

Situation of Rabies in Ethiopia: A retrospective study 1990-2000

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Abstract

Background: Rabies in Ethiopia is primarily a disease of dogs. However, many people receive post exposure anti-rabies treatment annually all over the country. Most people are at increased risk of being exposed to rabies, as man-dog contact is very common in the country. In this retrospective study, information on the status of rabies over the period of 1990-2000 is presented. **Methods:** The occurrence of rabies in humans and animals was determined by reviewing the registers used for recording human and animal rabies cases and post exposure anti rabies treatments.

Results: The information indicated that 96.2 % of the animals examined were dogs and 92% of humans who received post exposure anti-rabies treatments were due to dog bites. A total of 2172 rabid animals' brains were examined of which about 90% were dogs, 5.3% cats, 2.9% cattle and 1.9% other animals. Moreover, 322 fatal human rabies cases were recorded and 95% of these were acquired from dogs.

Conclusions: This study demonstrated the importance of rabies as a public health problem in the country. Dogs are responsible in maintaining the continuous persistence as well as dissemination of rabies in the country. Therefore, regular intervention targeted at controlling stray dogs and administration of anti-rabies vaccination campaigns is strongly recommended. [*Ethiop. J. Health Dev.* 2002;16(1):105-112]

Introduction

Rabies is one of the oldest known and most feared human diseases recognized since the early period of civilization (1). It is one of the main zoonotic diseases caused by a virus and death nearly always follows once an animal or human has been clinically ill with disease (2, 3). The first suggested written reference about the disease was in the ninth century BC, when Hector was compared to an enraged dog in Homer's Iliad (4).

Rabies in Africa constitutes a serious public health problem (5-7). In Ethiopia it is an important disease that has been recognized for many centuries. The treatments recommended for people bitten by rabid animals mainly dogs

have been recorded in many Ethiopian medical books since the early 17th century (Sterleyn 1968 cited by Fekadu (8)). The employment of a wide variety of supposed cures by early traditional practitioners illustrated the well-established character of the traditional pharmacopoeia in the country (9). The early 19th century travelers including Edward Ruppel, Rochet d'Hericourt, A. d'Abbadie and others reported either seeing a rabid dog or people bitten by apparently rabid dogs and the first and only recorded rabies epidemic in Addis Ababa occurred in August 1903 (9). Furthermore, the continued existence of traditional medicine practitioners in the various parts of the country to date is a testimony for the significance of the disease in Ethiopia.

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Even more alarming is the detection of unique strain of the rabies virus in saliva of dogs that showed remission after the onset of the disease

in view of the danger it may pose to people who come in contact with healthy-looking dogs (10).

On the other hand, the isolation of two rabies related viruses, Mokola and Lagos bat viruses from domestic animals in Ethiopia by Mebatsion *et.al.*, (11) is of public and veterinary concern in view of the difficulty of proper diagnosis and lack of effective vaccines against these agents.

In Ethiopia many people receive anti rabies post exposure treatments annually due to the wide spread nature of dog rabies. There is, however, lack of sufficient information to scale the magnitude of rabies among domestic animals and also humans in the country. In this retrospective study we report the magnitude of rabies as seen in the Ethiopian Health and Nutrition Research Institute (EHNRI) Zoonoses Laboratory over the period 1990-2000. The main objective of the study is, therefore, to generate baseline information on the magnitude of rabies in the country, thereby to create awareness among policy makers and the public at large.

Materials and methods

Information about infection with the rabies virus in different animal species was determined by reviewing the registers used for recording those animals that were brought live or dead, quarantined or processed for rabies diagnosis at the zoonoses laboratory of the Institute during the period 1990 – 2000. The EHNRI Zoonoses Laboratory is one of the laboratories under the Infectious and other Diseases Research Department. It is the only laboratory in Ethiopia that produces the nervous tissue Ferme Type adult sheep brain anti rabies vaccine for use both in humans and animals. In addition, the laboratory provides post exposure anti rabies treatments and perform rabies diagnosis from brain samples of animals and humans.

The number of people that received post exposure anti rabies treatments during the same period was obtained by reviewing the records of people that came to the Institute being bitten by rabid or suspected rabid animals and sent mainly to the Minilik II and St. Paul hospitals that provide post exposure treatment for humans. The recorded data contains information on the following; identification number, date, name of patients, sex, address (region, zone, woreda, kebele, house no.), type of biting animal, date of bite, site of bite, vaccine given and health institution where vaccine is given.

For regions, the register utilized to record the distribution of the Ferme Type Vaccine both for use on humans and animals was used although it contains only data for the last five years.

The data for fatal human rabies cases was obtained from the records of people that came to the Institute in search of treatment after developing the signs and symptoms of rabies and those who finally died. Their relatives who were told to come back to the Institute for post exposure treatments confirmed their death. Rabies diagnosis on humans was based on clinical signs and history of animal bite. A simple univariate analysis was performed to generate frequencies and cross-tabulation of variables of interest.

Results

Canine rabies in Addis Ababa:

Rabies in dogs is well established in Addis Ababa with no decline in the annual number of confirmed rabid cases during the last 10 years (Table 1). From the total of 2667 brain samples examined from dogs during the period, 1951 (73.2%) were positive for rabies (Table 1). Dogs accounted to 96.2% (Table 2) of the 13889 total animals examined and represented 89.83% (Table 1) of the total brain samples that were found to be laboratory confirmed positive rabies cases.

Table 1: Percent positive brain of animals examined for rabies in Addis Ababa in ten years (1990-2000)

Year	Dog		Cat		Cattle		Others	
	Brain examined	No. (%) Pos	Brain Examined	No (%) Pos	Brain Examined	No (%) Pos	Brain Examined	No (%) Pos
1990/91	236	184(78)	13	9(69.2)	9	6(66.7)	2	0
1991/92	305	203(66.6)	17	13(76.5)	6	5(83.3)	9	4(44.4)
1992/93	167	83(49.7)	10	6(60)	4	3(75)	1	1(100)
1993/94	221	149(67.4)	8	5(62.5)	6	6(100)	2	0
1994/95	301	246(81.7)	14	12(85.7)	4	4(100)	6	5(83.3)
1995/96	240	150(62.5)	13	5(38.5)	5	4(80)	12	9(75)
1996/97	290	210(72.4)	20	10(50)	15	14(93.3)	5	3(60)
1997/98	394	327(83)	40	32(80)	13	9(69.2)	20	11(55)
1998/99	304	240(79)	19	14(73.7)	9	7(77.8)	11	6(54.5)
1999/00	209	159(76.1)	16	10(62.5)	8	5(62.5)	7	3(42.9)
Total	2667	1951(73.2)	170	116(68.2)	79	63(79.7)	75	42(56.0)
% Positive	2172	89.83		5.34		2.9		1.93

Cats

During the indicated 10-year period cats accounted for 5.35% of the total confirmed rabies cases and contributed to 2.62% of humans that took anti rabies post exposure treatments.

Other domestic animals

The occurrence of rabies in the various species of animals in Ethiopia is summarized in Table 2. Cattle represent the highest rabies cases i.e., (2.9%) among domestic animals followed by sheep, goats and donkey.

Wild animals

Hyena, jackal, mongoose and cerval cat were included among the wild animals examined for rabies during the period. From the total of 13 brain samples of hyena examined, 9 of them were laboratory confirmed rabies cases.

During the past 10 years period, there were 1951 (89.83%) dogs, 116 (5.34%) cats, 63(2.9%) cattle and 42(1.93%) other animals (that included sheep, goats, jackals, mongoose, cerval cat, cheetah and humans) among 2172 laboratory proven animal rabies cases.

Post exposure treatments and fatal human rabies cases

At the moment an average of about 2200 people received post exposure anti rabies treatments annually in Addis Ababa alone during the last ten years period of 1990 – 2000. During the same period post exposure anti rabies treatments were given to 22219 people in Addis Ababa alone.

A total of 322 reported human deaths due to rabies, were recorded at Zoonoses Laboratory of EHNRI with an annual range of 17 to 54

Table 2: total animals examined for rabies in Addis Ababa from 1983-1992/1990-2000

Species	Total	Number & (%) positive	(%) from total examined
Dog	13364	1951(14.6)	96.22
Cat	321	116(36.1)	2.31
Cattle	88	63(73.3)	0.62
Sheep	19	10(52.6)	-
Goat	6	3(50.0)	-
Donkey	10	8(80.0)	-
Horse	2	1(50.0)	-
Hyena	13	9(69.2)	-
Monkey	47	2(4.3)	-
Jakal	7	4(57.1)	-
Mongoose	2	1(50.0)	-
Rabbit	1	-	-
Cerval Cat	1	1(100)	-
Cheetah	1	1(100)	-
Civer Cat	1	-	-
Rat	3	-	-
Human	5	2(40)	-
Total	13889		

Table 3: Fatal human rabies cases in Addis Ababa and its surroundings in the period 1990-2000

Year	Age Group				Total
	1-14	15-49	50+	Unknown	
1990/91	8(32.0%)	14(56.0%)	3(12.0%)	-	25
1991/92	10(32.25%)	15(48.39%)	4(12.9%)	2(6.45%)	31
1992/93	9(37.5%)	10(41.67%)	4(16.67%)	1(4.17%)	24
1993/94	19(54.29%)	13(37.14%)	3(8.57%)	-	35
1994/95	16(29.63%)	32(59.26%)	5(9.26%)	1(1.85%)	54
1995/96	8(34.78%)	11(47.83%)	4(17.39%)	-	23
1996/97	23(48.94%)	22(46.81%)	2(4.26%)	-	47
1997/98	13(39.39%)	10(30.30%)	8(24.24%)	3(9.09%)	33
1998/99	5(29.41%)	7(41.18%)	5(29.41%)	-	17
1999/2000	15(65.22%)	11(47.83%)	7(30.43%)	-	33
Total (%)	125(38.82)	145(45.03)	45(13.98)	7(2.17)	322

Table 4: Sex and age distribution of fatal human rabies cases in Addis Ababa and its surroundings 1990-2000

Age Group	Male		Female		Total	
	No	%	No	%	No	%
0-14	80	64	45	36	125	39.7
15-49	67	46.2	78	53.8	145	46
50+	22	48.9	23	51.1	45	14.3
Total	169	53.7	146	46.3	315	100

cases. Among the reported fatal human rabies cases, 38.82% were children, 45.03% adults, 13.98% old people and 2.17% were of unknown age (Table 3) and 95 % of the fatal human rabies cases were due to dog bite.

The records show that death due to rabies was more frequent among the adults. According to sex distribution of cases, in children aged 0 – 14 years males were more affected than females while in the adult age group of 15 – 49 the number of female cases were more than the males while in the old age group the cases were more or less similar for both sexes. Overall, adults and males were more affected than females (Table 4).

In relation to the incubation period, the shortest recorded was 19 days with the bite on the face region and the longest 18 months and 8 days (Table 5) with a bite on the thumb of a ten years old boy bitten by a dog and started two injections of the Ferme type vaccine and stopped it to begin local holy water treatment.

Table 5: Time interval between bite and death due to rabies 1990-2000

Age group	Time interval (Days)					
	19-59	60-99	100+	Total	Unknown	Mean No. of Days
1990/91	11(44)	11(44)	3(12)	25	-	74.56
1991/92	17(54.8)	10(32.3)	4(12.9)	31	-	61.42
1992/93	12(50)	8(33.3)	4(16.7)	24	-	69.46
1993/94	21(60)	11(31.4)	3(8.6)	35	-	59.51
1994/95	26(48.1)	20(37)	7(12.9)	53	1(1.9)	76.32
1995/96	8(34.8)	9(39.1)	6(26.1)	23		104.7
1996/97	8(17)	15(31.9)	5(10.6)	28	19(40.4)	75.14
1997/98	12(36.4)	19(30.3)	4(12.1)	26	7(21.2)	71.62
1998/99	5(29.4)	7(4.2)	3(17.6)	15	2(4.8)	81.13
1999/2000	12(36.4)	11(33.3)	3(9.1)	26	7(21.2)	71.7
Total	132(41)	112(34.8)	42(13)	286	36(11.2)	

Discussion

All available data indicate that dogs are responsible in maintaining as well as dissemination of rabies in Ethiopia and primary cause for fatal human rabies cases.

Although many ill dogs were not brought for examination, the actual number of rabid dogs in Addis Ababa is expected to be higher in comparison to the large number of stray dogs roaming around in the streets. Moreover,

dogs contributed to 92.14% of the human rabies post exposure cases that necessitated post exposure anti rabies treatments. These findings are consistent with those recorded by Fekadu (8) and Ayalew (12) for the periods 1964-1975 and 1980-82 respectively.

On the other hand, there was no significant peak in the monthly distribution of rabid dogs. This information suggests that dogs appear to bite people at a constant rate throughout the year with constant risk of contracting rabies by humans from the bite of these dogs.

The number of people treated every month in Addis Ababa in 1941 because of bite by rabid dogs was about a hundred that increased to more than 3000 people in 1956 (15). During the period 1964 - 1975 on the average about 5230 people received post exposure anti rabies treatment annually all over the country (8). An average of about 2200 people received post exposure anti rabies treatments annually in Addis Ababa during 1990 - 2000 is however, considered as an underestimate of the actual problem.

Cats are the second most important sources of rabies for human next to dogs in Ethiopia. The occurrence of rabies in wild animals was evidenced by the presence of laboratory confirmed rabies cases in hyenas, jackals, mongoose, cervical cat and cheetah.

Although other domestic animals like cattle, sheep, goats and equines are involved, in all these species there was invariably a history of the animals having been previously bitten by a rabid dog. Hence, the occurrence of rabies in other domestic and wild animals could be due to spillovers of infection from canine rabies. However, Fekadu *et al*, (13) recorded possible human-to-human transmission of rabies in Ethiopia.

The recorded presence of rabies in domestic animals other than dogs and cats in the different regional states of Ethiopia for the year 2000 indicated that rabies is wide spread

in the country (14).

Distribution wise from the total of 322 fatal human rabies cases at least 21.1% of them were from Addis Ababa and 66.5% from areas around Addis Ababa, from the areas previously called Shoa region and the rest 12.4% were from other regions.

Generally, the incubation period is shorter when the bite is nearer to the head and longer with bites farther away from the brain. However, the site of localization of the bite, the severity of the wound and the amount of virus introduced into the bite wound are also known to influence the duration of incubation period (16), though an unusually long incubation period of at least 5 years have also been recorded (17).

Ayalew (10) indicated that the wide spread use of supposedly traditional anti rabies herbal remedies were aggravating mortality since most of the infected people were utilizing these remedies and some of those who started even vaccinations were persuaded locally by their relatives to discontinue the vaccination regime to start these herbal remedies.

Consistent to these findings, the majority of fatal human rabies cases recorded at EHNRI during the last ten years were taking some form of herbal remedies or holy water.

Fekadu (18) estimated that approximately 10,000 people die of rabies annually in Ethiopia that make the country one of the worst affected countries highest in the world. To that effect the recorded fatal human rabies cases is considered as an underestimate of the actual problem. According to the World Survey of Rabies (19), annual human deaths due to rabies in Asia and Africa was 33075 and 204 respectively. Considering specific countries in particular, human deaths due to rabies include; India 30000, Bangladesh 2000, Philippines 362, Mexico 15, Sudan 29, Egypt 23, and Uganda 12. In Africa, the highest recorded human death due to rabies for the

year 1998 was 43 reported from Ethiopia.

The distribution of a total of 40774.41 doses of human and 95160 doses of animal vaccine during the last 5 years period of 1996 – 2000 to the various regions is a strong indicator of the wide spread nature of rabies both in humans and animals throughout the country.

Conclusion and Recommendations

All the above findings illustrate that rabies is well established in Ethiopia. This may be attributed to a number of factors that include poor vaccination coverage of owned dogs, lack of regulations for impoundment and elimination of stray dogs and the presence of supposed traditional herbal remedies that are widely practiced all over the country.

All the data collected at EHNRI indicate the persistence of rabies in the country. The fact that dogs are responsible in maintaining the continuous persistence as well as dissemination of rabies in the country points to the need for instituting an intervention programme targeted at controlling stray dogs, mass dog vaccination campaigns at regular intervals and education to enhance public awareness.

Since rabies is endemic throughout the country, most domestic animals are highly exposed to the disease as a result of which man is in continuous danger of contracting the disease.

The occurrence of rabies in other domestic animals and wild animals could be due to spillovers of infection from canine rabies. Therefore, the relative importance of these species as reservoirs of rabies and sources of human infection could be considered low.

The utilization of herbal remedies whose efficacy has not been fully evaluated against rabies should be discouraged since it is aggravating mortality due to rabies. Health workers should advise and educate people bitten by rabid or suspected rabid animals (mainly dogs) to go to health institutions for

better management of the problem.

In general, the data on fatal human rabies cases is an underestimate of the actual mortality rate considering countrywide distribution since most deaths occur deep into peasant villages and cases are neither properly diagnosed nor recorded. Therefore, further wider scale prevalence study is needed to determine the actual magnitude of the problem to launch proper control strategy.

References

1. Bernard KW and Hattwick MAW; Rhabdoviridae; Rabies virus In: principles and Practice of Infectious Diseases; Mandell GL, Douglas RG and Bennett JE; eds, 2nd ed. 1985:897-909.
2. Bögel H, and Motschwiller E. Incidences of rabies and post exposure treatment in developing countries Bull. WHO 1986;64:883-887.
3. Fields BN, Knipe DM. In: Virology 2nd ed., Raven Press New York USA 1990:883-930.
4. Debbie JG. Rabies: an old enemy that can be defeated World Health Forum, WHO 1988;9(4):536-541.
5. Owolodun BY. Rabies in cattle in Northern States/Nigeria, Bull. Epizoot Dis Afri 1968;16:425-427.
6. Rweyemamu MM, Loretu K, Jakob H, Gorton E. Observation on rabies in Tanzania Bull Epizoot Dis Afri 1973;21:19-27.
7. Kitale P, Perry B, Barrat J, King A. Proceedings of the Southern and Eastern African Rabies Group (SEARG) Meeting, 4 – 6 March 1997, Nairobi, Kenya, 1997.
8. Fekadu M. Rabies in Ethiopia. Am J Epidemiol 1982;115:266-73.
9. Pankhurst R. An Introduction to the medical history of Ethiopia, The Red Sea Press. Inc. Trenton, New Jersey: 1990;93-101.
10. Fekadu M. Atypical rabies in dogs in Ethiopia. Ethiop Med J 1972;10:79-86.
11. Mebatsion T, Cox JH, Frost JW. Isolation and Characterization of 115 Street Rabies Virus isolates from Ethiopia by Using Monoclonal Antibodies: Identification of 2

Isolates as Mokola and Lagos Bat Viruses *Jou of Infectious Diseases* 1992;166:972-7.

12. Ayalew Y. Analysis of 159 human rabies cases in Ethiopia In: Kuwert E, Meirieux C, Koprowski H, Bogel H eds, *Rabies in the Tropics*. New York: Springer-Verlag 1985.

13. Fekadu M, Endeshaw T, Alemu W, Bogale Y, Teshager T, Olson JG Possible Human-to-human transmission of rabies in Ethiopia, *Ethiop Med J* 1996;34:123-127.

14. MOA. Ministry of Agriculture, Veterinary Services Annual report, 2000.

15. Schaller KF. Ethiopia. A Geomedical Monograph Springer-Verlag Berlin Heidelberg, New York, 1972:27.

16. Acha PN and Szyfrez B. Zoonoses and Communicable Diseases Common to Man and

Animals 2nd edition WHO Scientific Publication, 1987;(503):425-449.

17. McColl KA, Gould AR, Selleck PW, Hooper PT, Westbury HA, Smith JS. Polymerase Chain Reaction and other laboratory techniques in the diagnosis of long incubation rabies in Australia. *Aust Vet J* 1993;70(3):84-89.

18. Fekadu M. Human rabies surveillance and control in Ethiopia, *In: Proceedings of the Southern and Eastern African Rabies Group Meeting Nairobi, Kenya 4-6 March 1997*.

19. RABNET survey of Rabies for the year 1998 No 34 WHO Department of Communicable Disease Surveillance and Response WHO/CDS/CSR/APH/99.6, 1998.