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## Canine Rabies in an unvaccinated indigenous dog in Jos East Local Government Area, Plateau State, Nigeria

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### Abstract

Rabies, a fatal zoonotic disease transmitted primarily through dog bites, remains a significant public health challenge in Nigeria, particularly in rural and semi-urban communities with high dog populations, limited veterinary services, infrastructure and public awareness. This case report documents a confirmed rabies case in an 11-month-old unvaccinated indigenous dog in Jos East Local Government Area, Plateau State, Nigeria. Preliminary diagnosis was carried out using the Lateral Flow Device (LFD) test, and confirmation was subsequently achieved using the Direct Fluorescent Antibody Test (DFAT) at the National Veterinary Research Institute (NVRI), Vom. The victims received rabies post-exposure prophylaxis (PEP) and anti-tetanus injection, while rabies immunoglobulin was administered to the victim who was bitten on the face. This report underscores the challenges of rabies control in rural and semi-urban Nigerian settings, and the need for integrating mass dog vaccination, community education and improved healthcare infrastructure.

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### Introduction

Rabies is a neurological viral zoonotic disease caused by the rabies virus, a member of the Lyssavirus genus

within the family Rhabdoviridae (Umar *et al.*, 2024). It affects warm-blooded animals and causes acute

encephalitis, with a case fatality rate approaching 100% once clinical signs appear. Transmission mainly occurs through bites of rabid animals primarily domestic dogs (Umar *et al.*, 2024). However, non-bite transmission can also occur through scratches, abrasions, or open wounds that come into contact with saliva, aerosols, or other potentially infectious materials from a rabid animal (CDC, 2024)

Despite being vaccine-preventable, rabies remains a major public health concern globally, especially in low and middle-income countries where 95% of the over 59,000 human deaths due to rabies occur annually. About 15 million people receive rabies post-exposure prophylaxis (PEP) annually (Umar *et al.*, 2024) and approximately 40% of people bitten by suspect rabid animals are children under 15 years (Amoako *et al.*, 2021). In light of these, the World Organization for Animal Health, (WOAH), World Health Organization (WHO) and Food and Agriculture Organization (FAO) initiated the “Zero by 2030” campaign to eliminate dog-mediated human rabies by 2030 using a One Health framework (WHO, FAO & WOAH, 2019). However, achieving this target in endemic regions like Nigeria has proven challenging due to sociocultural, economic and infrastructural challenges (Umar *et al.*, 2024).

In Nigeria, especially in rural and semi-urban communities, dog ownership is widespread and often linked to traditional practices like dog meat trade (Alabi *et al.*, 2014). This has led to a large, mostly unvaccinated dog population that plays a central role in rabies transmission.

Despite occasional mass vaccination campaigns, coverage remains low due to limited public awareness, economic constraints, sociocultural

practices and owner apathy (Odita *et al.*, 2019; Umar *et al.*, 2024). Additionally, logistical difficulties in conducting mass vaccination campaigns, high cost of PEP and inadequate health infrastructure for vaccine storage and administration have also been found to significantly hinder effective rabies control (Odita *et al.*, 2019). Achieving 70% dog vaccination coverage is crucial to prevent rabies outbreaks. However, this goal is hindered by poor awareness, financial barriers, and a prevalence of stray and unvaccinated dogs, which serve as reservoirs for the rabies virus and pose a serious threat to public health. A holistic approach that includes both widespread vaccination and effective control of the stray dog population is essential to reduce the incidence of rabies.

This report highlights a confirmed rabies case in an unvaccinated 11-month-old Nigerian Indigenous dog. It emphasizes the need for strengthened public health initiatives to curb rabies transmission in endemic regions like Jos and Nigeria as a whole.

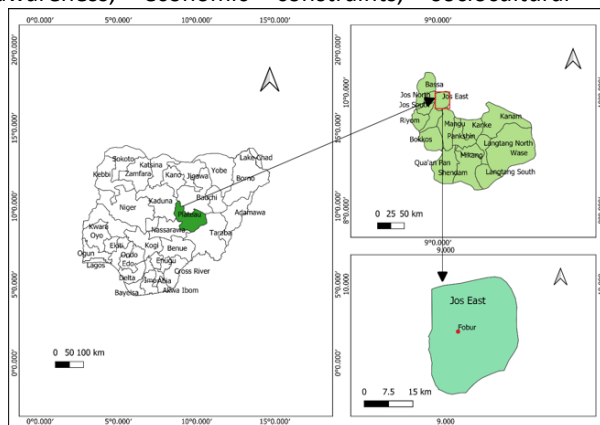
**Case Presentation**

Four dog bite victims accompanied by the dog owner visited the Veterinary Teaching Hospital, University of Jos upon referral from the Rizek Primary Health Centre, Fobur (within their community). The primary complaint was that a free-roaming 11-month-old, male indigenous dog bit 4 children unprovoked in Rizek, Fobur, Jos East Local Government Area, Plateau State (Figure 1). The dog was said to have suddenly turned aggressive and bitten a 5-year-old boy who was fond of it on the right elbow around 3:00 p.m on the 23rd of February 2025. The other 3 bite victims aged 12, 4 and 18 years (all within the same community) were bitten later that evening at about

6:00 p.m on the chest and hand; the face and left hand; and buttocks respectively. All the bites were said to be unprovoked from the history obtained from the victims’ parents/guardians. The dog had no history of rabies vaccination. Some of the signs observed in the dog by the client were restlessness, unnecessary aggressive behavior and drooling. The dog was killed by local residents that evening, roasted and decapitated and the head was presented to the VTH the next morning, while the rest of the carcass was consumed by some members of the affected community.

**Case management**

The brain tissue sample was collected using the simplified technique for the collection, storage and shipment of brain specimens for rabies diagnosis as described by the WHO Veterinary Public Health Unit (WHO, 1988).



**Figure 1:** Map of Jos East Local Government Area showing the location of the Rabies outbreak (Generated using Quantum Geographic Information System (QGIS)3.16.11)

The sample was placed on ice packs and sent to National Veterinary Research Institute (NVRI) for confirmation using DFAT (Direct Fluorescent Antibody Test), meanwhile, preliminary testing using a Lateral Flow Device was carried out at the VTH. The bite victims were given first aid treatment at the VTH by washing the bite sites with soap and water and the victims were asked to proceed immediately to the Birmingham University Teaching Hospital, Jos for the administration of rabies Post-Exposure Prophylaxis (PEP) (which was provided to them by the VTH) and Anti-tetanus injection. In addition, Rabies Immunoglobulin was administered to the victim who was bitten on the face (to provide immediate passive immunity and reduce the risk of the virus reaching the brain rapidly due to the proximity of the face to the brain).

#### *Laboratory diagnosis*

Rapid immunochromatographic Test (Lateral Flow Device)

After documentation, the collected brain sample was homogenized in a buffered solution to extract the viral antigens. This homogenate was prepared at a dilution of about 1:10, meaning that 0.1 grams of tissue was mixed with 1 millilitre of buffer. The mixture was agitated thoroughly to ensure the antigens were well suspended and available for detection by the LFD test.

About four drops of the homogenate were then applied to the sample pad of the lateral flow device, which was then placed on a flat surface for five to fifteen minutes. During the time, the fluid migrates along the strip, and if rabies antigens are present, they will bind to specific antibodies embedded in the device, triggering a visible signal.

The results were interpreted by examining the lines on the device. A valid test shows a control line, which confirms that the test has functioned correctly. A positive result is indicated by the appearance of both the control line and the test line. A negative result shows only the control line. An invalid result is one where the control line fails to appear, regardless of whether the test line is present or not.

Direct Fluorescent Antibody Test

Following necessary documentations, impression smears of the brain specimen were made on pre-cleaned glass slides and fixed in cold acetone for 30 minutes at -20°C. After fixation, smears were stained with the working dilution of the diagnostic antinucleocapsid monoclonal antibody, labelled with fluorescein isothiocyanate rabies fluorescent

antibody assay DFA (monoclonal antibody FITC-conjugate) and incubated for 30 minutes at 37°C; then washed in Phosphate-Buffered Solution (PBS). A drop of 50% buffered glycerol was added on dried, stained smear, and observed for apple green oval, sand-dust or ellipsoid fluorescent particles under the fluorescent microscope. Positive and negative control smears were made from brain tissue of rabies-positive infected and rabies-negative non-infected baby mice, respectively. All slides were carefully examined using a Fluorescent Microscope, comparing the test slides with the positive and negative controls.

#### **Results**

Rabies virus antigen was detected by Rapid immunochromatographic Test (Plate I), and confirmed by Direct Fluorescent Antibody Test (DFAT). Rabies virus antigen was detected by the N4-15 fluorescein-conjugated antibodies specific for lyssa viruses (Plate II) showing the bright apple-green fluorescence from positive test and positive control samples, compared to the negative control (Plate III) with no fluorescence under fluorescent microscope.

#### **Discussion**

The high prevalence of rabies in unvaccinated dogs in Nigeria is a major driver of its transmission (Vakuru & Kwaghe, 2024). The case presented emphasizes that vaccination remains the cornerstone of rabies prevention.

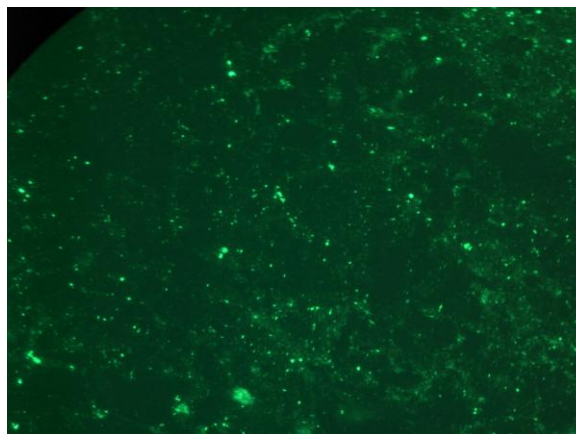
Since the dog was free-roaming, its contact with other dogs especially stray dogs and humans was increased, thereby increasing the risk of transmission of rabies virus among exposed animals. This risk is especially a concern in Plateau State, where dog population is on the rise and most dogs are managed under semi-extensive systems. Under such conditions, communities face an elevated risk of dog bites and potential rabies exposure (Ogbu *et al.*, 2020).

According to the tripartite bodies, vaccinating at least 70% of dogs in high-risk areas can break the transmission cycle and dramatically reduce human rabies cases (WHO, FAO & WOA, 2019). However, in areas like Jos East (as is the case with most low/middle-income settings), inadequate veterinary infrastructure, limited resources, and low public awareness often lead to poor vaccination coverage, with dog vaccination programs being inconsistently implemented or completely absent.

Cultural practices also play a critical role in rabies control. For example, consuming parts of potentially



**Plate I:** Image of the positive Lateral Flow Device (LFD) test of the dog brain tissue specimen, showing the appearance of both the control line and the test line, indicating the presence of rabies antigen



**Plate II:** Image of the rabies positive dog brain tissue specimen of the dog in question stained with rabies conjugate showing characteristic apple-green immunofluorescence confirming the presence of rabies virus antigen

rabid animals (as observed in this case) poses a significant challenge to prevention efforts. Such practices, common in semi-urban Nigerian communities, stem from limited awareness of rabies transmission risks (Umar *et al.*, 2024).

Access to post-exposure prophylaxis (PEP) remains a major hurdle. Despite its life-saving importance, many dog bite victims in Nigeria (particularly in rural and semi-urban areas) struggle to obtain timely and complete PEP due to financial constraints, long distances to healthcare facilities, unavailability of PEP and delays in seeking care. The situation in Plateau state exemplifies this challenge, as the nearest facility equipped to administer PEP is located in the state capital, making access difficult for many residents, particularly those in remote and hard-to-reach rural areas. Studies have shown that enhancing PEP availability, affordability, and public awareness could substantially improve rabies

prevention outcomes (Hampson *et al.*, 2015). To effectively prevent rabies in Plateau State and Nigeria as a whole, a comprehensive One Health approach needs to be implemented (Vakuru & Kwaghe, 2024).

In conclusion, this study highlights the need for a strategic, multisectoral response to rabies which is a 100% vaccine-preventable disease that still leads to avoidable deaths.

Effective control and eventual elimination of rabies in Plateau state and Nigeria at large will require the implementation of comprehensive public health interventions (using a one health approach). These should include sustained mass vaccination of dogs, targeted awareness and education campaigns, improved healthcare infrastructure, timely post-exposure prophylaxis (PEP), strengthened intersectoral communication and collaboration and the enforcement of responsible dog ownership practices. Only through such integrated strategies can the incidence of rabies be significantly reduced and ultimately eliminated.

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**Plate III:** Image of rabies negative non-infected baby mice stained with rabies conjugate showing no apple-green immunofluorescence serving as a negative control

### Conflict of Interest

The authors declare that there is no conflict of interest.

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