



Feasibility and benefits of a preexposure vaccination campaign against human rabies in students under 15 years of age: Experience of four (4) health districts in Côte d'Ivoire

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ABSTRACT

Introduction: Rabies is a deadly zoonosis in the absence of proper management. Children under 15 years of age are paying the highest burden. Pre-exposure vaccination is therefore imperative to protect this population. The purpose of this study is to evaluate the feasibility of preventive pre-exposure vaccination against human rabies in primary schools in four health districts in Côte d'Ivoire.

Materials and methods: This was a cross-sectional study conducted in November 2022. It was based on the database and activity reports from the rabies vaccination campaign for students from January 1 to February 28, 2016. A total of 751 students' records were evaluated. Statistical analysis was performed using Epi info software version 3.5.4.

Results: The sensibilization sessions proved to be effective and efficient as they permitted to vaccinate 751 students against rabies. The vaccination was done according to the intramuscular protocol of 03 doses (D0, D7, D21). Children aged 6-14 years were the most representative (89.6%). The vaccine compliance rate for this campaign was 76.43%. The cost of the vaccines was covered 96% by the National Institute of Public Hygiene (NIPH) and 4% by the parents.

Conclusion: These results encourage both the feasibility and the continuation of such an activity for the protection of children in a country that is struggling to eliminate dog rabies. Its implementation and sustainability at the national level requires collaboration between all actors in this sector for the well-being of children.

Keywords: Rabies; Pre-exposure prophylaxis; Vaccination campaign; Children; Cote d'Ivoire

INTRODUCTION

Rabies is a viral disease that almost always results in death at the first sign. Rabies is the tenth most deadly infectious disease in the world and remains one of the most serious diseases that can be transmitted to humans. The dog remains the potential and main vector of transmission of the disease to humans in 99% of

cases. According to the WHO, this zoonosis affects more than 150 countries in the world and it is estimated that more than 59,000 deaths occur annually [1]. This global threat remains neglected or underestimated in developing countries where the most vulnerable populations are those living in poor rural communities [2,3]. In Africa, the rabies virus represents a constant threat to the population, with one person dying every

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20 minutes [4]. Although all age groups are affected, children, especially those aged 5-14 years, account for 40% of annual rabies-related deaths [5].

Côte d'Ivoire is no exception to this global problem and is currently a high-risk country for rabies. It has recorded a continued increase in human rabies deaths over the period 2017 to 2022 with at least 131 officially reported deaths, 49% of which were children. The disease is largely unknown and the population is not sufficiently informed about risk prevention measures, particularly dog vaccination and pre-exposure prophylaxis for these at risk populations [6].

Information, education and behavior change being long and medium term processes, pet owners have not yet understood the need to vaccinate their pets for canine rabies control [7]. In the absence of regular mass vaccination campaigns for domestic and stray carnivores, pre-exposure vaccination against rabies could be an alternative means of prevention for children in Côte d'Ivoire.

In this context, a pre-exposure rabies vaccination campaign was organized in several elementary schools in the country.

The objectives of this study are to evaluate this campaign conducted in four (4) health districts of Côte d'Ivoire and to propose mechanisms for its sustainability.

MATERIALS AND METHODS

Framework of the campaign and study

The study was conducted at the National Institute of Public Hygiene's Antirabies Center, whose missions are as follows:

- Management of exposed individuals according to current protocols and pre-exposure vaccination of at-risk individuals
- Behavior Change Communication (BCC) for the population, especially pet owners and victims of bites, scratches or other contacts that may be a risk.
- The organization and coordination of epidemiological surveillance activities of human rabies throughout the national territory in collaboration with the health districts through the communal, regional and departmental branches of NIPH.

The vaccination campaign was co-organized by the Ministry of Health, Public Hygiene and Universal Health Coverage and the Ministry of National Education and Literacy. It took place from January 1 to February 28, 2016 in four (4) pre-school and primary schools namely:

- School group Andokoi 1 in the health district of Yopougon East;
- Akouedo school group camp in the health district of Cocody-Bingerville;
- Attécoubé 1 school group in the Attécoubé_Plateau_Adjamé health district;
- Amakebou school group in the Agboville health district.

The choice of schools was made in a reasoned manner. However, the elementary school in Attécoubé was chosen following the death of a student from rabies.

Type and period of study

This was a descriptive cross-sectional study conducted from February 2 to June 2, 2022 using the database and activity report from the vaccination campaign.

Survey population

This study concerned all the files and the activity report from the vaccination campaign during the study period. The vaccination was organized according to the protocol of three (3) doses (D0, D7, D21) in intramuscular specific to the preventive vaccination in pre-exposure. Thus, the subject is considered completely vaccinated if all three doses have been administered. Discontinuation of prophylaxis is defined as the administration of only one or two doses of rabies vaccine during the campaign.

Data collection

The information was collected on survey forms designed for this purpose. The source of our data was the database, the activity reports and the scorecards of this campaign.

Measured variables

For the realization of this study, three (3) types of variables were used:

- Socio-demographic characteristics (gender, age, level of education, locality)
- Vaccination compliance (complete vaccination and dropout)
- Evaluation of the organization of the vaccination campaign (cost of resources allocated, strengths and weaknesses of the vaccination campaign).

Data analysis

The analysis of the results was done with the software epi info version 3.5.4. Word and Excel software were used for document entry and table design.

Ethical and administrative considerations

The survey began after obtaining the authorization of the Director of the National Institute of Public Hygiene. Confidentiality was respected. Each subject was assigned an identification code. Participation in the interviews was voluntary and obtained after the informed consent of the actors of this campaign.

RESULTS

Distribution of students by age

At the end of this campaign, 751 pupils in the four (4) schools and preschools benefited from the vaccination. Among these students, 673 (89.60%) were between 6 and 14 years old and were at the primary level. Only 78 (10.40%) were between 0 and 5 years of age and were in early childhood (preschool). In terms of gender, the proportion of girls (51%) was almost identical to that of boys (49%) (Table 1).

Table 1: Distribution of students by health district and age group.

Variables		Headcount	Percentage (%)
Distribution of school groups by health district			
Yopougon	Andokoi 1	230	30,60
Cocody-Bingerville	Akouédo camp	130	17,3
Adjamé-Plateau-Attécoubé	Attécoubé 1	231	30,80
Agboville	Amakebou	160	21,30
Total		751	100
Socio-demographic characteristics of students (n=751)			
Age	5 years old	78	10,4
	6-years old	673	89,60
Total		751	100
Sex	Male	368	49
	female	383	51
Total		751	100

Distribution of students by vaccination compliance

Most students 574 (76.43%) had received all three doses. However, 177(23.57%) students had not followed the vaccination protocol and 1.19% had not started the vaccination (Table 2).

Table 2: Distribution of students by vaccination compliance.

Anti rabies treatment		Head count	Percentage (%)
General information on vaccine compliance			
	Complete vaccination	574	76,43
vaccine compliance	Abandonment of vaccination	177	23,57
Total		751	100
Specific information on vaccination compliance			
	After the first dose (D0)	9	1,19
	After the second dose (D7)	113	15,05
Level of vaccination abandonment	After the third dose (DJ21)	55	7,33
Total		177	23,57

Cost of resources allocated to the campaign

In this study, the supply and availability of inputs, particularly the rabies vaccine, was made possible by a \$30,090.24 (96%) subsidy from the INHP and a \$1,253.76 (4%) contribution from parents.

DISCUSSION

The main limitation of this study was the missing data due to its retrospective nature (logistics, human resources).

This study is the first to document the experience of a pre-exposure vaccination campaign against human rabies in Côte d'Ivoire. The results of this study showed that mass pre-exposure vaccination of children is possible in the country. This is a major contribution to the achievement of the goal of zero rabies deaths by 2030.

Children under 15 years of age are the most vulnerable and should be the first to benefit from pre-exposure prophylaxis [8,9]. In all locations where the campaign was conducted, adolescents were the most represented (89.61%). There were as many girls (51%) as boys (49%). This gender parity in primary education is explained by the fact that the Ivorian public service has made education a fundamental right for all children without distinction of gender [10].

In terms of vaccine compliance, the majority of students had received all doses of vaccine, i.e., they had kept all appointments in 76.43% of cases. However, 23.57% of students had dropped out of pre-exposure prophylaxis and 1.19% had not started it. This good compliance reflects the acceptability of this activity by parents and educational authorities, and could be explained by the improved financial and geographical accessibility of the vaccine. Indeed, 96% of the direct costs were borne by the INHP and the doses were directly available on site, avoiding the indirect costs associated with people's travel to the vaccination centers. Similarly, the N'Guessan study showed that free vaccine significantly reduced the dropout rate for rabies prophylaxis [11]. It should also be noted that free vaccination alone does not guarantee good compliance.

In this study, it was found that as the vaccination campaign was prolonged, the proportion of dropouts increased at D7 and D21. This result is consistent with N'guessan's study which showed that about half of the people receiving rabies prophylaxis dropped out after the first few doses. It would therefore be appropriate to combine awareness sessions with all vaccination campaigns in order to obtain optimal adherence as recommended by Tiembré.

This mass pre-exposure rabies vaccination campaign was co-organized by two ministries as part of the "one health" approach. However, it lacked the participation of national and international NGOs. This could be explained by the fact that rabies remains a neglected disease that affects only the poorest communities. It is virtually ignored in the funding of global and national organizations [12]. Indeed, in this study, the supply and availability of inputs, particularly the rabies vaccine, the subsidy

of the vaccine by the NIPH in the amount of \$30,090.24 and the contribution of the parents of the students, which amounted to \$1,253.76.

This is not the case for vaccination campaigns for other diseases where organizations join their efforts to the ministries of guardianship during the National Day of Vaccination by contributing more than one million dollars. Not to mention the efforts of public services that provides logistics and personnel for the success of the campaign [13]. These comments are supported by Somé, who has shown that in several countries, campaigns are managed by several sectors [14].

CONCLUSION

This study on the organization of a pre-exposure vaccination campaign for children has shown that the improvement of the geographical and financial accessibility of vaccines has made it possible to obtain good adherence and good vaccination coverage in the fight against human rabies in Côte d'Ivoire. The findings of this study demonstrated that widespread pre-exposure immunization of children is feasible in this nation. This makes a significant contribution to the 2030 goal of eliminating all cases of rabies consistent with N'guessan's study, which revealed that after the first few doses, about half of those receiving rabies prophylaxes discontinued.

However, the dropout rate (23.57%) remains quite high, which is why it is important to maintain sustained awareness before, during and after the campaigns and requires a policy of upstream multi sectorial collaboration among all stakeholders.

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