



RABIES KNOWLEDGE AND PRE-EXPOSURE VACCINATION STATUS OF CLINICAL VETERINARY MEDICINE STUDENTS IN NIGERIA

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Summary

Rabies is a zoonotic viral disease of all warm-blooded animals including humans and it is characterized by fatal encephalomyelitis. It is endemic in Nigeria where dogs are the most common source of infection to humans. Clinical students of Veterinary Medicine in Nigerian Universities are thought to be at risk of rabies since they are exposed to dogs with unknown rabies neutralizing antibody titres. This study was therefore conducted to assess the knowledge of these students about rabies and their pre-exposure vaccination status. A cross-sectional survey was conducted using a structured questionnaire administered to 241 clinical (DVM IV and V) students in six Faculties of Veterinary Medicine in Nigeria. Data obtained were analyzed using descriptive and inferential statistics (logistic regression) with the Stata 12.0 package and level of significance was set at $p < 0.05$. Results indicate that 91.3% of the clinical students were aware of rabies, its reservoirs, transmission routes and clinical signs in infected animals. However, 46 (19.1%) students did not know the correct steps to be taken if they were bitten by a rabid dog. Also, 199 (82.6%) of the students had never been vaccinated against rabies while one of those vaccinated received post-exposure prophylaxis after been bitten by a suspected rabid dog. Unvaccinated clinical students were 4.5 times more likely to have examined dogs/cats with no current (up-to-date) anti-rabies vaccination or with unknown vaccination history than their vaccinated counterparts (OR=4.493; 95% CI=1.68-12.02). We conclude that a large proportion of clinical students in Nigerian veterinary medical schools are at risk of rabies as they did not receive pre-exposure vaccination despite the obvious dangers they are exposed to through the handling of susceptible animals. The high cost and scarcity of rabies vaccines were identified as major hindrances to vaccination. Continuous rabies awareness education for clinical Veterinary Medicine students, provision of free or subsidized human rabies vaccines and strict adherence to clinical safety code are recommended.

Key words: Rabies, Vaccination, Clinical Veterinary Medicine students, Nigeria

Introduction

Rabies is a zoonotic disease that affects varying species of mammals in different parts of the world. It is caused by the rabies virus (RABV) which belongs to the family Rhabdoviridae in the genus *Lyssavirus*. The RABV is known to cause fatal encephalomyelitis in all warm-blooded animals including mammals and usually results in death if unattended. It is transmitted from an infected animal to other

animals and humans through bite or scratch wounds, licking of broken skin and mucous membranes (9). Transmission of RABV to humans through inhalation and organ transplantation such as corneal transplant from an infected donor has also been suggested (13). Rabies virus is worldwide in distribution although certain countries like Japan and New Zealand have never reported domestic rabies while others are now



considered to be free of the disease after wildlife rabies eradication campaigns (9). Rabies continues to claim the lives of humans yearly especially in developing countries of Africa despite the availability of effective human and animal anti-rabies vaccines (8). According to the World Health Organization (15), the annual number of human rabies deaths globally is about 61,000 with the vast majority of deaths (84%) occurring in rural areas.

Dogs are considered as the main source of RABV to humans, majorly through bites, and this accounts for more than 90% of human rabies cases especially in Africa (3, 8). In Nigeria, rabies is endemic and, as one of the most important zoonotic diseases in the country, it remains a significant public health issue (1). However, despite extensive studies on the disease, rabies infections in both humans and animals are still grossly under-reported in Nigeria (5). Thus, the true picture of the disease in Nigeria, especially in humans, remains unclear.

Mortality from human rabies is 100% in unvaccinated patients (16) and the only approach to human rabies prevention is by pre- and post-exposure vaccination. Pre-exposure vaccines should be offered to human populations at risk (10) such as Veterinarians, Veterinary students, animal handlers, zoo keepers, wildlife officers, etc., especially in countries like Nigeria where the disease is endemic. According to the WHO, individuals at risk of rabies should obtain pre-exposure vaccination given in series at days 0, 7 and 21 or 28 (14). Sero-monitoring at two-year intervals may indicate a need for booster dose if the rabies antibody titer is lower than protective titer. Pre-exposure vaccination simplifies post-exposure therapy by eliminating the need for rabies immune globulin and decreasing the number of doses of vaccine needed. In addition, it might protect persons whose post-exposure therapy is delayed and provide protection to persons at risk for in apparent exposures to rabies (10).

Clinical students of Veterinary Medicine in Nigeria are frequently exposed to dogs and cats with unknown rabies vaccination history

which makes them susceptible to animal bites. To our knowledge, no study has been conducted to evaluate the knowledge of these students about rabies and their pre-exposure vaccination status. This investigation was therefore carried out to assess the knowledge of clinical students of Veterinary Medicine in Nigerian universities about rabies and determine their pre-exposure vaccination status.

Materials and Methods

A cross-sectional survey was conducted using a structured questionnaire administered to clinical (DVM IV and V) students recruited from six Faculties of Veterinary Medicine in Nigeria. The schools involved are the University of Ibadan (UI), University of Nigeria (UNN), University of Abuja (UNIABUJA), Federal University of Agriculture, Abeokuta (FUNAAB), Ahmadu Bello University (ABU) and University of Agriculture, Makurdi (UAM). Four hundred and fifty questionnaires were administered in all the 6 Veterinary schools but only 241 clinical Veterinary students responded. The students were required to provide information on the following: demographics, knowledge of rabies (source, transmission route, susceptible animals, and clinical signs in infected animals), perceived rabies susceptibility, rabies prevention, history of rabies pre-exposure vaccination, reasons why they were not vaccinated and clues to encourage human vaccination.

Data were entered into a software program (STATA 12) for descriptive data analyses of Veterinary school, age, sex, class, type of accommodation and awareness of zoonosis. Odds ratios (OR) and exact 95% confidence intervals (CI) were calculated. Multiple logistic regressions were performed to further quantify associations between potential predictor variables and rabies vaccination status. Outcome (vaccination status) was coded as a dichotomous variable, with unvaccinated persons considered to be positive for the outcome while vaccinated persons were negative. P -values < 0.05 were considered to be statistically significant.

Result

Out of the 241 clinical Veterinary Medicine students involved in this study, 66 (27.4%), 50 (20.7%), 33 (13.7%), 32 (13.3%), 31 (12.9%) and 29 (12.0%) were from UI, UNN, UNIABUJA, FUNAAB, ABU and UAM, respectively (Table 1). One hundred and forty-eight (61.4%) respondents were aged 20-25 years, 115 (64.3%) were males and 144 (59.8%) were in their final clinical year (Table 1). Majority of them (n=136, 56.4%) resided within communities outside the Universities. Thirty-two students (13.3%) had been immunized against rabies out of which 31 (12.9%) received rabies pre-exposure vaccine while one (0.4%) with no history of pre-exposure vaccination received post-exposure prophylaxis (PEP) only after being bitten by a suspected rabid dog with unknown rabies vaccination history. 199 (82.6%) students had never been vaccinated against rabies while 10 (4.1%) had unknown rabies vaccination status (Table 2). Majority of the unvaccinated respondents indicated one or more of the following reasons for not being immunized: no provision made by the institution (n=73), vaccine not available in the hospital (n=69), high cost of the vaccine (n=53) and low perceived risk (n=24).

Forty-six (19.3%) students did not know the correct approach to be taken if they were bitten by a rabid dog while 32 (13.3%) believed that cleaning of dog and cat bite wounds with water and antiseptic alone was enough to prevent rabies (Table 2). Forty-one (17.0%) students disagreed that protection with post-exposure prophylaxis (PEP) was possible immediately after rabid dog bite while 21 (8.7%) were not sure (Table 2). Eighty eight (36.5%) students agreed that they had examined dogs or cats that were calm without mouth guard (Table 3). Among these were 64 (26.6%) unvaccinated and 18 (7.5%) vaccinated students. Also, 108 (44.8%) students, out of which 82 (34.0%) were unvaccinated and 24 (10.0%) were vaccinated,

agreed that they had examined dogs whose rabies vaccination history was unknown or not up-to-date. Eighty (33.2%) unvaccinated and 16 (6.6%) vaccinated students had been scratched or bitten by dogs before while students who perceived increased rabies risk during the DVM training were 211 (87.6%) of which 173 (71.8%) were unvaccinated and 30 (12.4%) were vaccinated. Multiple logistic regression revealed that unvaccinated clinical students were 4.5 times more likely to have examined dogs/cats with no current (up-to-date) anti-rabies vaccination or with unknown vaccination history than the vaccinated students (OR=4.493; 95% CI=1.68-12.02).



Table 1: Demographic Information on Clinical Veterinary Medicine Students Involved in the Study

Variable	Frequency (%)
Veterinary school	
UI	66 (27.4%)
UNN	50 (20.7%)
UNIABUJA	33 (13.7%)
FUNAAB	32 (13.3%)
ABU	31 (12.9%)
UAM	29 (12.0%)
Age (years)	
20-25	148 (61.4%)
26-30	81 (33.6%)
≥30	12 (5.0%)
Gender	
Male	155 (64.3%)
Female	86 (35.7%)
Class	
DVM IV	97 (40.2%)
DVM V	144 (59.8%)
Accommodation	
University Halls	87 (36.1%)
University Quarters	18 (7.5%)
Off-campus	136 (56.4%)



Table 2: Knowledge of Rabies and Vaccination Status of Clinical Veterinary Medicine Students in Nigerian Universities

Variable	Frequency (%)
Awareness of Zoonosis	
Yes	233 (96.7%)
No	8 (3.3%)
Heard of rabies before	
Yes	241 (100.0%)
No	0 (0.0%)
Sources of rabies virus	
^a All warm-blooded animals including humans	232 (96.3%)
Unknown	9 (3.7%)
Transmission of rabies virus	
^b Bites, scratches, mucous membrane contact	220 (91.3%)
Unknown	21 (8.7%)
Clinical signs in rabid dog/cat	
^c Signs of furious form and or dumb form	230 (95.4%)
Unknown	11 (8.6%)
Steps to take if bitten by rabid dog/cat	
^d Correct approach	195 (80.9%)
^e Incorrect approach	46 (19.1%)
Rabies vaccination status	
Vaccinated	32 (13.3%)
Unvaccinated	199 (82.7%)
Unknown	10 (4.1%)
Washing dog/cat bite wound with water and antiseptic is enough to prevent rabies	
Agreed	



Disagreed	32 (13.3%)
Not sure	196 (81.3%)
	13 (5.4%)
Protection against rabies is still possible immediately after rabid dog/cat bite by post-exposure vaccination	
Agreed	179 (74.3%)
Disagreed	41 (17.0%)
Not sure	21 (8.7%)

^{a-c}At least one of these was mentioned

^dCorrect approach: appropriate treatment consisting of tourniquet tying above wound, washing of wound with soap and water, application of antiseptic to wound, hospital visitation accompanied by administration of tetanus toxoid and complete rabies post-exposure prophylaxis

^eIncorrect approach: Carrying out one or more of the following - washing with water only, washing with soap only and taking oral analgesic to relieve pain.

Table 3: Rabies Exposure and Perceived Risk among Clinical Veterinary Medicine Students in Nigerian Universities

Statement	^a No. Of students that agreed to the statement (%)	Rabies vaccination status		
		Vaccinated	Unvaccinated	Unknown
I examine unrestrained dogs/cats as long as they are calm and not wild	88 (36.5%)	18 (7.5%)	64 (26.6%)	6 (2.5%)
I examine dogs/cats whose anti-rabies vaccination is not up-to-date or with unknown history	108 (44.8%)	24 (10.0%)	82 (34.0%)	2 (0.8%)
I have been bitten or scratched by dog(s)/cat(s) before	98 (40.7%)	16 (6.6%)	80 (33.2%)	2 (0.8%)
I have an increased chance of contracting rabies in the course of the DVM programme	211 (87.6%)	30 (12.4%)	173 (71.8%)	8 (3.3%)

^aNumber of students who agreed to the statement out of the 241 respondents



Discussion

The knowledge of occupationally exposed individuals especially Veterinarians, clinical Veterinary Medicine students, animal health technologists, animal handlers, individuals working in rabies diagnostic and research laboratories and zoo workers about rabies is crucial to the reduction of rabies risk exposure and prevention of avoidable deaths due to the disease. This knowledge should include information on rabies, means of transmission among susceptible animals and zoonotic spread to humans, clinical signs in infected animals and prophylactic measures to be taken in susceptible animals and by humans (9). The findings of this study indicate that the clinical Veterinary Medicine students had adequate knowledge of rabies, how it can be contracted and its clinical signs in infected animals (Table 2). However, in assuming a hypothetical rabid dog/cat bite scenario, 46 (19.1%) of the clinical students did not know the right steps to take following exposure, 32(13.3%) students responded that washing the dog/cat bite wound with water and antiseptic was sufficient to prevent rabies while 41 (17.0%) were not even aware of PEP. Although these proportions of clinical students are relatively small, knowing what to do immediately after dog/cat bite or scratch is crucial for survival of the victim and ultimately reducing fatalities due to human rabies. Our findings reveal that a substantial number of these students either lacked or were deficient in their knowledge of rabies post-exposure management.

According to the results of this study, a large number of the clinical Veterinary Medicine students (199, 82.7%) had not received pre-exposure vaccination despite the fact that rabies is endemic in Nigeria (12). This finding corroborates the results of a previous research conducted to assess rabies antibody levels among occupationally exposed persons, including clinical Veterinary Medicine students in a Nigerian University (11). According to these authors, only one (3.3%) of 30 tested clinical Veterinary students had

protective rabies antibody titre derived from post-exposure treatment following a suspected rabid dog bite. It is thus obvious from the present study that majority of clinical Veterinary Medicine students in Nigerian Universities are unprotected against rabies despite continuous exposure to the virus occasioned by the mandatory nature of clinical training that necessitates their handling of potentially rabid animals like dogs, cats and non-human primates. Thus, they constitute a highly susceptible human population that is at great risk of rabies. Reasons adduced by respondents in the present study for their “no-vaccination” status include no provision made by the institution (n=73; 30.3%), unavailability of the vaccine in hospitals (n=69, 28.6%), high cost of the vaccine (n=53, 22.0%) and low perceived risk (n=24, 10.0%).

Anti-rabies pre-and post-exposure prophylaxis for humans is expensive in Nigeria. Based on a cost rate of \$22.7 per anti-rabies vaccine dose (11) and the WHO recommendation of three injections for a complete course of primary vaccination (14), the current cost of pre-exposure prophylaxis in Nigeria is N13, 620 (exchange rate of N200 = \$1). We therefore suggest that governmental and non-governmental organisations intervene in providing free or subsidized anti-rabies vaccines so that individuals at risk can be vaccinated prior to rabies exposure. This becomes more germane when it is considered that the cost of post-exposure prophylaxis for an unvaccinated person is higher than for the vaccinated if they were both exposed to rabies virus (10). The vaccinated individual would require lower number of vaccine doses without need for rabies immune globulin (10), which has been reported to be scarce (2, 4). Another advantage of the rabies pre-exposure vaccination is that it might afford immunity against an unrecognized rabies exposure (10). Furthermore, it has been reported that some adequately vaccinated dogs do not attain the minimum threshold level of rabies neutralising antibody (7), thus increasing the chances of rabies infection in such dogs and



heightening the risk to Veterinarians, clinical Veterinary Medicine students and animal handlers who would ordinarily assume that since such dogs had “up-to-date” vaccination records, they were protected against the disease. Pre-exposure anti-rabies vaccination will therefore protect such individuals in case they contract the virus through animal bites, scratches, saliva on mucous membranes or open skin. In the present study, 80(33.2%) unvaccinated clinical students revealed that they had been bitten or scratched by dogs or cats while 173(71.8%) feared they had increased rabies risk based on their exposures during the clinical years.

With an estimated number of human deaths due to rabies being 23,800 persons (95% confidence interval: 21,000-28,000) in Africa as at 2010 (6), the continent has a high rabies burden, thus making it imperative for preventive measures to be put in place at the country level. We therefore conclude that mandatory pre-exposure vaccination of individuals at risk of rabies especially clinical Veterinary Medicine students, and post-exposure treatment as previously recommended (10), should be strictly implemented in Nigeria. Moreover, the Veterinary Council, which is responsible for regulation of Veterinary education in Nigeria, should make it mandatory, as part of accreditation requirements, that all clinical students in Veterinary Medicine Faculties nationwide be given free pre-exposure anti-rabies immunization. Additionally, there should be continuous rabies awareness promotion programmes aimed at increasing consciousness of the disease and the need for vaccination among clinical Veterinary Medicine students before their entrance into the clinical years while government should ensure availability of the vaccines in hospitals. Finally, a strict dress code involving the donning of laboratory coats, boiler suits, gloves and face masks or shields, especially at post-mortem, should be enforced for the safety of these students.

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