

Involvement of Healthcare Staff from First Contact Health Establishments in the Elimination of Human Rabies in the Health Districts of Ferkessedougou and Kong in Ivory Coast, 2020

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Abstract

Introduction: Rabies is endemic and constitutes a public health problem in Côte d'Ivoire. In the health districts of Kong and Ferkessedougou, exposure to rabies infection reported by the National Institute of Public Hygiene of Ferkessedougou averages 200 cases per year. However, in the involvement of health workers from First Contact Health Establishments (FCHE) of the 2 Districts, the management of exposed persons is unknown. This study aimed to determine the involvement of healthcare personnel in FCHE in the health districts of Ferkessedougou and Kong in the elimination of human rabies.

Material and Methods: This was a prospective cross-sectional study with a descriptive aim which took place from October 21, 2020 to November 20, 2020. The data were collected using a questionnaire and then analyzed with the software EXCEL and Epi Info 3.5.3. **Principle Results:** It emerged from this study that the average age of the participants was 36.8 years with an average professional seniority of 5.07 years. The majority (73.90%) of healthcare staff have not received training on rabies. However, plenty of healthcare personnel respectively experienced the transmission of the rabies virus from animals to humans (98.60%), with dogs (97.10%) as the main animal vector of rabies to man, the bite (100%) as the way of contamination of rabies, the immediate washing with water and soap (66.70%), the administration of the anti-rabies vaccine (75.4%), the National Institute of Public Hygiene as a reference structure (63.8%). At the level of practices after exposure to rabies in-

fection, the majority (65.2%) of the healthcare staff consulted the patients, of whom 84.4% and 95.6% of these consultants respectively carried out communication for social change and behavior and referred patients to the National Institute of Public Hygiene ($p < 0.01$). **Conclusion:** Some health workers did not have the necessary knowledge to care for people exposed to rabies infection. Thus, they were not all involved in post-exposure prophylaxis against rabies. It would therefore be desirable for the National Institute of Public Hygiene to strengthen the capacities for the prevention of rabies for all human health workers, particularly those in first contact health establishments with a view to eliminating this disease from here in 2030.

Keywords

Human Rage, Healthcare Staff, Involvement, Ivory Coast

1. Introduction

Rabies is one of the 20 neglected tropical diseases [1] on the agenda of the Sustainable Development Goals [2]. At present, it is responsible worldwide for 59,000 human deaths per year, mainly in rural areas of Africa and Asia with respectively 21,000 and 35,000 cases of annual death [3].

Despite the existence of an effective rabies vaccine, these deaths are largely due to the high price and lack of local availability of the products coupled with the complexity of post-exposure prophylaxis (PEP) protocols against rabies, in particular for rural and/or poor populations in endemic countries, who are most at risk and to the development of counterfeit products [4].

In addition, in our country, in Ivory Coast, all of the health establishments, including first contact health establishments (FCHE), closer to rural areas, are not directly involved in rabies prophylaxis. Thus, the care of people exposed to rabies is solely devolved to the Antirabies Center (ARC) of the National Institute of Public Hygiene (NIPH) and its municipal, departmental and regional branches. In addition, these branches are 29 in number throughout the territory against 133 health districts. Consequently, most of the populations of the Health Districts are very often far from these antennas. Also, some people exposed to rabies arriving in FCHE are referred to the NIPH Anti-Rabies Center. Some people exposed to rabies arrive in first contact health establishments.

However, the non-involvement of health workers in PEP can affect their knowledge of rabies and hinder the correct treatment of people exposed to rabies infection. Indeed, Mbaipago [5] believes that adequate management and effective communication are highly dependent on the knowledge and practices of human and animal health workers.

Our study is justified by the fact that some authors such as Mindeken [6] in 2018 in Chad, Mbaipago [5] in 2020 in Chad and BA [7] in 2021 in Senegal have worked on the knowledge attitudes and practices (KAP) of human health work-

ers and veterinarian on rabies while others such as Bhalla [8] in 2005 and Nayak [9] in 2013 in India worked on KAP of general practitioners, and Jidge [10] in 2019 in India carried out KAP study on rabies in military doctors. However, none of these studies has been performed in all healthcare staff in first contact facilities. Thus, our study focused on the involvement of caregivers in first contact health facilities in the elimination of human rabies.

The general objective of this work is to determine the involvement of the healthcare staff of the first contact health establishments of the health districts of Ferkessedougou and Kong in the elimination of human rabies. More specifically, the objectives aimed to first identify the socio-professional characteristics; then, to evaluate the level of knowledge on rabies and finally to determine the practices of the nursing staff of first contact health establishments in the care of patients.

2. Materials and Methods

2.1. Material

2.1.1. Framework and Location of the Study

The study took place in first contact health establishments in the Regional Health Department of Tchologo northern part of Ivory Coast. This DRS had 3 health districts: Ferkessedougou, Kong and Ouangolodougou. They are the first two who participated in the study because of the health coverage against human rabies by the same anti-rabies center of the regional branch of the NIPH located in Ferkessedougou. Ouangolodougou is covered by a departmental branch of the NIPH.

The distribution of the 28 FCHEs in the health districts of Ferkessedougou and Kong was as follows:

- Kong Health District (HD): five (05) rural dispensaries, one (01) Urban Health Center and four (04) Rural Health Centers;
- Ferkessedougou health district: two (02) specialized urban health units, nine (09) rural health centers, two (02) rural dispensaries and five (05) urban health centers.

2.1.2. Study Population

The healthcare staff of the FCHE which took care of consultations, nursing care and prevention services, consisted of 6 doctors, 51 nurses, 28 midwives and 6 nursing assistants.

Inclusion Criteria

We included in the study the nursing staff made up of Doctors, Nurses and Midwives who were present and agreed to participate in the study.

2.2. Methods

2.2.1. Type and Period of Study

This was a descriptive cross-sectional study that took place from October 21 to November 20, 2020.

2.2.2. Sample Size

The sample size was exhaustively obtained.

2.2.3. Pre-Survey

The pre-survey carried out at the anti-rabies center of the National Institute of Public Hygiene in Abidjan Treichville allowed us to test our questionnaires and to observe the difficulties inherent to the different questions.

2.2.4. Collection of Data

Data collection was carried out during an interview by means of a questionnaire completed by an IDE investigator from each structure trained for this purpose and who was supervised by the human rabies focal point of the Anti-Rabies Center of the regional branch of the NIPH.

The data collected concerned the following variables:

- the socio-professional characteristics of the healthcare staff:
 - ✓ age (years) split into 2 groups: 21 to 35 years old and 36 to 60 years old;
 - ✓ professional seniority (years) (year) split into 4 tranches: ≤5;]5 - 10];]10 - 15] and]15 - 20];
 - ✓ the profession made up of 3 modalities: doctor, state-certified nurse (SCN) and midwives
- the knowledge on rabies of healthcare staff:
 - ✓ training on rabies (yes/no);
 - ✓ rabies is a viral infection (yes/no);
 - ✓ the mode of transmission: bite, scratch, lick, from animal to human or from human to human or from human to animal;
 - ✓ vectors of the virus: dog, cat, monkey, mouse, bat, other warm-blooded mammalian animals
 - ✓ rabies is curable (yes/no);
 - ✓ rabies is always fatal (yes/no);
 - ✓ prevention against rabies after contact with an animal suspected of carrying rabies. The knowledge of healthcare staff on the actions to be taken during post-exposure prophylaxis (PEP):
 - do careful cleaning by washing the wound with soap and water (yes/no), using an antiseptic (yes/no); using alcohol at 70°C (yes/no), using simple clean water (yes/no), using dilute sodium hypochlorite (yes/no/);
 - suture the wound after contact (yes/no);
 - use antibiotics (ATB);
 - administer a series of doses of an anti-rabies vaccine (yes/no);
 - refer the patient to the NIPH (yes/no)
- Practices of healthcare staff:
 - ✓ make the consultation in case of exposure to rabies infection (yes/no)
 - ✓ refer the patient to the NIPH (yes/no);
 - ✓ communicate for a social and behavioral change in the patient exposed to rabies infection (yes/no).

2.2.5. Data Analysis

Data were entered and analyzed using Epi Info 3.5.3, Excel and Word software. The variables were compared at the 5% significance level.

2.2.6. Ethical Considerations

The realization of our study took into account the following ethical considerations: the research authorization issued by the Directorate of establishments and the health profession under No779/MSHP/DGS/DEPS/S-DPS/epng of June 29, 2020, obtaining informed consent from all participants, observing confidentiality and anonymity when processing data.

3. Results

3.1. Socio-Professional Characteristics of Healthcare Staff in First Contact Health Establishments

The proportion of healthcare staff (**Table 1**) aged between 21 and 35 years was substantially the same for the age groups of 36 to 60 years ($p > 0.05$) with an average age of 35.3 years and the extrema of 23 years minimum and 52 years maximum.

The majority (65.2%) of healthcare staff surveyed (**Table 1**) had a seniority of at most 5 years ($p < 0.01$) with an average seniority of 5.07 years and the extrema of 1 year minimum and 20 years maximum.

State-certified nurses (**Table 1**) made up the majority (58%) of the healthcare staff surveyed, followed by midwives (33.3%) and doctors (8.7%) ($p < 0.01$).

Table 1. Distribution of healthcare staff according to socio-professional characteristics.

Socio-professional characteristics	Numbers	Percentage (%)	p-value
Age groups (years)			
[21 – 36]	39	56.5	0.125
[36 – 60]	30	43.5	
Age [min. = 23 years; max. 52 years old], mean age 35.3 years old			
seniority in the profession (years)			
≤ 5	45	65.2	p < 0.01
]5 - 10]	15	21.7	
]10 - 15]	7	10.1	
]15 - 20]	2	2.9	
Seniority [min. = 1 year; max. 20 years], average seniority 5 years			
Profession			
State-certified nurse	40	58	p < 0.01
Doctor	6	8.7	
Midwife	23	33.3	

3.2. Level of Knowledge of Healthcare Personnel on Rabies and Its Preventive Measures

3.2.1. General Knowledge of Healthcare Staff about Rabies

Among the staff surveyed (**Figure 1**), 26.10% of them were trained on rabies while 73.9% of these caregivers were not trained.

Table 2 shows that:

Rabies was known as a viral infection by 88.4% of healthcare staff against 11.6% who did not know it.

Rabies was known as a lethal disease by 56.5% of healthcare staff against 43.5% who did not know it ($p > 0.05$).

Table 2. Distribution of healthcare staff according to knowledge of rabies (N = 69).

Rabies knowledge	Number	Percentage (%)	p-value
Viral infection			
yes	61	88.4	<0.01
no	8	11.6	
Lethal			
yes	39	56.5	0.125
no	30	43.5	
Healing			
yes	54	78.3	<0.01
no	15	21.7	
Mode of transmission			
bite	69	100	<0.01
scratch	50	72.5	<0.01
licking	3	4.3	<0.01
animal to human	68	98.55	<0.01
human to humman	15	21.73	<0.01
Human to animal	1	1.45	<0.01
Virus vectors			
dog	67	97.1	<0.01
cat	53	76.8	<0.01
monkey	43	62.3	0.004
bat	19	27.5	<0.01
mouse	12	17.4	<0.01
Other warm-blooded mammalian animals	12	17.4	<0.01
Notifiable disease			
yes	63	91.3	<0.01
non	6	8.7	

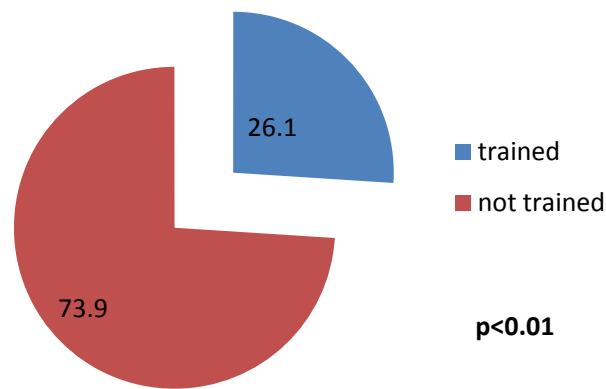


Figure 1. Distribution of respondents according to training on human rabies (N = 69).

Rabies was known as a curable disease by the majority (78.3%) of healthcare workers ($p < 0.01$).

All healthcare staff (100%, $p < 0.01$) experienced biting as a mode of rabies transmission. In addition, the majority (72.5%, $p < 0.01$) of healthcare staff also experienced scratching as a mode of transmission while the majority (95.7%; $p < 0.01$) of healthcare staff did not experience licking as a mode of transmission of this disease.

The majority (98.5%; $p < 0.01$) of healthcare staff knew that rabies was transmitted from animal to human. However, the majority (78.27%; $p < 0.01$) of the healthcare staff believed that rabies was not transmitted from human to human. Moreover, the majority (98.55%; $p < 0.01$) of the PS believed that rabies was not transmitted from human to animal.

Most (97.10%; $p < 0.01$) of the nursing staff designated the dog as the vector of rabies. Also, the majority of the staff respectively knew the cat (76.80%; $p < 0.01$) and the monkey (62.3%, $p < 0.01$) as vectors of the disease. However, bats (27.5%, $p < 0.01$), mice (17.4%, $p < 0.01$) and other warm-blooded mammalian animals (17.5%, $p < 0.01$) were not known by the majority of the PS as vectors of rabies transmission.

The majority (91.3%; $p < 0.01$) of PS experienced rabies as a notifiable disease.

3.2.2. Specific Knowledge of Healthcare Personnel on Post-Exposure Prophylaxis against Rabies after Contact with an Animal Suspected of Carrying Rabies

For rabies post-exposure prophylaxis (**Table 3**), the majority of healthcare staff experienced cleaning the wound with soap and water (66.7%, $p < 0.01$), administration of rabies vaccine (75.4%, $p < 0.01$), the use of antibiotics (69.6%, $p < 0.01$) as means of prevention against rabies. In addition, most of the healthcare staff knew about rabies prevention by referring the patient to the NIPH.

However, the majority of these staff (**Table 3**) did not respectively experience alcohol at 70°C (87%; $p < 0.01$); clean water (89.9%; $p < 0.01$), dilute sodium hypochlorite (89.9%; $p < 0.01$) and immediate suture of wounds (72.5%, $p < 0.01$) as means of prevention against rabies.

Table 3. Distribution of healthcare personnel according to Knowledge of rabies prevention (N = 69).

Knowledge of rabies prevention	Number	Percentage (%)	p-value
Post-exposure prophylaxis (PEP)			
cleaning the wound			
washing the wound with soap and water	46	66.7	<0.01
antiseptic	38	55.1	0.233
alcohol à 70°C	9	13.0	<0.01
clean water	7	10.1	<0.01
dilute sodium hypochlorite	7	10.1	<0.01
suturing wounds immediately	19	27.5	<0.01
use of antibiotics (ATBs)	48	69.6	<0.01
administration of rabies vaccines	52	75.4	<0.01
referred the patient without any care to the NIPH ^a	44	63.8	<0.01

a: National Institute of Public Hygiene.

Table 4. Distribution of healthcare personnel according to practices in the event of exposure to rabies.

Practices in the event of exposure to rabies	Number	Percentage (%)	p-value
Consult patients (N = 69)	45	65.2	<0.01
CSBC ^a (n = 45)	38	84.4	<0.01
Refer patient to NIPH (n = 45)	43	95.6	<0.01

a: Communication for social and behavior change.

3.2.3. Practices of Healthcare Personnel in First Contact Health Establishments in the Event of Exposure to Rabies

In the event of exposure to rabies infection (**Table 4**), certain practices were carried out by the nursing staff. Thus, the majority (65.2%, $p < 0.01$) of the healthcare staff affirmed that they consulted people exposed to rabies infection, of which 84.4% and 95.6% of these consultants respectively affirmed that they carried out communication for social and behavioral change ($p < 0.01$) and referred patients to the National Institute of Public Hygiene ($p < 0.01$).

4. Discussion

4.1. Socio-Professional Characteristics

The professional seniority of nearly 2/3 of the healthcare staff did not exceed 5 years. Moreover, the average seniority was 5.07 years. This result would show the inexperience of most of the nursing staff of the first contact health establishments in the health districts of Ferkessedougou and Kong. This leads to less efficient results and poor quality of care [11]. In addition, the increase in the seniority of nurses in a care service is associated with a 1.3% decrease in the average

length of stay for patients [11]. This observation is encouraging because we found that more than half (58%) of the nursing staff were state-certified nurses. Thus, it would be desirable that the healthcare staff, in particular the state-qualified nurses of the FCHEs, be authorized by the national health authorities, to take care of the patients exposed to the rabies infection in order to participate in the elimination of rabies by 2030. Nurses are at the front lines of service delivery and play an important role in patient-centred care [12].

4.2. Level of Knowledge of Healthcare Staff on Rabies and Its Preventive Measures

4.2.1. General Knowledge of Healthcare Personnel about Rabies

Rabies training was taken by less than a third of the healthcare staff in our study. Thus, nearly 3/4 of health workers have not been trained in the care of patients with rabies. Jidge [10] found no military doctors trained in rabies. Our result would initially be due to the fact that these agents were not interested in this disease. In a second step, the formative approach would be done during the World Rabies Day without involving all the agents because of the limit of the financial means for the activities of this day. Thirdly, the agents trained during their initial training would willingly neglect their knowledge of rabies because they know that rabies is treated by the NIPH. To solve the problem of training health workers in Ivory Coast in the context of epidemics, WHO has installed multimedia rooms in the 133 health districts of the country. Thus, the NIPH should organize annual capacity building sessions for all health workers not trained in rabies, particularly those in first contact health establishments, via videoconference. The importance of the issue of rabies according to Mindeken [6], requires the development of continuous training through seminars and workshops for human and animal health workers. Thus, the NIPH should organize annual capacity building sessions for all health workers not trained in rabies, particularly those in FCHE, via videoconferencing. The importance of the issue of rabies according to Mindeken [6], requires the development of continuous training through seminars and workshops for human and animal health workers.

Concerning the knowledge on the viral origin of rabies, less than 1/5 of the healthcare staff knew rabies as a viral infection. According to the WHO [13], rabies is a zoonosis of viral origin. The high level of ignorance of the viral origin of rabies indicates that these personnel would be unaware of the structure of this virus and the first actions to be taken upon exposure to rabies infection. Indeed, it is a virus with an envelope that is therefore very fragile in the external environment and sensitive to the action of heat, lipid solvents and soaps or quaternary ammoniums [14].

Regarding the vector of rabies, the dog was the most cited (97.10%) as the animal transmitting rabies, respectively followed by the cat (76.80%) and the monkey (62.3%). However, the majority of caregivers ignored bats (27.5%, $p < 0.01$), mice (17.4%, $p < 0.01$), and other warm-blooded mammalian animals

(17.5%, $p < 0.01$) as animals transmitting this disease. The WHO [13] reports that domestic dogs are responsible for transmitting the rabies virus to humans in almost 99% of cases. However, rabies affects both domestic and wild animals.

As for the mode of transmission of rabies, all the healthcare staff experienced the bite, followed by the scratch cited by more than 2/3 of this staff. However, the majority (95.7%) of respondents did not know licking as a mode of transmission of this disease. Rabies is an inoculation zoonosis. Rabies is a vaccine-preventable, zoonotic, viral disease. It is spread to people and animals through bites or scratches, usually via saliva [14]. Lack of knowledge of certain modes of transmission could lead health workers in first-contact health facilities to initiate ineffective management for poor quality of care resulting in rabies-related deaths. The modes of transmission in exceptional situations were also mentioned by the participants of our study. Thus, the majority of caregivers knew that rabies is transmitted from animals to humans in 98.5% of cases, while 21.73% and 1.45% of them respectively estimated that rabies is transmitted from man to man on the one hand and, on the other hand from man to animal. Transmission from animals carrying rabies to humans is well documented by the WHO [13] [15]. Concerning the transmission from rabid man to animal, no description has been made to date. As for human-to-human transmission, rabies has never been confirmed, except very rarely following a transplant of infected tissues and organs [16], and a single case of probable perinatal transmission of the virus has been reported, according to Aguémon [17] quoted by the WHO [18]. Nevertheless, health workers involved in rabies post-exposure prophylaxis should respect good hospital practices, in particular the wearing of personal protective equipment in order to avoid possible exposure.

As for knowledge about recovery from rabies, more than 3/4 of healthcare staff believed that rabies can be cured. This result shows that most healthcare workers would be unaware of the severity and lethality of rabies once symptoms appear. The WHO indicates that Rabies is almost always fatal, but it can be prevented with vaccination before and/or after suspected or proven exposure to the virus [13] [15]. However, the proportion of caregivers unaware of lethality was substantially the same as those who experienced rabies lethality ($p > 0.05$). To this end, the NIPH must strengthen the capacities of the health workers of the FCHE on rabies in order to take care of people exposed to rabies infection very early on.

Concerning the obligatory declaration of rabies, the majority (91.3%) of the healthcare staff knew that rabies must be obligatorily declared. Indeed, since the March 2008 meeting of Africa Rabies Expert Bureau (AfroREB) Grand-Bassam in Ivory Coast, the notification of rabies cases has become mandatory in this country [19]. Thus, the NIPH has integrated human rabies into epidemiological surveillance systems. Since rabies is a notifiable disease in a country, surveillance data can be collected [20]. In addition, the estimate of the number of cases is more precise, which allows a better estimation of the impact of rabies in this

country. Consequently, the authorities could make the fight against rabies a priority in public health actions to achieve the goal of zero deaths by 2030.

4.2.2. Specific Knowledge of Healthcare Personnel on Post-Exposure Prophylaxis against Rabies after Contact with an Animal

In our study, the majority of caregivers respectively experienced cleaning the wound with soap and water and the use of ATB for rabies prevention. However, the majority of these staff did not respectively experience alcohol at 70°C (87%); clean water (89.9%) and diluted sodium hypochlorite (detergent) (89.9%) as cleaning substances for rabies prevention. The WHO [13] advises for category II and III wounds, first aid includes abundant rinsing and immediate cleaning of the wound for at least 15 minutes with soap and water, with a detergent (sodium hypochlorite, alcohol at 90°C...), with povidone iodine (antiseptic) or other substances that suppress and kill the rabies virus. If possible, wounds should not be sutured. However, when it is unavoidable to suture the wounds which have previously been cleaned, it is important to infiltrate them with the immunoglobulins against rabies before and to wait several hours after the infiltration to proceed in order to allow the diffusion of the antibodies in surrounding tissues [21]. If necessary, treatment will be supplemented by the administration of tetanus prophylaxis and/or antibiotic therapy. Health workers who ignore PEP for all Category II and III exposures put patients at risk of developing rabies [13]. Thus, effective prophylactic treatment must be started soon after exposure to the virus in order to avoid the appearance of rabies symptoms and death [7]. If immediate suturing after wound cleansing cannot be avoided, the wound should first be carefully infiltrated with rabies immunoglobulin and suturing delayed for a few hours to allow the immunoglobulin to diffuse into the tissues before closure. The wound, reduced to a minimum [15]. The NIPH must train the agents of the first contact health establishments on the correct management of victims of exposure to rabies infection in order to curb death due to rabies.

The reference of patients who had been bitten, scratched or licked by an animal was known by 68.9% of the nursing staff. This result is somewhat encouraging because all agents should know the reference structure of human rage since the AfroREB meeting held in Grand Bassam in 2005 [19]. This shows that more than a quarter of healthcare staff would not follow rabies news. The Ministry of Health through its Communication Department should publish a document presenting all the reference structures for the management of notifiable diseases to make it available to health establishments.

4.3. Healthcare Practices

Nearly 2/3 of the healthcare staff consulted people exposed to rabies infection, of which 84.4% among the consultants claimed to do communication for social and behavior change (CSBC). Moreover, the majority (95.6%) of consultants assumed to refer patients exposed to rabies infection to the NIPH. Our result indicates that midwives (33.3%) would not consult while nurses and doctors would

be involved in the consultation. Indeed, nursing professionals are on the front lines of service delivery and play an important role in the care of individuals and communities. In many countries, they are leaders or key members of multidisciplinary and interdisciplinary care teams. They provide a wide range of services at all levels of the healthcare system [12]. Thus, they must get involved in the prevention of rabies which, according to the WHO [18], is largely based on raising awareness of the disease among populations at risk. This involvement of healthcare workers in rabies elimination would incorporate the strategic process of social and behavior change communication to influence community engagement in rabies control. Thus, all health workers in first-contact health facilities should participate in this communication approach to change the mentalities, attitudes and behaviors of the Communities vis-à-vis rabies.

5. Limit of the Study

The limit of our study is linked on the one hand to the small size of the sample and on the other hand to a single health region out of 33 in Ivory Coast. Thus, it would be difficult to generalize the results of the debt study. However, these results can serve as indicators for health authorities to involve CST health workers in the fight against rabies for the achievement of elimination goals by 2030.

6. Conclusion

Ultimately, our study showed that some health workers in first contact health establishments did not have the appropriate knowledge for the care of people exposed to rabies infection. Thus, they were not all involved in post-exposure prophylaxis against rabies. This attitude contributes to the non-compulsory declaration of rabies and the authorities would not make it a public health priority. It would therefore be desirable for the National Institute of Public Hygiene to strengthen the capacities for the prevention of rabies for all human health workers, particularly those in first contact health establishments with a view to eliminating this disease from here in 2030.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Global alliance for Rabies Control (GARC) (2021) GARC Joins Coalition to Improve Animal Health Globally. <https://rabiesalliance.org/news/garc-joins-coalition-improve-animal-health-globally>
- [2] French Republic. Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) (2021) Neglected Tropical Diseases: Support for the One Health Approach. <https://www.cirad.fr/en/cirad-news/news/2021/neglected-tropical-diseasesone-health>
- [3] Hampson, K., Coudeville, L., Lembo, T., *et al.* (2015) Estimating the Global Burden

- of Endemic Canine Rabies. *PLOS Neglected Tropical Diseases*, **9**, e0003709. <https://doi.org/10.1371/journal.pntd.0003709>
- [4] Taylor, E., Banyard, A.C., Bourhy, H., Cliquet, F., Ertl, H., Fehlner Gardiner, C., *et al.* (2019) Avoiding Preventable Deaths: The Scourge of Counterfeit Rabies Vaccines. *Vaccine*, **37**, 2285-2287. <https://doi.org/10.1016/j.vaccine.2019.03.037>
- [5] Mbaipago, N., Mindekem, R., Oussiguere, A., Moyengar, R., Naissengar, K., Madjadinan, A., Zinsstag, J. and Léchenne, M. (2020) Rabies Knowledge and Practices among Human and Veterinary Health Workers in Chad. *Acta Tropica*, **202**, Article No. 105180. <https://doi.org/10.1016/j.actatropica.2019.105180>
- [6] Mindekem, R., Lechenne, M., Daugla, M.D., Zinsstag, J., Ouedraogo, L.T. and Sahidou, S. (2018) Connaissances-Attitudes-Pratiques des agents de santé humaine et animale sur la rage au Tchad. *Santé Publique*, **30**, 418-428. <https://doi.org/10.3917/spub.183.0418>
- [7] Ba, M.F., Kane, N.M., Diallo, M.K.K., Bassoum, O., Boh, O.K., Mboup, F.Z.M., Faye, E.H.B., Bedekelabou, A.P., Dieng, S.D., Diop, F.N., *et al.* (2021) Knowledge, Attitudes and Practices on Rabies among Human and Animal Health Professionals in Senegal. *Pathogens*, **10**, Article No. 1282. <https://doi.org/10.3390/pathogens10101282>
- [8] Bhalla, S., Mehta, J.P. and Singh, A. (2005) Knowledge and Practices among General Practitioners of Jamnagar City Regarding Animal Bite. *Indian Journal of Community Medicine*, **30**, 94-96. <https://doi.org/10.4103/0970-0218.42859>
- [9] Nayak, R.K., Walvekar, P.R. and Mallapur, M.D. (2013) Knowledge, Attitudes and Practices Regarding Rabies among General Practitioners of Belgaum City. *Al Ameen Journal of Medical Sciences*, **6**, 237-242.
- [10] Jidge, A.C., Rokade, H.G. and Mangulikar, S.K. (2019) Knowledge, Attitude and Practices about Rabies Prophylaxis among Medical Officers. *International Journal of Community Medicine and Public Health*, **6**, 60-64. <https://doi.org/10.18203/2394-6040.ijcmph20191539>
- [11] Bartel, A.P., Beaulieu, N.D., Phibbs, C.S. and Stone, P.W. (2014) Human Capital and Productivity in a Team Environment: Evidence from the Healthcare Sector. *American Economic Journal: Applied Economics*, **6**, 231-259. <https://doi.org/10.1257/app.6.2.231>
- [12] Nursing. PAHO/WHO Newsletters. <https://www.paho.org/en/topics/nursing>
- [13] World Health Organization (WHO) (2021) 100% Preventable Viral Disease, Rabies Is Transmitted to Humans through the Infected Dog Bites. It Is Fatal Once Symptoms Develop. Target Is to Reach Zero Human Rabies Deaths by 2030. <https://www.who.int/en/news-room/fact-sheets/detail/rabies>
- [14] World Health Organization (2021) Rabies. <https://www.who.int/news-room/fact-sheets/detail/rabies>
- [15] World Health Organization (2018) WHO Expert Consultation on Rabies: Third Report. <https://apps.who.int/iris/handle/10665/272364>
- [16] Rupprecht, C.E., Nagarajan, T. and Ertl, H. (2016) Current Status and Development of Vaccines and Other Biologics for Human Rabies Prevention. *Expert Review of Vaccines*, **15**, 731-749. <https://doi.org/10.1586/14760584.2016.1140040>
- [17] Aguémon, C.T., *et al.* (2016) Rabies Transmission Risks during Peripartum—Two Cases and a Review of the Literature. *Vaccine*, **34**, 1752-1757. <https://doi.org/10.1016/j.vaccine.2016.02.065>
- [18] World Health Organization (WHO) (2018) Rabies Vaccines: WHO Position Pa-

per—April 2018. Weekly Epidemiological Record, No. 16.

<https://apps.who.int/iris/bitstream/handle/10665/272372/WER9316-201-219.pdf>

- [19] Dodet, B., Adjogoua, E.V., Aguemon, A.-R., Baba, B.A., Bara Adda, S., *et al.* (2010) Lutte contre la rage en Afrique: Du constat à l'action [The Fight against Rabies in Africa: From Recognition to Action]. *Bulletin de la Société de Pathologie Exotique*, **103**, 51-59. <https://doi.org/10.1007/s13149-009-0034-3>
- [20] Global Alliance of Rabies Control GARC (2017) A Blueprint for the Control of Rabies in Dog Populations. <https://caninerabiesblueprint.org/3-2-3-Why-does-rabies-need-to-be-a?lang=en>
- [21] World Health Organization (WHO) (2018) Frequently Asked Questions about Rabies for Clinicians. https://apps.who.int/rabies/Rabies_Clinicians_FAQs_20Sep2018.pdf?ua=1