
Human rabies in Lebanon: lessons for control

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SUMMARY

Human rabies is known to be endemic in countries bordering Lebanon, but its prevalence in Lebanon has not been studied before. All eight cases of human rabies reported to the Lebanese Ministry of Public Health between 1991 and 1999 were reviewed, as well as three other cases admitted to the American University of Beirut Medical Center. A total of 1102 cases of animal bites to humans, the majority of which were dog bites, were reported to the Ministry of Public Health between 1991 and 1996. In this period, 2487 doses of rabies vaccine were administered to the above group, as post-exposure prophylaxis. Veterinarians, a high risk and educated group, were interviewed, and only 7 out of 72 were found to have been vaccinated. Major improvements in surveillance and reporting, better control of animal rabies, more awareness especially among high risk groups, and regional cooperation, are all needed to prevent and control this deadly infection.

INTRODUCTION

Rabies, one of the most feared and oldest infections on record, continues to be an invariably fatal disease [1]. The estimated global incidence is around 35000–50000 cases per year [2]. The infectious agent, rabies virus, belongs to the *Lyssavirus* genus of the *Rhabdoviridae* family. It is a bullet-shaped, single stranded, negative-sense, non-segmented RNA virus, consisting of a nucleocapsid containing the nucleic acid, and covered by an outer lipid-containing envelope. It is found in both domestic and wild animals, and is transmitted to humans through close contact with animal saliva [3]. Human-to-human transmission has been reported to occur through corneal grafts [4, 5].

The incubation period can be as short as 4 days and up to 19 years, but it is usually between 20 and 90 days [6]. After gaining entrance through the skin, the virus

is believed to replicate in muscles first. This is followed by an ascent through peripheral nerves, until the virus reaches the central nervous system, when the prodromal symptoms appear, which include malaise, fatigue, headache, nausea, vomiting, diarrhoea, anxiety, irritability, and depression [7]. The prodromal phase usually lasts 2–10 days, following which the acute neurological period occurs, that could be either furious rabies, predominantly manifested by hyperactivity, or dumb, paralytic, rabies [8]. Death ultimately occurs within the first 7 days of the acute illness.

Animal rabies is known to be endemic in countries bordering Lebanon, mainly Syria and Israel [2, 9]. Although human rabies is a reportable disease in Lebanon, few cases have been reported to the Lebanese Ministry of Public Health (LMOPH), and the true incidence of this disease in Lebanon has never been evaluated before.

The purpose of this study was to determine the

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Table 1. *Cases of human rabies reported to the Lebanese Ministry of Health (1990–9)*

Date of report	9/92	9/92	10/92	11/92	11/92	9/95	12/95	6/99
Age (years)	61	Not known	11	Not known	Not known	Not known	9	77
Gender	Female	Female	Male	Female	Male	Male	Male	Male
City	Baalbeck	Baalbeck	Baalbeck	Not known	Baalbeck	Akkar	Rashaya	Baalbeck
Region	Bekaa	Bekaa	Bekaa	Bekaa	Bekaa	North	South	Bekaa
Vector	Dog bite	Animal bite	Dog bite	Animal bite	Animal bite	Dog bite	Dog bite	Dog bite
Bite site	Not known	Not known	On face	Not known	Not known	Not known	Not known	On hand
Incubation period	10 weeks	Not known	30 days	4 weeks	Not known	30 days	2 months	2 months
Clinical presentation	Not known	Not known	Hydrophobia, aerophobia, paralysis, coma, encephalitis	Not known	Not known	Encephalitis	Fever, photophobia, hydrophobia	Not known
Management	Wound care only	Not known	None	Not known	Not known	Not known	Not known	Rabies vaccine
Outcome	Death 12/92	Death	Death 5 days after symptoms	Death	Not known	Death, few hours post admission to hospital	Death	Death

prevalence of human rabies in Lebanon, the incidence of animal bites to humans as reported to the authorities and how they are managed, and to evaluate the immunization status of the veterinarians in Lebanon, who are a high risk group.

METHODS

Records from the American University of Beirut Medical Center (AUBMC), the largest hospital in Lebanon, that serves as a tertiary care medical facility, and a referral centre for many cases from all over the country, as well as records from the LMOPH, were reviewed. Records from AUBMC were reviewed from 1978, when all medical records were put on a computerized database, until June 1999. Other major hospitals were contacted and did not have any records of human rabies cases during this period. At LMOPH the records were checked from 1990, the year that marks the end of the civil war in Lebanon and the reorganization of the governmental structure, until June 1999. Records prior to 1990 were either misplaced or unavailable for review. Because the records at AUBMC contained more details than the records of the LMOPH, the cases were reviewed separately.

Information concerning animal bites, as well as post-exposure vaccination, were reviewed between 1991 and 1996 from the LMOPH records (records

after 1996 are not indexed yet). Veterinarians registered at the Lebanese Order of Veterinary Physicians were interviewed concerning their immunization status and their exposure to animal bites. Out of 99 registered veterinarians, 72 were contacted and interviewed, and the remaining 27 were either unavailable or did not respond.

RESULTS

In total, 8 cases of human rabies were reported to the LMOPH (Table 1), and 3 cases were diagnosed and admitted to AUBMC (Table 2). Ten out of 11 cases occurred in areas close to borders with neighbouring countries (Bekaa 6; North 2; South 2), but these are also farming areas and areas where wild animals such as foxes, hyenas, or jackals could be found and could be the wild reservoir of rabies. Only one case was reported from Beirut. The vector of infection, when mentioned, was invariably a dog bite. The incubation period varied from 11 days to 2 months, being shortest in the patient bitten over the left orbit (Table 2). The clinical presentation, when available, was similar among the different cases and included: hydrophobia, aerophobia, anorexia, agitation, fever, diaphoresis, up to paralysis and coma. Data concerning the management was available only from AUBMC patients. It included supportive care, isolation, benzodiazepines and antipsychotics, as well as rabies vaccine

Table 2. *Cases of rabies who presented to AUBMC, 1978–99*

Date	17/5/1985	15/6/1985	28/8/1987
Age (years)	50	25	18
Gender	Male	Female	Male
City	Tripoli	Tyre	Beirut
Region	North	South	Beirut
Nature of the lesion	Unprovoked bite by a stray dog (dog was killed on 2nd day)	Unprovoked bite by a stray dog	Dog bite
Bite site	Left orbit (lesion was sutured)	Face	Upper lip
Incubation period	11 days	3 weeks	23 days
Clinical Presentation	Tachypnea, hydrophobia, aerophobia, agitation, insomnia, fever	Severe hydrophobia, disorientation, agitation, fever	Hydrophobia, claustrophobia, aerophobia, fever, weakness, anorexia, profuse sweating
Management	Isolation. Diazepam, phenobarbital, haloperidol, ara-C*, rabies antiserum, rabies vaccine	Isolation. Ara-C, chlorpromazine, haloperidol, phenergan	Isolation. Lorazepam, chlorpromazine, tetanus toxoid and tetaglobin
Course in hospital	Not known	Comatose, febrile, areflexic, tachycardic, for 10 days after admission. Decerebrate posture	Not known
Outcome	Discharged against advice 36 h after admission, and deceased within 24 h of discharge	Death by cardiac arrest, 12 days post admission (5 weeks post bite)	Respiratory arrest 10 h post admission (28 days post bite)

* ARA-C, cytosine arabinoside.

Table 3. *Total number of animal bites to humans and number of exposed people, 1991–6*

	Number of observed animals*				Total number of bites	No. of people who received			Total number of vaccine doses delivered per year	
	Dogs	Cats	Rats	Other		Vaccine only	Rabies immunoglobulin	Both		
1991	99	5	18	0	Not known	122	Not known	Not known	Not known	350
1992	182	44	7	0	Not known	233	Not known	Not known	Not known	454
1993	143	12	36	4	82	198	73	33	54	347
1994	144	12	5	1	63	170	83	4	13	427
1995	128	4	19	3	49	154	63	8	NA	389
1996	184	4	29	8	86	225	93	26	28	520
Total	880	81	114	16		1102				2487

* Animals that were recognized and observed by the LMOPH after the bite.

and high titre rabies immunoglobulins. Ara-C was used on two patients. The outcome, when documented, was invariably fatal (10 deaths, 1 undocumented), and occurred a few hours to a few days after presentation.

A total of 1102 animal bites to humans were reported to the LMOPH between 1991 and 1996.

Table 3 shows the number of people exposed to animal bites who received vaccine, rabies immunoglobulin, or both, and the total number doses of vaccine issued by the LMOPH. The animals involved included dogs, cats, rats and others such as monkeys, donkeys, and foxes. It is worth noting that not all

those exposed to animal bites were given rabies vaccine.

Out of the 72 veterinary physicians interviewed, 7 admitted having received rabies vaccine, and 1 claimed to have received rabies immunoglobulin without vaccine (reason unclear). Out of the 7 vaccinated, 4 received it post-exposure, 2 received it as a personal preference, and 1 received it in France where he used to practice. Only 3 out of the 7 vaccinated received the recommended booster doses. Only one physician reported exposure to a dog bite, and did not receive any rabies immunization.

DISCUSSION

An annual average of 184 animal bites to humans (range 122–233) were reported to the LMOPH between 1991 and 1996. However animal bites were reported to authorities only when physicians had a high index of suspicion of rabies. We were able to identify 11 cases of human rabies in Lebanon (3 at AUBMC over 20 years, and 8 reported to the LMOPH since 1990). No pathological identification was made, and the diagnosis was clinical. These 11 cases may not reflect the true incidence of rabies in Lebanon and may underestimate the problem, since the reporting system is still not yet fully developed. The discrepancy between the number of people who received rabies vaccine and the total doses of vaccine given, i.e. a ratio of 2.26 doses/bite instead of 5 doses/bite, could be explained by either one of the following: some of the bitten people were lost to follow-up after receiving the first dose, and thus did not receive the appropriate boosters, or some of the animals involved were identified and labelled as non-rabid. It is noteworthy that both active and passive prophylaxis are provided free of charge by the LMOPH.

Human rabies is mainly secondary to canine rabies in Lebanon. In all of the 8 cases where the source animal was mentioned, a dog bite was identified. This could be due to the marked decrease of wild life population and to minimal human contact with wild animals. People with high risk exposure do not receive the recommended pre-exposure prophylaxis, as is manifested in the veterinarians, who belong to an educated high risk group. The outcome of human rabies is invariably fatal, and there is no effective treatment, despite the fact that some investigators have tried several drugs [10, 11]. Two out of the three patients at AUBMC received Ara-C, following reports

about its usefulness *in vitro* against the replication of rabies virus [12, 13], but both of them died.

Prevention remains the only tool to fight this deadly disease; the following measures should be undertaken. Post-exposure prophylaxis, which consists of local wound care, administration of diploid vaccine and rabies antiserum should be given. Health care workers and law enforcement authorities should be educated about the existence of rabies in Lebanon, modes of prevention, and availability of post exposure measures. They should be instructed how to handle, counsel, and channel people who sustain animal bites, to the national rabies control office at the LMOPH. Animal rabies should be controlled, through mass canine control and vaccination of dogs. This would be a very difficult task to undertake in Lebanon, given the high costs of such measures, and the wide geographic borders that Lebanon shares with neighbouring countries, allowing continuous inflow of wild animals. The practical approach will be to sensitize owners of domestic dogs to the need of animal vaccination, to control stray dogs by municipal authorities, and to initiate close regional cooperation between various countries. Although vaccination of other domestic animals such as cats, horses, cows, and sheep has been recommended [14], this attitude does not seem warranted in Lebanon, due to the lack of rabies cases in these animal species. Preexposure vaccination of high risk personnel such as veterinarians, shepherds, farmers, and others, should be strongly encouraged [15], and appropriate reporting and surveillance systems, to monitor the prevalence and efficacy of control measures should be introduced.

In conclusion, although several cases of human rabies have been reported, its exact prevalence remains unknown, because of the lack of an adequate reporting system. Dogs were the only vector of human disease in the reported cases and the most commonly reported animal bites to humans. Therefore, control of stray dogs is an essential part of any attempt to deal with human rabies in Lebanon.

Even though the reporting system in Lebanon is evolving, it still lags behind, and needs improvements in terms of documentation, more detailed information about the cases, and better follow-up of people exposed to high risk bites. Public awareness is crucial since prevention is the only option available. Veterinarians are an example of an educated high risk group who should receive antirabies prophylaxis, but most fail to do so.

Since the vast majority of cases that were reported

to the LMOPH or presented to AUBMC came from geographic areas with open borders to neighbouring countries, better regional coordination is needed in any serious attempt to reduce the risk of human rabies and to control the disease in Lebanon and in the region.

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