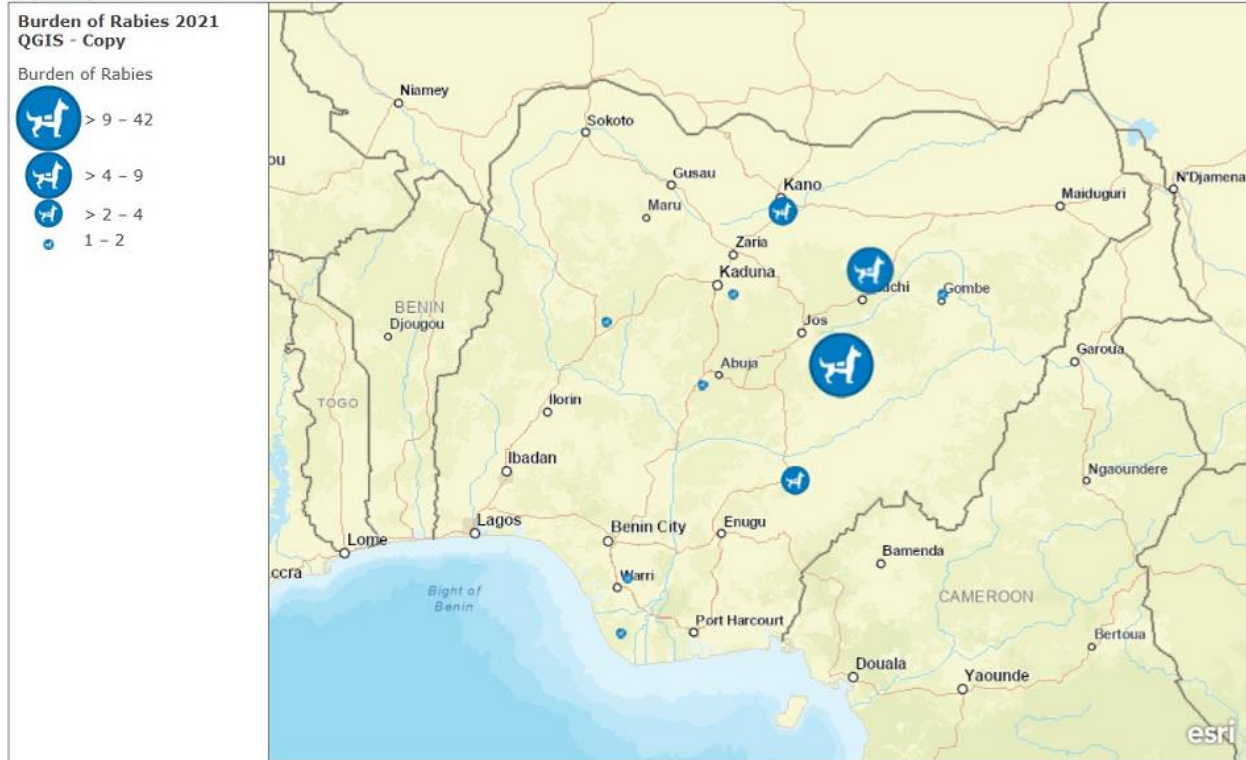
Figure 3: a recumbent dog showing symptoms of paralytic rabies

Figure 4: the distributions of Veterinarian in State public services in Nigeria as of December, 2020

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My Map



Esri, HERE, Garmin, FAO, NOAA, USGS

Figure 1: the burden of canine rabies in Nigeria from January to July 2021

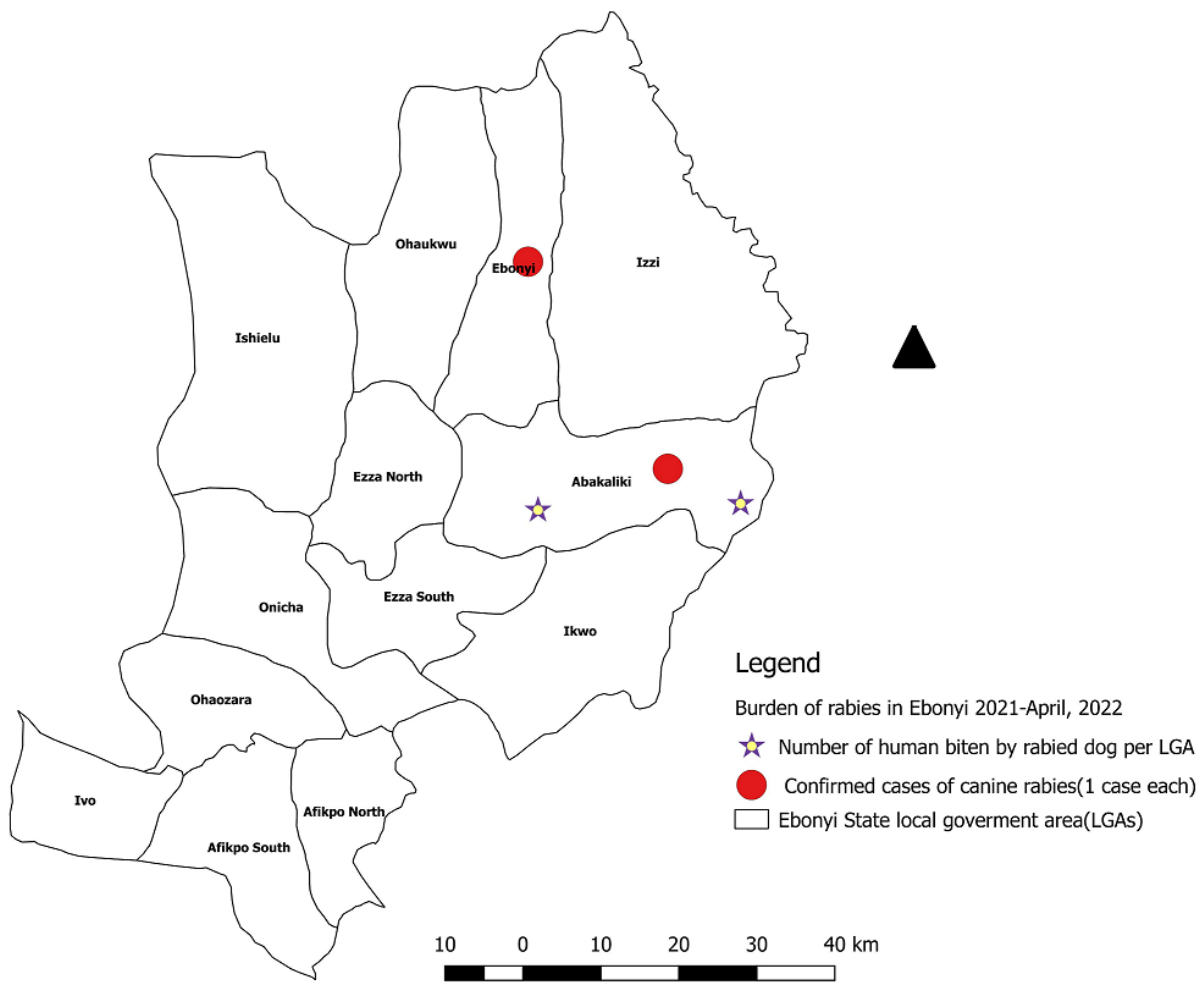


Figure 2: the burden of canine rabies in Ebonyi State Nigeria from 2021 to the second quarter of 2022



Figure 3: a recumbent dog showing symptoms of paralytic rabies

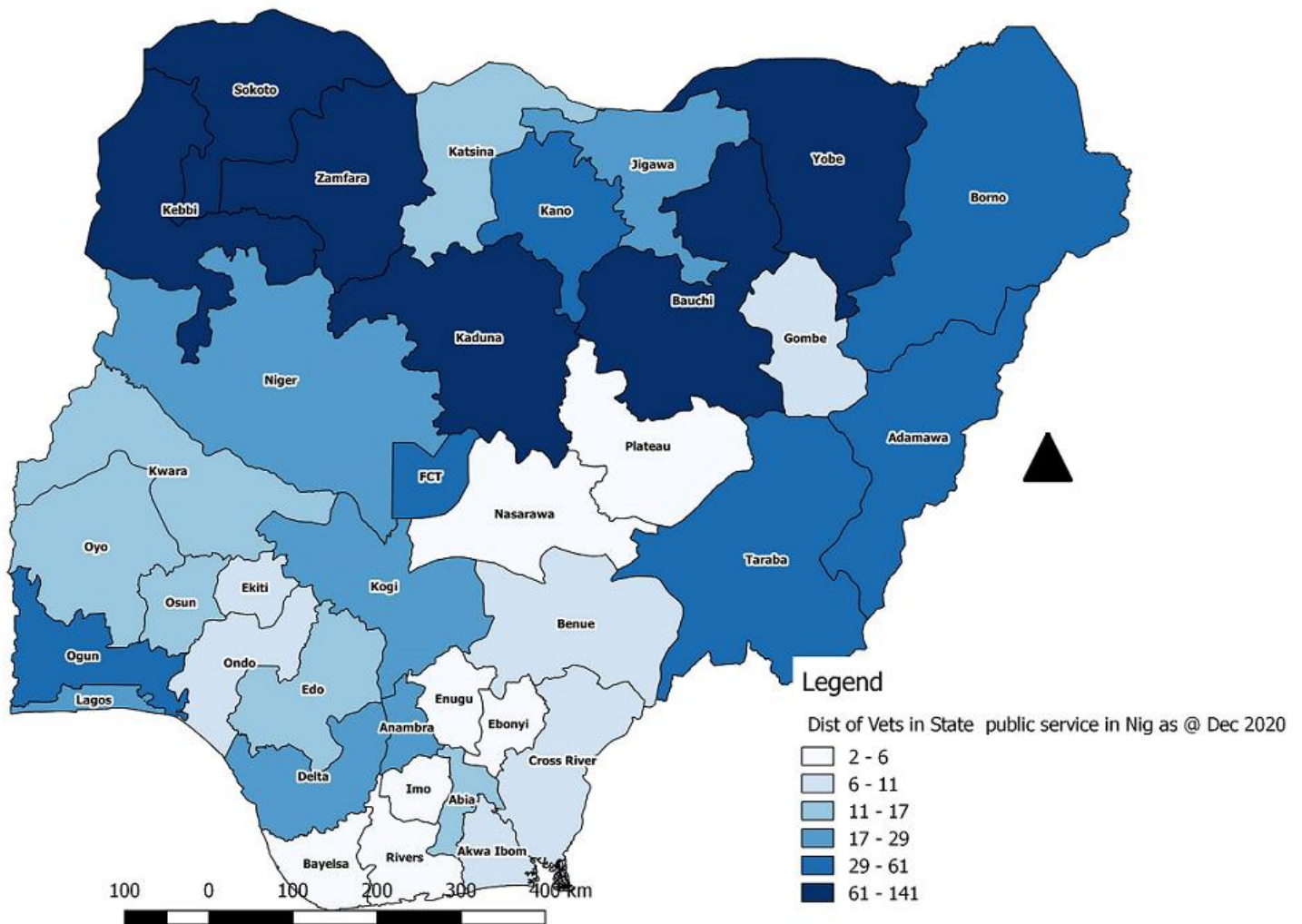


Figure 4: the distributions of veterinarian in State public services in Nigeria as of December, 2020