

Original Research

Status of Canine Rabies in Addis Ababa and the surrounding Regions: A Five years Retrospective Study

Mesfin Aklilu*, Wegayehu Tadele, Endalkachew Birhanu, Abebe Getachew, Ebsa File, Alemnesh Hailemariam, Gebyaw Mola, Bethlehem Mebratu, Garoma Getahun, Gutu Kitila, Sintayehu Abdela, and Yimer Mulugeta

Ethiopian Public Health Institute

*Corresponding author

Mesfin Aklilu, Ethiopian Public Health Institute, Email: mesfinaklilu@yahoo.com

Submitted: 10 August 2021

Accepted: 23 August 2021

Published: 24 August 2021

ISSN: 2379-948X

Copyright

© 2021 Aklilu M, et al.

OPEN ACCESS

Keywords

- EPHI
- Quarantine
- Log book
- Post exposure
- Pre exposure

Abstract

Rabies is a looming threat to public health because rabid dogs bite humans, resulting in thousands of deaths every year. A five year data (2015 -2019) is used for the study. Animal rabies examination recording log book and laboratory result registration log book is applied to collect data. Out of 2,670 dogs subjected to quarantine at home, 2,608 (97.7%) were free of rabies whereas 31 (2.3%) were died and proven positive by a laboratory test (FAT). All 35 cats quarantined at home were free of rabies. Similarly, among 278 dogs and 8 cats quarantined in the EPHI facility throughout the study period, 91(32.7%) dogs and 4 (50%) cats died and tested positive by a laboratory test respectively. Out of 1464 canine, 85 feline, 49 bovine 12 equine 10 shoots, and 41 wild life samples brought to the EPHI rabies referral laboratory during the five years period, 1019 (69.6%) dogs, 39 (45.9%) cats, 25 (51%) bovines, 10 (83.3%) equines, 5 (50%) shoots, and 24 (58.5%) wildlife brain samples tested positive respectively. The standard laboratory diagnostic method adopted by the laboratory was FAT (Table 1). Out of 2917 dogs and 43 cats, clinically diagnosed in the Ethiopian public health institute, 2670 (91.5%) dogs and 40 (93%) cats were owned while 247 (8.5%) dogs and 3(7%) cats were stray respectively. As far as vaccination status is concerned, 731 (25%) dogs were vaccinated. Regarding cats, none of vaccination data is recorded in the Ethiopian public health institute.

INTRODUCTION

The major part of the global burden of dog-mediated rabies falls on Africa and Asia, where still an estimated 60,000 people die of the disease annually (Athingo et al., 2020), of which, at least 24,000 deaths per year are in Africa and 30,000 people in Asia (Yousaf et al., 2012). The WHO considers that canine rabies potentially threatens over three billion people in Asia and Africa (Tricou et al., 2016). Except for some islands, these continents record over 95% of the fatal cases of rabies worldwide (Ripani et al., 2017).

Rabies is a viral disease that affects warm blooded mammals. The virus shades in the saliva of clinically ill animals and is transmitted through a bite (M Aga et al., 2016). It has been established as a major disease only after multiple introductions during the colonial era; rabies continues to spread into new reservoirs and territories in Africa (Streicker et al., 2012)

Despite all mammals, domestic dogs are the main sources of exposure and primary transmitter of human rabies, especially in Afri-can and Asian where there is no or inadequate dog rabies control strategies (M Aga and Hurisa, 2016). Its transmission to humans depends on dogs' relation-ship with humans and on the density and immune status of the dog population (Fekadu, 1993).

Although the disease has been extensively studied in wild life populations in Europe and North America, the dynamics of rabies in domestic dog populations has been almost entirely neglected. It is estimated that the dog owner population varies in Ethiopia between 3-4 million. Dogs are kept for the purpose of prestige and guarding house-holds. Ethiopian people love raising dogs. Almost all families in rural areas keep one or two dogs. There is no legal proclamation which prohibits rising of dogs, or any enforcement in dog registration. As a result of this, rabies has been spreading all over the country without any control measures (Mariam, 1985).

Over the past 2 decades, demographic, economic and socio- political trends in Africa have increasingly favored the persistence and spread of rabies, while limiting the effectiveness of control measures (Cleaveland, 1998).

Diagnosis of the rabies infection in humans and animals is performed by a rapid and sensitive fluorescent antibody technique (WHO, 2018). It is the WHO and OIE recommended gold standard for the diagnosis of rabies in fresh or frozen brain samples (Duong et al., 2016). The main advantage of this test is that results can be obtained within 2 hr., but the requirement of specialist laboratories, properly immunized

well trained personnel, fluorescence microscope and rabies conjugate makes this technique relatively expensive (Singathia et al., 2012).

Empirical observation and models of the transmission of canine rabies indicate that rabies can be eradicated if 70% of the dog population is vaccinated repeatedly to achieve herd immunity (Deressa et al., 2010). Since the disease is almost invariably fatal once symptoms appear but can be prevented if post-exposure prophylaxis is received within a few days after the exposure (Sofeu et al., 2018).

The disease and its history can be traced back more than 5000 years ago (Lackay et al., 2008) (Rabies in small animals), and records in many Ethiopian medical books since the early 17th century evidenced that treatments were recommended for people bitten by rabid animals mainly dogs (Yimer et al., 2002a).

The Fermi type adult sheep brain nervous tissue vaccine produced at the Ethiopian Public Health Institute (EPHI) since 1940's. The country is still producing and using this long time WHO banned Fermi type anti-rabies vaccine for post exposure treatment. Regardless of its quality, there is limited supply of rabies vaccine and also lack of adequate, safe and effective PET and PEP biologics in public health. Whereas high quality vaccine may be available in some private facilities, the cost is prohibitive and cannot be afforded by public at large (M Aga et al., 2016). The five years retrospective study conducted in Addis Ababa and the surrounding regions, Ethiopia, showed how the rabies situation in the country is serious to attract concerned government parties so that appropriate monitoring mechanisms would be implemented in a timely manner (Aklilu et al., 2021), (Figure 1&2). Further-more, 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.

Methodology

- Animal rabies diagnosis registration log book: Name and full address of the owners of the responsible animal, vaccination status of the animal, full address of the

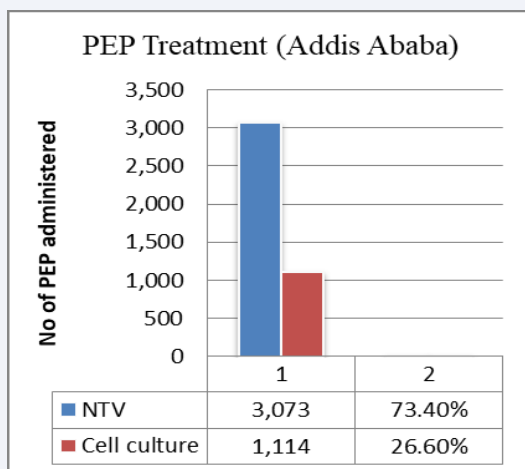


Figure 1 Post exposure prophylaxis Treatment in Addis Ababa. Source: Situation of Rabies in Ethiopia by (Aklilu et al., 2021).

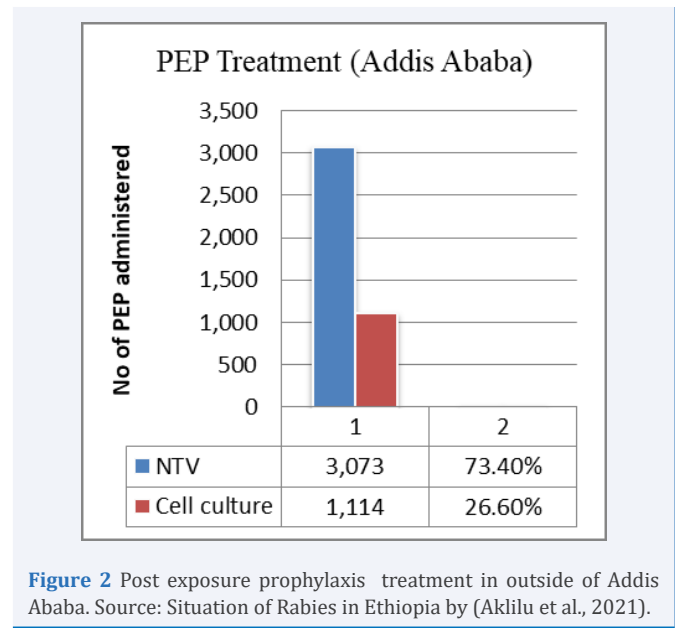


Figure 2 Post exposure prophylaxis treatment in outside of Addis Ababa. Source: Situation of Rabies in Ethiopia by (Aklilu et al., 2021).

victims, site of bite, and any treatment administered to the victims clinical diagnosis result.

- Quarantined animals and first aid treatment registration log book: This consists of data about ownership status of the animal that allows for decision either to control or observe the animal for ten days regarding owned dogs (Quarantine at home) or euthanizing the animal and confirming of the disease in the laboratory as far if the dog is unowned. It also consists of 10 days quarantine result. It also consists of data pertaining to wound care management, full address of both the owner of the animal and the victim to ensure proper follow up.

Data obtained from the aforementioned documents were entered into Epi Info version7 and transferred to SPSS version 20 for analysis. Descriptive statistics were used to analyze the data.

RESULT

Vaccination and ownership status

Out of 2917 dogs and 43 cats, clinically diagnosed in the Ethiopian public health institute, 2670 (91.5%) dogs and 40 (93%) cats were owned while 247 (8.5%) dogs and 3(7%) cats were stray respectively. As far as vaccination status is concerned, 731 (25%) dogs were vaccinated. Regarding cats, none of vaccination data is recorded in the Ethiopian public health institute (Table 1 & 2).

Diagnostic result of animals quarantined in EPHI and at home (Table 3)

Animals, commonly cats and dogs that bitten a human being or any other animal and visited our institute were advised to confine the responsible animal by its owner for 10 days as a precaution against the possibility that an animal may appear healthy, but actually be sick. Out of 2,670 dogs subjected to quarantine at home, 2,608 (97.7%) were free of rabies whereas 31 (2.3%) were died and proven positive by a laboratory test (FAT). All 35 cats

Table 1: Dogs under clinical observation & quarantine.

Year	Species	Ownership Status		Vaccination Status	
	Dog	Owned	Stray	Vaccinated	Unvaccinated
2015	869	857 (98.6%)	12 (1.4%)	110 (12.6%)	759 (87.4%)
2016	711	625 (89%)	86 (12%)	153 (21.5%)	558 (78.5%)
2017	552	484 (88%)	68 (12%)	117 (21.2%)	435 (78.8%)
2018	398	366 (92%)	32 (8%)	67 (16.8%)	331 (83.2%)
2019	387	338 (87.3%)	49 (12.7%)	284 (73.4%)	103 (26.6%)
Total	2917	2670 (91.5%)	247 (8.5%)	731 (25%)	2186 (75%)

Table 2: Cats under clinical observation & quarantine.

Year	Species	Ownership Status		Vaccination Status	
	Cat	Owned	Stray	Vaccinated	Unvaccinated
2015	22	20 (98.6%)	2 (9.1%)	-	22 (100%)
2016	9	9 (89%)	-	-	9 (100%)
2017	7	6 (88%)	1 (14.3%)	-	7 (100%)
2018	3	3 (92%)	-	-	3 (100%)
2019	2	2 (87.3%)	-	-	2 (100%)
Total	43	40 (93%)	3(7%)	-	43 (100%)

Table 3: Diagnostic result of animals quarantined in EPHI and at home.

Year	Dog				Cat			
	Quarantined at EPHI / Home				Quarantined /Result			
	EPHI		At Home		EPHI		At Home	
	Alive	Dead/Lab Result	Alive	Dead/Lab Result	Alive	Dead/Lab Result	Alive	Dead/Lab Result
2015	106	51 / +VE	712	7 / +VE	3	2 / +VE	17	-
2016	65	32 / +VE	614	9 / +VE	-	1 / +VE	8	-
2017	16	8 / +VE	528	4 / +VE	1	1 / +VE	5	-
2018	-	-	398	5 / +VE	-	-	3	-
2019	-	-	387	6 / +VE	-	-	2	-
Total	187	91 / +VE	2639 (90.5%)	31	4	4 / +VE	35	-

quarantined at home were free of rabies. Similarly, among 278 dogs and 8 cats quarantined in the EPHI facility throughout the study period, 91(32.7%) dogs and 4 (50%) cats died and tested positive by a laboratory test respectively (Figure 4).

Laboratory diagnosis of Rabies was conducted on brain samples collected from animals suspected of being rabid. Between 2015 and 2019, the Institute received a total of 1,661 brain samples. Out of 1464 canine (), 85 feline, 49 bovine 12 equine 10 shoots (), and 41 wild life samples brought to the EPHI rabies referral laboratory during the five years period, 1019 (69.6%) dogs, 39 (45.9%) cats, 25 (51%) bovines, 10 (83.3%) equines, 5 (50%) shoots, and 24 (58.5%) wildlife brain samples tested positive respectively. The standard laboratory diagnostic method adopted by the laboratory was FAT (Table 4).

DISCUSSION

Data collected in The Ethiopian public health institute human

rabies counseling and animal quarantine station revealed that, dogs are the primary cause of rabies in Ethiopia, followed by cats. Previous reports by (Yimer et al., 2002b), (Fekadu, 1993) showed that dogs are the primary cause of fatal human rabies cases and cats are the secondary cause, as well as being responsible for the maintenance and spread of rabies in Ethiopia. According to (Burgos-Cáceres, 2011), the disease is a looming threat to public health because rabid dogs bite humans, resulting in thousands of deaths every year. The WHO excerpt of rabies consultation committee expressed the situation as “in more than 99% of all human rabies cases, the virus is transmitted from dogs; half of the global human population lives in canine rabies-endemic areas and is considered at risk of contracting rabies” (“National programmes for the control of rabies in dogs;,” 2004).

Currently there is no functional quarantine facility in the Addis Ababa and surrounding veterinary clinics. In such circumstances, the veterinarian in each sub city veterinary clinic is responsible to

Table 4: Brain samples examined between 2015 – 2019.

Year	Result	Brain Examined		Bovine	Equine	Shoot	Wildlife
		Dog	Cat				
2015	+VE	222	2	5			5
	-VE	128	6	15	-	-	-
	Total	350	8	20	-	-	5
2016	+VE	181	4	7	2	3	3
	-VE	83	5	5	-	-	3
	Total	264	9	12	2	3	6
2017	+VE	198	12	6	4	-	2
	-VE	79	9	2	-	-	2
	Total	277	21	8	4	-	4
2018	+VE	188	13	6	-	1	3
	-VE	72	13	1	-	1	3
	Total	260	26	7	-	2	6
2019	+VE	230	8	1	4	1	11
	-VE	81	13	1	-	1	9
	Total	311	21	2	4	2	20

assess whether or not the exposing dog is vaccinated for rabies. If not, according to the protocol followed by EPHI, the veterinarian euthanizes the dog immediately and submits the sample to EPHI for laboratory confirmation. If the owner is unwilling to euthanize, strict quarantine for 4 months or longer without direct contact with people may be an option. The rabies guideline of the Ethiopian public health institute /EPHI/ advises to perform joint contact tracing by veterinary and public health professionals so as to identify the biting animal, quarantined for observation. The fact that, there is no treatment for rabies once manifesting the clinical signs, Dogs and cats, bovines, shoots, equine and other domestic animals, if bitten by a rabid animal, the veterinarians recommend to euthanize the animal and confirm the cause of the disease in the laboratory except for dogs and cats that were already immunized with pre exposure anti-rabies vaccine.

For any of these situations, if at any time during the quarantine period, signs suggestive of rabies developed (e.g., paralysis or seizures), the animal should be euthanized and submitted for rabies testing. The 10 days follow-up period demonstrates that not all biting dogs were afflicted with rabies. Under normal circumstances, it is customary for the Ethiopian community to have travel door-to-door from one house to another for cultural reasons and other religious norms, so that people around the area will easily be exposed to a dog bite. The violent behavior commonly noticed in male dogs during mating and breeding season that emanates from physiological reaction could also be taken as a reason for a dog bite. Besides, it is a common phenomenon that female dogs get nervous under normal circumstances and respond aggressively to anyone who tends to approach and steal their newly born puppies. Clinical diagnosis of rabies and animal quarantine results showed that more than 50 percent of the animals subjected to a 10 days quarantine period in EPHI were free of rabies unlike to those quarantined at home that exceeds by 40%. The possible transmission of the rabies virus from wild to domestic animals is explained by

the natural interaction that usually observed between the two animal categories such as in grazing areas, water points that could be considered as a potential factor to accelerate the spread of the disease in an alarming rate. The laboratory diagnosis of the suspected rabid animals that died during the quarantine period was confirmed by the direct fluorescent antibody test /DFAT/, and the cause of the death was rabies. Laboratory confirmation of rabies in clinically suspected animals is required for urgent decision-making on anti-rabies vaccination (PEP), which may prevent unnecessary treatment, as well as determining the local disease burden and ensuring that the disease is not prevalent in a declared region.

In order to scale up the rabies diagnosis service in Ethiopia, two regional rabies laboratories, in addition to the EPHI referral laboratory, were established in Tigray and Amhara administrative regions. This allows us to provide services at the regional level, improve rabies epidemic response in other areas of the country, and avoids unnecessary cost for shipment of the sample.

However, there are ongoing efforts to control Canine rabies through the joint effort of the ministry of health, ministry of agriculture, partner organizations such as CDC Atlanta, Ohio state university. These efforts are minimal and have little impact on rabies elimination due to Inadequate laboratory capacity, Inadequate Surveillance System, Inadequate inter-sectorial collaboration and partnerships between the animal and the human sector, Low awareness on rabies prevention and control of human and animal health workers, inadequate enforcement of laws and regulations, Absence of problem solving research on rabies and reliable data, and limited supply of anti-rabies vaccine especially in the human sector.

Progress made towards rabies control includes Prioritization of zoonotic diseases, Referral rabies diagnostic laboratory establishment under GHSA rabies program and inter sectoral collaboration such as establishment of zoonotic diseases technical working group (Rabies control effort in Ethiopia).

CONCLUSION

Conducting continuous rabies Surveillance in Ethiopia must be strengthened so as to better understand the epidemiology of the disease and its implications for global public health Cooperation among different stakeholders such as the ministry of health (MOH), the ministry of Agriculture (MOA), and CDC, WHO, FAO, and coordinated advocacy campaign's to make it back on agenda are crucial strategies to make the transition from effective control to elimination.

Strict Regulations in the area of dog population management including dog registration, vaccination of dogs and cat, and responsible dog ownership are critical factors in rabies elimination and control in countries like Ethiopia, where the disease is a major public health concern.

REFERENCES

- Aklilu M, Tadele W, Alemu A, Abdela S, Getahun G, et al. Situation of Rabies in Ethiopia: A Five-Year Retrospective Study of Human Rabies in Addis Ababa and the Surrounding Regions. *J Trop Med*. 2021: 1-7.
- Athingo R, Tenzin T, Shilongo A, Hikufe E, Shoombe K, et al. Fighting Dog-Mediated Rabies in Namibia-Implementation of a Rabies Elimination Program in the Northern Communal Areas. *Trop. Med. Infect. Dis*. 2020; 5: 12.
- Burgos Caceres S. Canine Rabies: A Looming Threat to Public Health. *Animals*. 2011; 1: 326-342.
- Cleaveland S, The growing problem of rabies in Africa. *Trans R Soc Trop Med Hyg*. 1998; 92, 131-134.
- Deressa A, Ali A, Bayene M, Selassie B, Yimer E, et al. The status of rabies in Ethiopia: A retrospective record review. *Ethiop J Health Dev*. 2010; 24.
- Duong V, Tarantola A, Ong S, Mey C, Choeng R. Laboratory diagnostics in dog-mediated rabies: an overview of performance and a proposed strategy for various settings. *Int J Infect Dis*. 2016; 46:107-114.
- Lackay SN, Kuang Y, Fu ZF. Rabies in Small Animals. *Vet. Clin. North Am. Small Anim. Pract*. 2008; 38:851-861.
- M Aga A, Hurisa B, Current Situation of Rabies Prevention and Control in Developing Countries: Ethiopia Perspective. *J Anc Dis Prev. Remedies*. 2016; 4.
- Mariam SH, Epidemiology of Rabies in Ethiopia. *Rabies in the Tropics*. Springer Berlin Heidelberg. 1985: 473-480.
- Mekonnen Fekadu. *Canine Rabies*. 1993.
- National programmes for the control of rabies in dog. WHO Expert Consult. *Rabies* 4. 2004.
- Ripani A, Mérot J, Bouguedour R, Zrelli M. Review of rabies situation and control in the North African region with a focus on Tunisia: -EN- -FR- Examen de la rage et de son contrôle en Afrique du Nord : situation dans la région et gros plan sur la Tunisie -ES- Repaso de la situación de la rabia y su control en la región del Norte de África, en particular Túnez. *Rev Sci Tech*. 36, 831-838.
- Singathia R, Dutta P, Yadav, R., Gupta, S., Gangil, R., Gattani, A., 2012. An update on rabies diagnosis. *Int. J. Agro Vet. Med. Sci*. 6, 229.
- Sofeu CL, Broban A, Njifou Njimah A, Blaise Momo J, Sadeuh SA, et al. Improving systematic rabies surveillance in Cameroon: A pilot initiative and results for 2014-2016. *PLoS Negl Trop Dis*. 2018; 12: e0006597.
- Streicker DG, Recuenco S, Valderrama W, Gomez Benavides J, Vargas I, et al. Ecological and anthropogenic drivers of rabies exposure in vampire bats: implications for transmission and control. *Proc. R. Soc. B Biol. Sci*. 2012; 279:3384-3392.
- Tricou V, Bouscaillou J, Kamba Mebourou E, Koyanongo FD, Nakoune E, et al. Surveillance of Canine Rabies in the Central African Republic: Impact on Human Health and Molecular Epidemiology. *PLoS Negl Trop Dis*. 2016; 10: e0004433.
- World Health Organization. WHO Expert Consultation on Rabies: third report, WHO technical report series. WHO. 2018.
- Yimer E, Newayeselassie B, Teferra G, Mekonnen Y, Bogale Y, et al. a. Situation of Rabies in Ethiopia: A retrospective study 1990-2000. *Ethiop J Health Dev*. 2002; 16:105-112.
- Yousaf MZ, Qasim M, Zia S, Rehman Khan Mur, Ashfaq UA, et al. Rabies molecular virology, diagnosis, prevention and treatment. *Virology*. 2012; 9: 50.

Cite this article

Aklilu M, Tadele W, Birhanu E, Getachew A, File E, et al. (2021) Status of Canine Rabies in Addis Ababa and the surrounding Regions: A Five years Retrospective Study. *J Vet Med Res* 8(2): 1209.