

Serological detection of antibodies against Hepatitis E virus among Camels (*Camelus dromedarius*) in Nigeria

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Abstract

Hepatitis E virus (HEV) is a zoonotic disease with increasing endemicity in many countries around the world. At the moment no data on the status of and epidemiology of HEV in camels an important livestock in the semi-arid and arid parts of Nigeria. This study determined HEV seroprevalence in two areas (with high population of camel in Nigeria) using indirect Enzyme Linked Immunosorbent Assay. Out of 88 camels sampled, HEV antibodies were detected in 27 suggesting a prevalence rate of 30.7%. Higher rates were observed among camels in Maigatari LGA (22.7%) compared with 7.9% in Suletankarkar LGA, Jigawa State. These findings reinforce the need for further studies on molecular characterization and evolutionary diversity in Camel as well as pastoralists in Nigeria.

Keywords: Hepatitis E virus; *Camelus dromedarius*; Enzyme linked immunosorbent assay; Zoonosis; Nigeria

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Introduction

Hepatitis E virus (HEV) is an emerging viral hepatitis in some parts of the world (Sridhar et al., 2015). It belongs to the genus *Orthohepevirus* and family *Orthohepeviridae* (Balayan et al., 1983). *Orthohepevirus* A species include isolates from human, pigs, rabbits, deer, mongoose, and camels (Woo et al., 2014; Batts et al., 2011; Sridhar et al., 2017). HEV has eight genotypes which belong to a single serotype (Smith et al., 2016). Genotypes 1 and 2 are common among human; genotypes 3 and 4 cause infection in both animals and man; genotypes 5 and 6 are found among pigs, while

genotypes 7 and 8 are found among camels (Sridhar et al., 2017; Rasche et al., 2016). There are over 6 million camels in the world and 60% of these are indigenous to Africa (Faye et al., 2011). Of this population, 84% are one-humped camels with the scientific name *Camelus dromedarius*. About 278,840 camels are estimated to be in Northern Nigeria (FAO, 2014). The one-humped camel is an important livestock species because it is a source of food, facilitates farming activities (traction) and serves as a reliable means of transportation (Abdussamad et al., 2011). Climate change is

seriously impacting the epidemiology of infectious diseases among animals (Martin et al., 2008) and Camels are facing drier climate scenarios with the attendant health implications (Faye et al., 2011). Generally, HEV is a major health concern in Africa and Asia especially in areas with very poor hygiene (Sridhar et al., 2015). It is transmitted through ingestion of contaminated water or food, contact with infected individuals or via blood transfusion in the case of human (Cai et al., 2017; Zhou et al., 2015; Li et al., 2017). Despite the large number of camels in Nigeria there is scanty information on HEV epidemiology in camels in the country. This study therefore investigated the seroprevalence of HEV among dromedaries in two Local Government Areas (LGAs) in Jigawa State, Nigeria.

Materials and Methods

This was a purposive cross-sectional study among camels in Maigatari and SuleTankarkar LGAs (Figure 2) of Jigawa State (Figure 1) Nigeria, located between latitudes 11.00°N to 13.00°N and longitudes 8.00°E to 10.15°E respectively. These LGAs were selected because they share international borders with Zinder province of Niger Republic. Maigatari LGA has an international livestock market where camels from neighboring African countries are traded. On the other hand, SuleTankarkar LGA has two transhumance routes that traverse the LGA through which camels access grazing reserves in Jigawa State. Sera were randomly collected from 88 camels in both LGAs from November 2016 to April 2017. Fifty camels were obtained from Maigatari LGA and 38 camels where from SuleTankarkar LGA.

Sera were transported at +4°C to the Virus Laboratory of the National Veterinary Research Institute (NVRI) Vom, Plateau State. We screened for total HEV antibodies using ID Screen® Hepatitis E Indirect Multi-Species Enzyme Linked Immunosorbent Assay (IDvet, France). Dilution buffer, (190µl) was first added to each microwell. After which 10µl of the negative control was added to wells A1, A2, B1 and B2; 10µl of the positive control was added to C1, C2, D1 and D2. In the remaining wells, 10µl of camel samples were added and incubated for 45 min at 21°C. Wells were washed three times with 300µl of the wash solution after which 100µl of conjugate was added to each well and incubated for 30 minutes at 21°C. This followed another round of washing as above and 100µl of substrate was added to each well and incubated for 15 minutes at 21°C. Finally, 100µl of stop solution was added to terminate the reaction before reading the optical density at 450nm. The S/P percentage was calculated as follows:

$$S/P\% = \frac{\text{net } OD_{\text{sample}}}{OD_{\text{PC}}} \times 100$$

Interpretation of results was according to the manufacturer's instruction and values $\leq 60\%$ were considered negative while $\geq 70\%$ were considered positive.

Ethical approval

Approval for the study was obtained from Ahmadu Bello University Ethical Committee (ref ABUCAU/2020/67) and the Director Veterinary Services of Jigawa State.

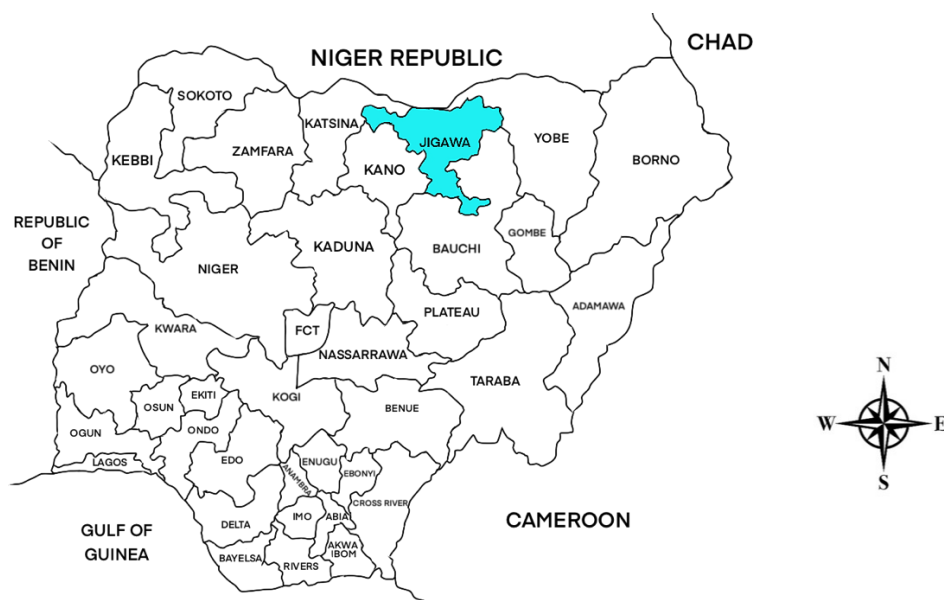


Figure 1. Map of Nigeria showing Jigawa State Highlighted in Cyan

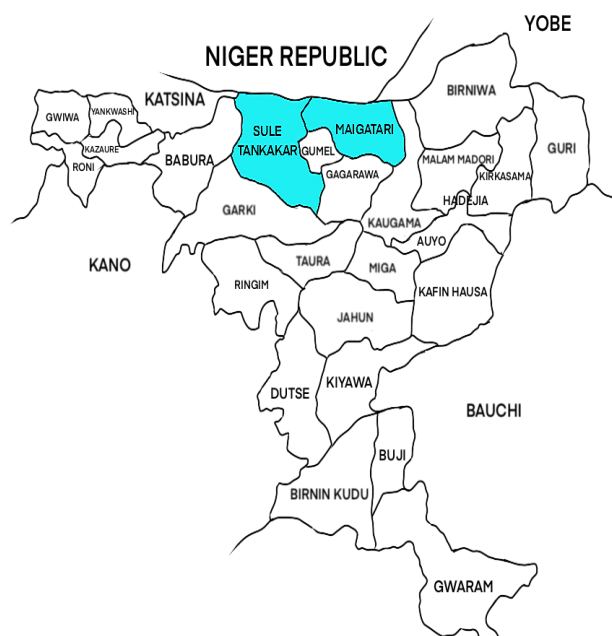


Figure 2: Map of Jigawa State showing The Sampling Sites Highlighted in Cyan (Right)

Results

Out of 88 camels, 30.7% had detectable antibodies against HEV. In Maigatari LGA 40% were positive while 18.4% were positive in Suletankarkar. Age groups 11-15 years had the highest seropositivity 15/42 (35.7%) compared to other age groups. Cows (females) recorded high prevalence 11/24 (45.8%) and were twice more likely (OR = 1.83) to be infected with HEV compared to bulls (males).

Discussion

This paper is reporting the presence of HEV antibodies in camels for the first time in Nigeria. Among study population, consumption of raw camel milk and urine is customary practices which predispose them to HEV infection especially because of their low level of education. To support our findings, consumption of unpasteurized camel milk has been linked to HEV infection among people in the Middle East. Li and authors used a more specific assay targeting camels for their studies, whereas we used a multispecies assay for this study (Li et al., 2017). Our discussions with pastoralists during sample collection showed that consumption of unrefined camel products such as milk and camel urine is believed to have therapeutic ability ranging from treatment of heat stroke, diabetes, cancer, amelioration of pain from sickle cell disease, while some use it as aphrodisiac and for hair growth. Cows (females) stay longer in the herd as they are used for breeding purposes and their milk is usually consumed. This is a major risk factor for HEV in this study. There is need for public health enlightenment, and further studies on molecular characterization and evolutionary diversity of

HEV in the herds as well as among pastoralists living in close proximity to the animals. This report is the first evidence of HEV seropositivity among Camels in Nigeria. The results of our studies should be interpreted with caution as the kits used are for serology and hence, future studies should focus on the molecular techniques for validation.

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Conflicts of interest

None declared. All authors do not have any financial or personal relationships with other people or organizations that could influence our work.

Data Availability

Data will made available upon reasonable request

Author contribution

All authors contributed equally and have read and agreed to the published version of the manuscript.

Table 1. Demographic features of hepatitis E virus antibodies in camels in Jigawa state, Nigeria

Variable	Total No. tested	No. positive	Prevalence (%)	95% CI	Chi square	p-value	OR
Sampling locations							
Maigatari LGA	50	20	40.0	27.17, 53.96	2.58	0.108	1.00
Suletankarkar LGA	38	7	18.4	8.43, 33.1			0.46
Age (yrs.)							
0-5	7	2	28.6	5.1, 66.9	0.57	0.902	1.00
6-10	36	9	25.0	12.9, 40.9			0.88
11-15	42	15	35.7	22.4, 50.9			1.25
> 15	3	1	33.3	1.7, 86.8			1.17
Sex							
Male	64	16	25	15.6, 36.7	1.77	0.184	1.00
Female	24	11	45.8	26.9, 65.7			1.83

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