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Pilot Study for Introduction of Thai Red Cross Protocol in Rabies Post-exposure Prophylaxis: Case of Regional Public Hygiene Office of Bouake, Ivory Coast, 2019

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Abstract: *Context*: A project called GAVI-RAGE, in 2017 was initiated in three African countries including Côte d'Ivoire. The idea was to offer subjects at risk of rabies infection the three different protocols, while offering free only prophylaxis by the Thai Red Cross protocol. Paradoxically, this free service was not preferred by all subjects. Some people have opted for the usual fee-based protocols (Essen and Zagreb). The search for an understanding of this paradox required a study. *Methods*: A retrospective cross-sectional study with an analytical aim was carried out from December 2018 to May 2019 at the regional public hygiene office in Bouake. This study consisted of interviewing all subjects exposed to a risk of rabies infection and who consulted the regional public hygiene unit during the project period. The comparison of the proportions was made by the chi-square test with a significance level set for a value $p \leq 0.05$. *Results*: The subjects exposed to rabies were from urban areas (83%), were children under 15 (51,3%) and males (59,3%). Among our respondents, 77% of the subjects had opted for the free vaccine protocol. The reasons given were that it was free of charge (93.5%), lack of money on the day of the consultation (44.3%) and lack of health insurance (44.3%). Respondents who did not accept the free protocol cited insufficient awareness (80.9%) and doubts about its effectiveness (9.9%) as their reasons Acceptance of the said protocol was significantly associated with the living area of the exposed people ($p<0.000$) and awareness of the treatment ($p<0.000$). *Conclusion*: a free vaccine protocol is not synonymous with its acceptance by all populations. However, this free service is a lifeline for many people, especially the poorest.

Keywords: Rabies, Vaccine, Thai Red Cross

1. Introduction

Rabies is an under-reported neglected zoonosis with a lethality of almost 100% in humans and animals. Human rabies of canine origin causes tens of thousands of deaths annually (estimates are of the order of 59,000 deaths annually [1]) although it is 100% preventable. The populations most affected are those living in rural areas, particularly children from economically disadvantaged backgrounds in Africa and Asia. These are areas where awareness of the disease and access to post-exposure prophylaxis (PEP) is limited or non-existent [2]. This figure, which places rabies as the 10th most deadly infectious disease, does not seem to be changing favorably. On the contrary, rabies even seems to be re-emerging in some parts of the world, notably China, Vietnam and several African countries [3]. Ivory Coast is also concerned by this scourge. During 2017, 18 suspected cases of human rabies were notified

throughout the country, 7 of which were confirmed [4]. These two protocols require 4 and 5 doses of vaccine respectively [5].

Another protocol offers more advantages in terms of economic gains, doses and time, that of the Thai Red Cross [2]. Adherence to this new protocol by rabies-exposed individuals has been evaluated through the so-called GAVI-RAGE project, initiated in 2017. The three countries chosen for the pilot phase of the project were Mali, Chad and Côte d'Ivoire. In essence, this project involved offering rabies post-exposure prophylaxis to rabies-exposed individuals using the three different protocols, while only offering free prophylaxis using the Thai Red Cross protocol. In Côte d'Ivoire, this project was coordinated by the Swiss Centre for Scientific Research (SCSR) in the cities of Bouake and San Pedro.

We therefore conducted this study to determine the reasons for adherence to the Thai Red Cross protocol for post-exposure prophylaxis of human rabies, specifically at the anti-rabies center (CAR) of the public health unit in Bouake, Ivory Coast.

2. Methods

This was a retrospective cross-sectional study with an analytical aim that took place from December 2018 to May 2019 at the regional public hygiene office of Bouake. The sampling was exhaustive and included all persons at risk of rabies infection who came for consultation during the project period, that is, from May 2017 to March 2018. The data collection tool was a questionnaire developed from the consultation files of the rabies center and adapted to the subject of our study. Data were collected by telephone. From the telephone contacts appearing on the files of the patients or their legal guardians, we came into contact with them. The persons or their legal guardians, for minors, were questioned after obtaining their informed consent. The data collected was entered and analyzed with SPSS 17.0 software. Quantitative variables were presented as position and dispersion parameters, and qualitative variables as proportions. In the bivariate analysis, the comparison of proportions was done with the chi2 test or the chi2 test with YATES correction or even the Fisher exact test when the chi2 test was not applicable. The significance level was set for a $p \leq 0.05$ value. Confidentiality was maintained by assigning an anonymity number to each survey form.

3. Results

During the project period, 1,098 people were received at the anti-rabies center of the regional public hygiene branch of Bouake for the institution of post-exposure prophylaxis, of which 648 (59.01%) were effectively contacted. Of those contacted, 604 (93.2%) agreed to participate in the study, representing 55.0% of our patients exposed to rabies risk during the study period. Of these exposed subjects, 83% were from urban areas and 55% were children under 15 years old. Sixty percent of the cases were male (60%); sex ratio 1.48. They had primary (41.2%) or secondary (%) education, notably pupils/students (53%), without health insurance (74%). The minor victims were accompanied by a parent (89.2%) or by the owner of the animal (2.8%). The persons in charge of these minors had secondary education (35.8%) or higher (32.1%) and were serving officials (41.7%). (Table 1). Of our respondents, 94% had heard of rabies; their main sources of information were school (56.7%) and television (19.8%). More than 85% of those surveyed perceived rabies as a fatal disease. For them, humans and animals were exposed to the risk of rabies (95.1%) either after a bite (93.6%) or scratching a rabid animal (31.8%). The animals likely to transmit rabies according to them were dogs (95.6%), cats (51.1%) and monkeys (24%). They were aware of the existence of the rabies vaccine (93%). However, they were unaware of the different rabies vaccination protocols (98.1%). (Table 2). After their exposure to rabies risk, 77% of them had opted for the Thai Red Cross protocol; the reasons given were that it was free of charge (93.5%), lack of financial means on the day of the consultation (44.3%) and lack of health insurance (44.3%). Those who had refused this protocol rather spoke of insufficient information on the said protocol (80.9%) or even expressed reservations about its effectiveness (9,9%). (Table 3). Acceptance of the protocol was significantly associated with the area of residence of those exposed ($p<0.000$) and with treatment awareness ($p<0.000$). (Table 4). Post-exposure prophylaxis was abandoned by 20% of subjects exposed to the risk of rabies. (Table 3).

Furthermore, a statistically significant relationship was found between acceptance of the Thai Red Cross protocol and complete vaccination ($p=0.000$). (Table 5).

Table 1. *Sociodemographic characteristics of people exposed to rabies.*

	n	%
Characteristics of people exposed to rabies		
Residential area (n=604)		
Urban	502	79,0
Rural	102	21,0
Age group (year) (n=604)		
]0-15]	310	51,3
]15-25]	76	12,6
]25 et plus]	218	36,1
Sex (n=604)		
Male	358	59,3
Female	246	40,7
Level of study (n=604)		
Not in school	145	24,0
Primary	249	41,2
secondary	137	22,7
Superior	73	12,1
Occupation (n= 604)		
pupil/student	320	53,0
Unemployed	102	16,9
Liberal profession	108	17,9
Official	69	11,4
retired	5	0,8
Possession of health insurance (n= 604)		
Yes	450	74,5
No	154	25,5
Marital status (n= 280)		
Married	101	16,7
Single	102	16,9
Cohabitation	64	10,6
Widower	12	2,0
Divorced	1	0,2
Characteristics of the accompanying persons of minors		
Marital status of persons responsible for minors (n= 324)		

	n	%
married	150	24,8
single	46	7,6
cohabitation	119	19,7
Widower	6	1,0
Divorced	3	0,5
Link to the victim (n= 324)		
parents	289	89,2
Tutor	7	2,2
Pet owner	9	2,8
Others	19	5,8
Age (n=324)		
]20-35]	99	30,5
]35-50]	165	51,0
]50-76]	60	18,5
Sex (n=324)		
Male	212	65,0
Female	112	35,0
level of study (n=324)		
Not in school	51	15,7
Primary	53	16,4
Secondary	116	35,8
Superior	104	32,1
occupation (n=324)		
Student	21	6,5
Unemployed	25	7,7
Liberal profession	128	39,5
Official	135	41,7
retired	15	4,6

Table 2. *Knowledge about rabies.*

	n	%
Heard about rabies (n=604)		
Yes	566	94,0
No	38	6,0
Sources of information on rabies (n=566)		
School	312	56,7
Television/radio	172	19,8
Other sources	137	7,9
Perception of the dangerousness of rabies (n=604)		
Yes	516	85,4
No	88	14,6
Mammals exposed to rabies (n=566)		
Men and animals	545	96,3
Men alone	1	0,2
Animals only	9	1,6
Don’t know	11	1,9
Categories of persons exposed to rabies (n=566)		
Everyone	538	95,1
The big people	3	0,5
Women	4	0,7
Don’t know	21	3,7
Modes of rabies transmission (n=566)		
Bite	530	93,6
Scratch	180	31,8
Licking	66	11,7
Don’t know	33	5,8
Rabies Vectors (n=566)		
Dog	541	95,6
Cat	289	51,1
Monkey	136	24,0
Other Vectors	57	10,1
Don’t know	12	2,1
Informed of the existence of rabies vaccine (n=566)		
Yes	529	93,0
No	37	7,0
Rabies Vaccine Information Site (n=566)		
School	210	39,0
Health center	115	21,7
Inhp	95	18,0
Other places	113	21,3
vaccination protocols (n=529)		
Yes	10	2,0
No	519	98,0

Table 3. *Practices after exposure to rabies.*

	n	%
Washing the lesion before the ARHP (n=604)		
Yes	440	72,8
No	164	27,2
Spontaneous consultation at the ARHP (n=604)		
Yes	325	54,0
No	279	46,0
Referral for people who did not consult spontaneously (n=279)		
Advice from the entourage	34	12,2
Advice from a health worker	245	87,8
awareness received at the ARHP (n=604)		
Yes	335	55,0
No	211	35,0
don't remember	58	10,0
Dressing the lesion (n=604)		
No	497	82,0
Yes	98	16,0
Don’t know	9	2,0
Outcome of the animal in question (n=604)		
Found or identified	479	79,0
Not identified	125	21,0
Veterinarian's opinion (n=479)		
Yes	229	48,0
No	250	52,0
Adherence to post-exposure prophylaxis (PPE) (n=604)		
Completed	313	51,8
Suspended	170	28,2
Stopped	121	20,0
Type of vaccination chosen (n=604)		
Free	463	77,0
Paid	141	23,0
Type of protocol chosen		
Thai Red Cross	463	77,0
Zagreb	79	13,0
Essen	62	10,0
Reasons for Accepting the Thai Red Cross Protocol		
Free	433	93,5
Efficiency	267	57,7
Lack of financial resources on day of consultation	205	44,3
No health insurance	205	44,3
New character	62	13,4
Other reasons	24	5,2
Reasons for non Accepting the Thai Red Cross Protocol		
Not enough advertising on free protocol	114	80,9
Trust in paid protocols	71	50,4
Doubt about the effectiveness of free	14	9,9
Old character	10	7,1
Reduced number of injections	7	5,0
Possession of health insurance	5	3,5
Other reasons	28	11,2

Table 4. *Determinants of acceptance of the Thai Red Cross Protocol.*

		Acceptance of the Thai Red Cross Protocol				Chi2	*p*
		Yes		No			
		n	%	n	%		
						17,276	*0,000*
Patient's area of residence (n=604)	Rural	62	13,4	40	28,4		
	Urban	401	86,6	101	71,6		
						11,895	*0,003*
Have you been made aware of the treatment? (n=604)	Yes	269	58,1	66	46,8		
	No	145	31,3	66	46,8		
	DNK	49	10,6	9	6,4		

NB: There is no statistically significant relationship (p>0.05) between the acceptance of the TRC protocol and the following: patient's age; patient's educational level; possession of health insurance; educational level of the accompanying person; already heard about rabies ?; subjects affected by rabies; transmission by bite; transmission by scratch; transmission by licking; transmission by the dog; transmission by the cat; aware of the existence of a rabies vaccine; knowledge of the different vaccine protocols; fear of rabies; animal involved found and / or identified.

Table 5. *Determinants of complete vaccination.*

		Complete vaccination				Chi2	*p*
		Yes		No			
		n	%	n	%		
						20,764	*0,000*
Acceptance of CRT protocol	Yes	266	85,0	79	65,3		
	No	47	15,0	42	34,7		

4. Discussion

In our study, the exposed people mostly came from an urban area (83%). The explanation could be found in the large proportion of urban rabies or enzootic canine rabies in the three major natural cycles of this disease. Indeed, urban rabies alone accounts for more than 98% of annual rabies deaths worldwide [6]. This result is in the same direction as that of Zamina and col in Abidjan in 2015 where 96% of cases of rabies were reported in urban areas [7]. Children under the age of 16 accounted for more than half of those exposed. Indeed, the lack of judgment due to their young age, sometimes leads them to take actions that can be easily perceived by the animal as a threat or an aggression [8]. In a study by Ouattara and al. in Abidjan, of seven cases of rabies reported and managed from 2005 to 2009, four occurred in children and adolescents [9]. Also, between 1970 and 2003, out of 20 cases of rabies diagnosed in France, 50% were children [10]. In China, Li GW and al 2015, found that those exposed were older with an age range of 40-60 years [11]. Almost all of those exposed did not have health insurance. Letourmy Alain. in 2008, had already noted that in Africa, the proportion of health insurance coverage did not exceed 20% of the population [12]**.** In their study, Zamina and al. found a lack of health insurance in 95.5% of cases [7]. The respondents mentioned as vectors of rabies, the dog (51.72%), followed by the cat (27.63%). The dog is the main reservoir of rabies in the world and is responsible for almost 99% of fatal cases in humans [13]. This could explain why this animal is mentioned by the respondents. Adjé and al in Senegal in 2011, found that dogs were identified by 95% of respondents as the animal most likely to transmit rabies; transmission by other animals was not known [14]. As regards the mode of contamination, bites (65.5%) and scratches (22.5%) were the most frequently cited. Tiembre and al in Abidjan in 2008 found that exposure through animal bites accounted for 88.1% and exposure through scratches for 5.7% of cases [15]. In a study in France in 2013, the military had identified the bite as the mode of contamination in 99% of cases [16]. Most people were aware of the existence of a rabies vaccine (93.5%), probably because of the information received during the consultation at the regional office. However, the different post-exposure management protocols were unknown to them. Tiembre and col. in Abidjan had found that vaccination (79.82%) was known as the main means of protection against rabies [17]. In the study by Adje and col, on the other hand, the vaccine as a means of prevention was not known by 39% and 55% of students respectively [14]. Regarding post-exposure prophylaxis proper, the Thai Red Cross protocol was accepted by 77% of patients. The reasons given were mainly financial, in particular the fact that the protocol was free of charge (93.5%), the lack of choice in the absence of financial means on the day of the consultation (44.3%) or even of health insurance (44.3%). These different observations show the importance of free post-exposure prophylaxis for adherence. Indeed, financial inaccessibility to post-exposure prophylaxis was also found to be the main reason for dropping out by Tiembre et al in Abidjan [18]. The main reasons for refusing the free protocol in our study were the lack of sufficient information about the protocol (80.9%), which would lead to doubts for the free protocol (9.9%) and confidence in the paid protocol (50.4%). However, the Thai Red Cross protocol is effective and approved [19].

Sufficient information and media coverage on this protocol could have reduced the number of reluctant people, especially since bivariate analysis revealed that acceptance of said protocol was statistically associated with awareness of the treatment (p<0.000), beyond the living area of the exposed people (p<0.000). Victims in urban areas would find it less inconvenient to travel, unlike those in rural areas, who will certainly have to incur other costs to get to the care center, including travel and possibly accommodation and the food. Thus, neither the school level (p>0.05), nor the possession of health insurance (p>0.05) influenced their acceptability of the free protocol, but only the free nature. In Abidjan, Tiembre et

al. found that the lack of financial means to go to the CAR was a reason for abandoning the PEP [18]. There was also a statistically significant relationship between acceptance of the free Thai Red Cross protocol and completion of vaccination (p=0.000). This last result reinforces the finding that free treatment is important for improving adherence and not necessarily the type of protocol.

5. Conclusion

This study shows that the removal of any financial obstacle contributes to increasing adherence to post-exposure rabies prophylaxis regardless of the type of protocol, given the reasons for acceptability of the Thai Red Cross protocol made free during this project. The reasons for joining were purely financial, as were the associated factors. Another free study of this protocol should be conducted to better understand patient adherence. In order to remove the financial factor to better appreciate the choice between these different preventive protocols, it would be preferable to conduct a study making all these three protocols paid or free.

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