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Epidemiological Profile of Pet Bites and Rabies Cases from 2005-2015: Case of the City of Lubumbashi in the DRC

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Abstract

Introduction: Rabies, a neglected disease, could be grossly underreported in the DRC; in the absence of post-exposure prophylaxis, the WHO estimates that this disease would cause 327,000 deaths per year in Africa and Asia. The objective of this study is to determine the epidemiological profile of this zoonosis in order to encourage decision-makers to develop national strategies for its elimination. **Materials and Methods:** We conducted a cross-sectional descriptive study. Data collection was done retrospectively and in total6 420 victims of bites received during the period between January 2005 and December 2015 at the anti-rabies center in Lubumbashi were included in this work. Excel 13 software and Epi info 3.3.4 were used for data analysis and interpretation. **Results:** People over the age of 15 are the main victims of canine bites (62.1%), more than half of the victims are male (55.9%); dogs represent the majority of biting animals (96.4%) of which around 3/4 are unvaccinated (71.37%). Two municipalities are more affected: Lubumbashi (prevalence 83.35/100,000 and Kampemba (Prevalence 51.74/100,000). LBite peaks were observed from July to October (p = 0.01). For the 34 people seen with clinical signs of rabies encephalitis (confirmed case of rabies), the case fatality rate was 100%. **Conclusion:** Rabies is a major problem in Lubumbashi but its extent is different depending on the municipality. The dog is the main biting animal and the vaccination coverage of dogs remains very low. Access to rabies vaccine for bite victims is difficult. Its elimination remains possible through the implementation of an extensive canine vaccination program, the

awareness of owners and the large-scale provision of post-exposure prophylaxis.

Keywords

Epidemiology, Bites, Rabies, Lubumbashi

1. Introduction

Rabies is lethal encephalitis induced by neurotropic viruses to RNA belonging to the Rhabdoviridae family and to the Lyssa virus genus. It is a zoonosis transmissible to humans by bite, scratch, licking on a wound from a rabid animal, by projection of infectious material on the mucous membranes or by tissue graft from an infected patient [1]. Three genotypes of lyssa virus are endemic: genotype 1 or rabies virus, which infects non-flying terrestrial animals [2]; and genotypes 5 and 6 respectively European bat lyssa virus type 1 (EBLV-1) and 2 (EBLV-2) [3]. Rabies is endemic in sub-Saharan Africa and in the Democratic Republic of Congo in particular.

Rabies poses a significant threat to human health, the population at risk is estimated at more than three billion in 150 countries [4], unfortunately only one case is reported out of 160 [5]. This contagious and deadly disease kills more than 150 people every day and about 40% of bite victims are children; Also because of this high lethality, 60,000 deaths per year worldwide [6]; and the enormous economic cost it generates, such as in China and the USA with respectively more than 15 million and 16,000 to 39,000 victims supported in post-exposure [7]; as well as in the Americas region approximately 2 million doses of post-exposure prophylaxis administered annually to bite victims in the Americas region [8]; the global cost of rabies is estimated at 3.7 million DALYs and the financial cost at 8.6 billion dollars [1]; it represents a major public health problem. The purpose of this study is to draw an epidemiological profile, to collect data likely to support the arguments in favor of the creation of a program of control against rabies, to formulate recommendations for close monitoring of this zoonosis in Lubumbashi.

2. Patients and Methods

2.1. Study Site

The study was carried out from January 2005 to December 2015 at the Office Vaccinogène de Lubumbashi located in the city of Lubumbashi. The latter, although also administrative, is a mining town, made up of 7 municipalities. The city is located in the province of Haut-Katanga, Democratic Republic of Congo and has a vaccinogen office, a service producing vaccines for human use, which no longer manufactures the rabies vaccine produced on nerve tissue (NTV) for compliance reasons [9]; lack of funding. The Office has a functional anti-rabies

centre, however the statistics of canine populations are not known by the town's veterinary services.

2.2. Type of Study, Methods of Data Collection and Analysis

This is a cross-sectional descriptive study. The study took into account data included from all bite victims received at the rabies center from January 2005 to December 2015. Were excluded in the analyses; cases whose commune of origin was not specified and dogs with unknown vaccination status (strays). The most used variables for our study are: age in months, sex, origin, vaccination status. Data collection was carried out using registers outpatient and curative consultation, and treatment sheets for bite cases. Data entry and analysis were performed using Excel 13 and Epi-infos 3.3.4 software.

3. Results

Figure 1 on the sex of bite victims shows that for a total of 6420 cases of bites recorded during the study period, 2822 (*i.e.* 43%) are female and 3589 (*i.e.* 57%) male with a sex ratio of 2.2/1.8.

Table 1 on the age group of bite victims shows that people aged 15 and over (62.1%) are the most affected by bites, followed by those whose age is between 5 and 14 years (30.89%).

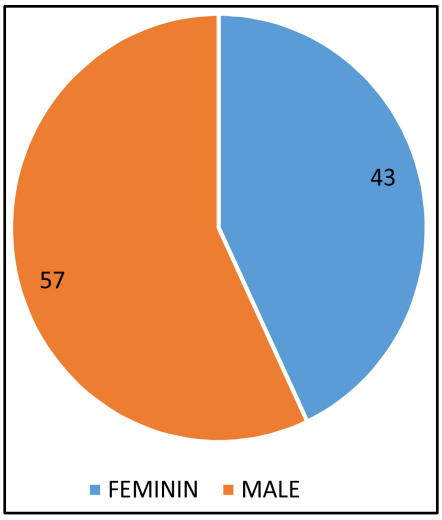

Figure 1. Breakdown by sex of bite victims.

Table 1. Breakdown of bite victim age groups.

Age groups	Number of cases	Proportion	p-value
0 - 4 years old	421	6.56	
5 - 14 years old	1983	30.89	
≥15 years old	3987	62.1	0.001
Unspecified	29	0.45	
Total	6420	100	

Table 2 explains that the communes having notified the most cases are urban, Kampemba (27%) and Lubumbashi (24.4%) compared to the Urbano-rural commune Annex (15.9%), the daily average is two bites.

When we look at Table 3, concerning the type of biting animals; dogs represent the majority with 96.4% of cases, followed by cats (2.82%).

Figure 2 on the vaccination status of biting animals shows that 68.8% are non-vaccinated dogs.

The results presented in Figure 3 on the frequencies of cases show a upward

Table 2. Residence (commune) of the biting animal.

Commune	Number of cases notified	Percentage %
Annex	1354	21.09
Kamalondo	262	4.08
Kampemba	1734	27
Katuba	678	10.56
Kenya	254	3.96
Lubumbashi	1570	24.45
Rwashi	486	7.57
Unspecified	82	1.28
Total	**6420**	**100**

Table 3. Distribution according to the types of biting animals.

NOT	Animal	Number	%
1	Dog	5990	96.40
2	Cat	175	2.82
3	Monkey	36	0.58
4	Mouse	10	0.16
5	Pork	2	0.03
6	Bat	1	0.02
	Total	**6214**	**100**

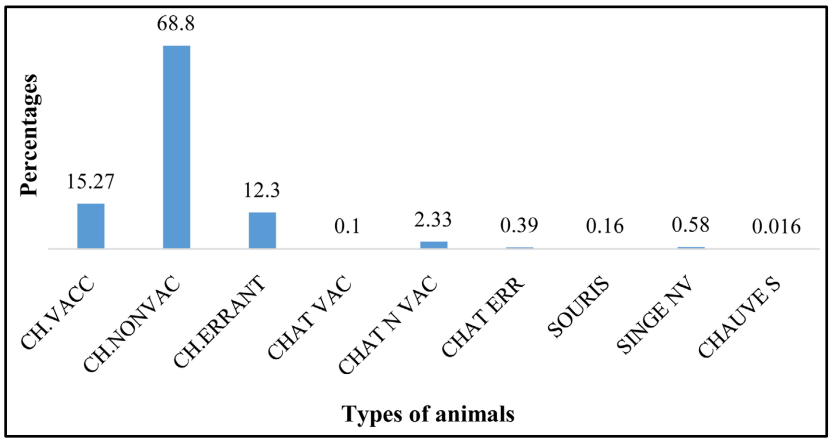

Figure 2. Vaccination status of biting animals.

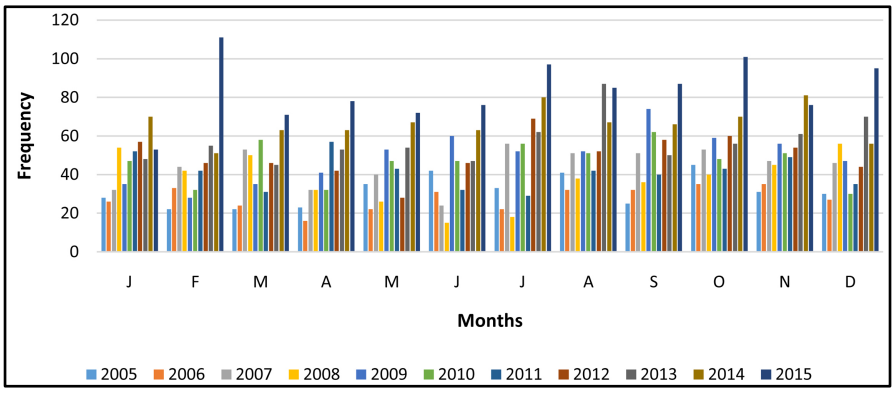

Figure 3. Frequencies of bite cases per month.

evolution of cases per year; the period of monthly peaks was observed from July to October; and the difference is statistically significant (p = 0.01).

4. Discussion

We find that people aged at least 15 are more affected and represent 62.1% of cases (p = 0.001). The proportion of children aged 0 - 4 years is 6.56% because they are better protected by their parents. This result is consistent with that of the study conducted by Ponsich A *et al.* in 2016 [10] where the average age of bite victims is 20.8 ± 18 years; unlike the study conducted in Ethiopia by Ramos J. M. *et al.* [11], in which children under the age of 15 were more exposed to dogs (94.9%) than adults (88.7%) (p = 0.01). Rabies is most common in children under the age of 15 in average, 40% of post-exposure vaccinations are given to children aged 5 to 14 and the majority of vaccinated individuals are boys [12]. Talking about the gender variable of bite victims; our study shows that it is more the male sex that is more concerned. In effect; out of 6420 cases of bites, reported in our series, 3589 (*i.e.* 55.9%) are male and 2822 (*i.e.* 43.96%) female with a sex ratio of 2.2/1.8. This result confirms that of the study conducted in Spain by R Gallart M *et al.* 2002 [13] who found that more boys were bitten than girls (2.75/1), as well as other studies done in china by Yin C *et al.* 2012 and Guo W *et al.* 2015 [14] with respectively 2.32/1 and2.41/1 male/female sex ratio This would be explained by the fact that it is adults or children, the male sex is less cautious and often provokes dogs. As for the biting animal, our study shows that it is essentially the dog that is the main cause in 96.4% of cases. This result supports the various studies conducted in china [11] [15] [16] [17] and in several African countries such as Ethiopia [7] and in Ivory Coast [5] with respectively (93.4%) and (90.8%). This could also be explained by the fact that, culturally, the dog is the pet of choice in this specific environment. In addition, the vaccination coverage of the dogs in our study is only 15.27%; it is like the study conducted by Tiembre I *et al.* [5] who found that only 3.2% of these animals had a valid vaccination card. In Nigeria Eke CB *et al.* [18] found that 52.3% of biting dogs had unknown vaccination status. In Kinshasa, 100% of biting dogs were unvaccinated [19].

The so-called heat periods of dogs coincide with the high prevalence of cases observed from July to October. This is consistent with other studies Hang Zhou *et al.* in 2016; Guo W *et al.* 2015 [14] [20]. Similar studies have shown that the hot summer and autumn seasons record high reported incidences of rabies with 66% of annual cases Jianping R *et al.* 2015 [21] as well as a peak of 41% PEP during the summer [22].

5. Conclusion

Rabies remains a major public health problem in Lubumbashi, but its extent is different depending on the municipality. Regarding the vaccination coverage of dogs, it remains very low and access to rabies vaccine for victims of difficult bites; however, to eliminate rabies, the authorities must imperatively create a rabies control program, educate the population and support partners, make canine vaccination mandatory, and make rabies vaccine available for bite victims.

State of Current Knowledge on the Subject

- Post-exposure support exists;
- Dog vaccination coverage is high elsewhere.

Gap of Our Study to Current Knowledge

- Epidemiological profile of pet bites and cases of rabies in the city of Lubumbashi is known;
- Trend of canine bites on the increase in Lubumbashi DRC;
- Need to operationalize the one health approach in order to eliminate rabies.

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Author Contributions

ANK designed the study, collected, analyzed the data and wrote the manuscript; PMC, GK, CM, JCM, CY, ANK, AM and contributed to the literature review, data analysis, writing the manuscript. OLN and EMS have read and framed the writing of the article. All authors have read.

Ethical Approval and Consent to Participate

Ethical approval was obtained from all participants who provided written informed consent before participating.

Competing Interests

The authors declare that they have no competing interests.

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Abbreviations

RNA: Ribonucleic Acids; DALY: Number of Disability Corrected Life Years; EBLV-1: European Bat Lyssavirus type 1; EBLV-2: European Bat Lyssavirus type 2; NTV: Nerve Tissue Vaccines; WHO: World Health Organization; OVL: Vaccinogenic Office of Lubumbashi; PEP: Post-Exposure Prophylaxis; Ground floor: Democratic Republic of Congo.