

Original article

Assessment of animal guinea worm infection intervention in Gog and Abobo woreda's of Gambella region, Ethiopia

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Introduction: Dracunculiasis (guinea worm disease) is caused by a parasitic worm called *Dracunculus medinensis*. Ethiopia is an endemic country since 2013. Dog, cat, and baboons are infected species. Proactive dog chaining intervention was implemented to interrupt transmission.

Objective: To assess animal guinea worm infection and interventions in Abobo and Gog Woreda, Gambella region, Ethiopia, from March to April 2019.

Methods: Cross-sectional study design was used. Data were collected using a semi-structured questionnaire interview with key informants in the program and community, facility-based document review, and observational methods. Data were analyzed using SPSS version 23.

Results: A total of 69 animal infections were reported in the Gambella region from 2013 to March 2019. Dog, cat, and baboon are found infected. Baboon infections reported only in Ethiopia (Table 1). Out of the total infections, 54 (78%) were dogs, and 9 (13%) Olive baboons. Most of the infections occurred in Gog woreda. Animal infection was increased from 4 cases during 2013 to 17 cases in 2017; but, the containment rate was still low 27 (39%). Animal welfare is not considered; no provision of balanced food and water, unable to naturally mate and reproduce; there is no proper housing protective from sun and animal attack. Of the total observed dogs, 175/352 (50%) were found with poor and medium body condition. There was no selection criterion to chain dogs. Out of 118 households interviewed around 46 (39%) of the owners had encounter the death of dogs during the intervention. Poor management of stray dogs, weak collaboration, animal welfare, poor reporting and documentation, lack of veterinary facilities are the major challenges assessed upon the program.

Conclusion: Animal guinea worm infection is increased over time, but the containment rate is low. Chaining intervention lacks welfare considerations. Government sectors were not responsible for animal infection and death. Communities are fighting against hunger and guinea worm. Addressing the challenges of the intervention must be considered as a top priority to enhance the effectiveness of the eradication program. The program should apologize to the community or compensate for the death of dogs.

Keywords: Animals, guinea worm, animal welfare, proactive chaining, Ethiopia

Introduction

Dracunculiasis (guinea worm disease) is caused by a parasitic worm called *Dracunculus medinensis*. Approximately 1 year after a person or an animal acquires infection from contaminated drinking water, the worm emerges through the skin, usually on a lower limb. (Donald 2017; Sandy 2002). The campaign to eradicate dracunculiasis worldwide began in 1980 at CDC. In 1986, the global Guinea Worm Eradication Program (GWEP) began assisting ministries of health in countries with endemic dracunculiasis. In 1986, an estimated 3.5 million cases occurred each year in 20 countries in Africa and Asia (CDC 2016; WHO 2019; Watts1986). After the global eradication program begins, the number of endemic countries was reduced to only 5 which are Chad, Ethiopia, South Sudan, Mali, and recently Angola. Dracunculiasis was rediscovered in Chad in 2010 after an apparent absence of 10 years (CDC 2010; Ebehard 2014). The global number of human infections in 2018 has fallen to 25 cases (WHO 2019). However, animal infection was persistently increased. From 2012 to 2018, there are a total of

3625 dogs and 31 cats infection reported in the world (GWEP 2019).

Ethiopian Dracunculiasis Eradication Program (EDEP) was established in 1992 and the elimination of the disease among humans seems to be to the end because no human cases reported since 2018; however, another challenging scenario has emerged with the occurrences of animal infection and it is increasing over time. Dogs, cats, and olive baboons were infected. Infection among olive baboons was the first to be reported in Ethiopia (Habtamu et.al. 2017). Unlike the other regions, dogs value greater than other livestock's; because of wider forestation and community lives close to the wildlife. Dogs are serving as a guardian, farm keepers, and hunting assistances.

The EDEP has applied different strategies interrupt transmission of the disease between animals; among the interventions; what is called "Proactive chaining or tethering of Dogs and Cats" is one of the major interventions recently implemented. However, there has been no comprehensive assessment conducted on

it. Besides, the intervention has faced a serious challenge including animal welfare, community acceptance, feeding, and animal death and the reason for the death of dogs has not been investigated and assessed. Since, the establishment and implementation of the intervention have not included veterinary professionals the animals' welfare issues are not properly maintained. The community awareness on animal guinea worm infection is not assessed. Finally, since dogs are playing a vital role in the community, losing the value of them due to chaining has compliance with the community. Therefore, a team was established from different sectors and assessed the overall progress of the animal guinea worm infection and intervention strategies that have been conducted by EDEP.

The team has assessed the animal infection, proactive chaining strategy/tethering, animal welfare issues, and cash reward awareness of animal guinea worm infection. The assessment will help to improve and fill gaps up on the interventions; by providing strong operational recommendations. As the global GWEP certification process criteria and according to WHO standard eradication definition; one country to be certified there should be the interruption of transmission GWD in humans and animals for three consecutive years or longer. In addition, the community and health care provider awareness on cash reward and the disease; including reporting sites and documentation of surveillance data is mandatory. So, conducting such kind of assessment is important to facilitate the certification process.

Material and Methods

A descriptive cross-sectional study was employed in Gog and Abobo woreda Gambella region, Ethiopia, from March to April 2019. *Animal tethering/proactive chaining Intervention*: It is intervened to control the movement of dogs and cats

or to be kept under the supervision of an owner until the guinea worm sign and symptom is shown or the worm is extracted and dogs are expected to be tethered for 1 year.

Households in Gog and Abobo woreda, Gambella region who are under animal guinea worm intervention program was the study population. A stratified random sampling technique was used. A total of 118 households were randomly selected and interviewed and 346 dogs and 10 cats were observed and assessed. Facility document review and questionnaire-based interviews with key informants in the program and the community and observational assessment tools were used to collect data.

Age, sex, and occupation, species of chained animals, animal body condition are some of the variables collected. Data were analyzed using SPSS version 23. Expertise from Zoonoses, Public Health Emergency Management, and Ministry of Agriculture was deployed. Ethical clearance was obtained from EPHI-IRB. Informed oral consent was taken. The questionnaire was translated orally by the local translators. Specific anonymity of the study participants was kept confidential.

Results

Animal Guinea worm infection: A total of 69 animals were found infected by guinea worm since 2013. Dogs, cats and baboons have identified and confirmed infected. Infection among *Olive baboons* was reported only in Ethiopia. Almost all of the infections (68/69) were reported in Gog woreda. Out of the total infections, 54/69 (78%) were dogs and 9/69 (13%) were *Olive baboons*. The overall animal infection containment rate during the last 6 years was 27/69 (39%); however, the containment rate was not improved after the intervention begins in 2018 which was 7/17(41%) (Table 1).

Table 1: Animal guinea worm infection in Abobo and Gog Woreda during 2013-2018, Gambella region, Ethiopia.

Year	Gog Woreda			Abobo Woreda			Total infection	contained infection
	dog	cat	baboon	dog	cat	baboon		
2013	3	0	1	0	0	0	4	0
2014	3	0	0	0	0	0	3	0
2015	13	0	1	0	0	0	14	4
2016	13	0	2	1	0	0	16	10
2017	11	0	4	0	0	0	15	6
2018	11	5	1	0	0	0	17	7

The trend of guinea worm infection among animals in Gambella region for the past 6 years is increased shown in (Figure 1).

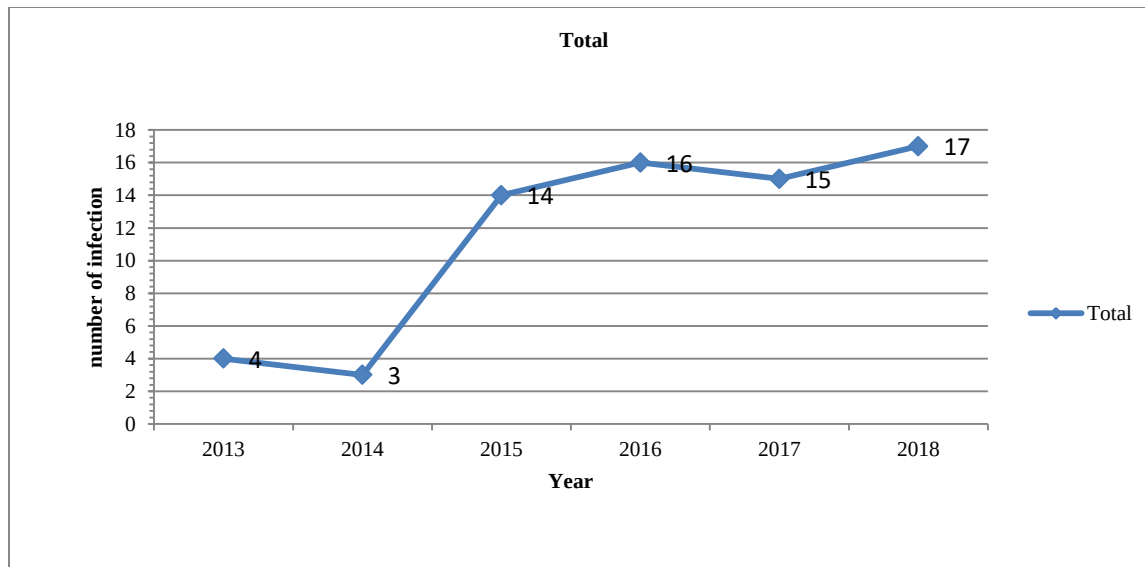


Figure1: Trend on guinea worm infection among animals in Abobo and Gog woreda, Gambella region, Ethiopia, from 2013-2018.



Figure 2: Picture showing an infected dog up on worm extraction, 2013-2018

Animal tethering intervention: Abobo and Gog woredas in Gambella region are two guinea endemic areas. There are 77 households in Abobo and 447 households in Gog under chaining intervention. Out of the total, 497 of them are implementing chaining of dogs and cats. A total of 118 individuals were interviewed; 22(18.6%) from Abobo and 96 (81.4%) from Gog. Most of the study participants 93 (78.8%) were females. Majority of the study participants were at the age group of 15 to 30 comprising 52 (44.1%). A total of 346 dogs and 10 cats were owned by the study participants; dogs are tethered with the range from 1 to 13 per household. Most of the study participants own with an average of 4 dogs per households.

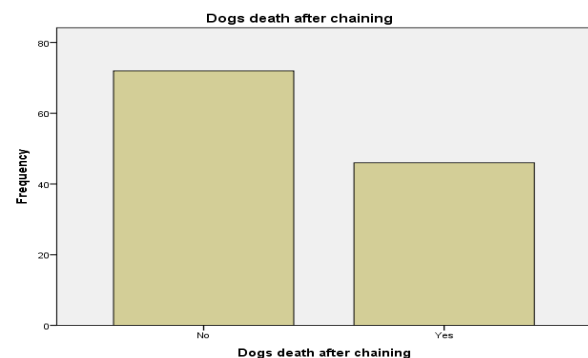


Figure 3: Percentage of dog's death after chaining in Abobo and Gog woreda, Gambella region, Ethiopia, 2013-2018

Interventional assessments: The program has providing only 4kg of maize and 2kg of lentil for dogs. Majority of the owners 61/118 (51.7%) didn't give additional food. Our result shows that there is no sufficient and quality of food provided for tethered dogs. Out of the total study participants, 46(39%) were reported death of dogs during the intervention

(Figure 3). A high number of death of dogs occurred and there was no any such death reported in the area before. Among the different reasons for the death of dogs, suffocation, feed change and stress due to chaining were some of the mentioned reasons by the communities (Table 3).

Table 3: Reasons listed for the death of dogs reported by the community in Abobo and Gog woreda, Gambella region, Ethiopia, 2013-2018

Possible Reasons	Frequency	Percentage	Remark
Died after showing signs and symptoms	24	20.3%	Bloody diarrhea, coughing, ectoparasites infestation
Animal bite	4	3.3%	Aanimal bites include snake bite, baboon and dog bite
Died as a result of suffocation due to chaining (problem of selection)	12	10.2%	This includes dogs which were pregnant and died due to unknown reason during the chaining process
Killed by the owner	1	.8	Killed after biting the owner
Died due to hunger/scarcity of food	3	2.5%	Unbalanced ration for the dogs (food shortage)
Died due to unknown reason	74	62.7%	Needs a special study
Total	118		

Regarding the role of dogs; among the study participants, 57 (48%) and 34 (29%) used dogs as guardian and farm keepers respectively. The impact of the intervention were assessed; out of the study participants, 34/118(28.8%) of them affected due to chained dogs. They complained the intervention with regards to security impact 20/34 and 18/34 food safeties. A total of 4 standard questions about animal guinea worm cash reward were asked to evaluate their awareness. Around 28 (24%) of them responded that they chain their dogs to get cash reward. Most of the study participants 114 (96.6%) have heard about the cash reward and 99/114 (86.8%) responded the exact amount which is 500 ETB. Village Based Volunteers (VBV) was found the primary source of information and GWO was found second (Table 4). An observational assessment on tethered dogs was made with a total of 352 dogs. Up on body condition

scoring, 53(15.1%) and 122(34.7) have found in poor and medium body condition. About 29(24.6%) and 64(54.2%) of tethered dogs have not provided water and food consecutively and 17(14%) of the dogs have no clean and properly built houses that protect from sun and attack.

Program challenges: The Community argument, problem of stray dogs, lack of budget and vehicle for government stakeholders, food provision for tethered animal, problem of wild animal, poor animal health professional engagement, poor documentation and reporting, weak coordination and collaborative with stakeholders, lack of responsible government body and lack of veterinary services were the major challenges of the program identified during the assessment.

No	Questions	Responses	Frequency	Percentage
1	Have you heard about cash reward?	No	4	3.4
		Yes	114	96.6
		Total	118	100
2	How much is exact amount of cash reward?	500 ETB	99	83.9
		Others	11	9.3
		Don't know	8	4.2
		Total	118	100
3	Source of information	Via GWO	26	22.02%
		Via VBV	91	77.12%
		Other sources	1	0.80%
		Total	118	100.00%

Table 4: Cash reward status of the community in Abobo and Gog, Gambella region, Ethiopia, 2013-2018

Discussion

This assessment is a supportive study showing the status of infection, identify gaps and suggesting recommendation. There are limited descriptive study published to show the intervention and animal

infection in Ethiopia so far. A total of 69 animals were infected since 2013. Dog, cat and olive baboons were found infected in Ethiopia. Ethiopia is the only country

reporting guinea worm infection among olive baboons as described in a study published reporting infection among animals in Ethiopia (Habtamu et al. 2017). Similarly, Chad and Mali were the known countries reporting infection among dogs and cats. The burden of the infection among animal was much higher in Chad compared to Ethiopia and Mali (GWEP 2019). Globally, the infection rate among animals especially

in dogs and cats were increasing from 27 animal infections during 2012 to 3665 in the year 2018 (GWEP 2019; CDC 2016; WHO 2018).

In Ethiopia, the peculiar rise of infection among animals was reported since 2013. Almost all infections were in Gog woreda (68/69); so that, targeted multi-sectorial and scientific plan is needed. Unlike the other areas, dogs have a great role in Gambella; because, the community lives inside the dense forest and closer to the wildlife'. Dogs are used for hunting, farming and wood collecting and generally as source of income for the community.

Animal welfare in disease outbreaks and eradication programs has received considerable attention in recent years as, throughout the world and concerns have raised over human options for impacted animals (Sebastian 2012). Similarly, in our study animal welfare issues were not considered by the program; physical, physiological health condition, naturalness and the behavior changes were ignored (Leach 2008). Since, there are limited similar studies published, we have failed to discuss our result. However, we have discussed our result as professional expertise, scientific facts and through observing the intervention. The "dog tethering intervention" by itself is the difficult intervention with regards to the different situations like; unable to chain all animals, community argument and understanding, community practices, life style, unknown disease transmission dynamics in the wild life, temperature, altitude and others.

Even though, there are challenges, the intervention is conducted in two woreda's of Gambella region; Abobo and Gog. The intervention was implemented without any professional inclusiveness and sectorial incorporation. It was conducted simply by trial and error experiment among animals which is inhuman and violating animal welfare. Most of the trials conducted have no any professional suggestion and the decisions costs animals' life in death. The program begins without planned activities; not consider source of the animal feed, selection criteria of tethered dogs (pregnant, diseased and adult or some other un-threatened physiological condition) and possible potential diseases in the area was not identified and vaccination was not delivered and given.

Animals were confined together without any precondition and understanding their health conditions, lack of food, water and medication; so that, dogs could be died due to neglectation of animal's

welfare. Around 46/118 (39%) of households have reported death of dogs. However, there was no responsible body for the death and not recognized as a fault of intervention and action was not taken to assess the cause. But we believe that, the program should investigate the root cause of death on time and solve the problems. The team has observed; the intervention didn't meet the basic standards of animal welfare upon physical, behavioral and naturalness conditions. Dogs were tethered with no appropriate feed, water, housing, selection criteria, unable to naturally met and reproduce and didn't consider the puppies.

All dogs and cats were provided only lentil and corn. There was no any protein source food that was given either by the program or owners. The dogs had no experience of eating lentil, 173/180 (96%). Since, dogs and cats are carnivore's they don't have the efficiency to convert protein from cereals. Therefore, most of dogs failed to gain weight easily; showing BCS, out of the total dogs observed 175/353 (49.6%) are found in poor and medium body condition. About 29/118 (24.6%) and 64/118 (54.2%) of respondents has not provided water and food during the assessment consecutively. Most of the housing is not properly designed to protect animals from the natural and physical phenomenon. Even if the intervention has come up with some improvements; there is still a gap because, all dogs and cats are not under the intervention, there are a number of released dogs and communities had no practice of reporting for the released dogs. Dogs were released at night time and communities were argued and complained to chain their dogs. So that, it is difficult to say it is well implemented up on all those challenges.

A total of four questions were asked for evaluating awareness on the cash reward on animal GWI and more than 96% of the communities have heard about the disease and 86.8% of them know the exact amount of the cash reward. However, around 30/118 (25.4%) of the respondents have reasoned why did they chained their dogs was to get the cash reward. This showed to work more on the attitude and behavior of the community. Because, the communities are now considering the intervention as source of income.

The two worst scenarios observed in the intervention; most of the communities have keeping more dogs and even adopting dogs to be paid. The dog population are rising for sake of cash; we have seen 5 dog houses for 15 dogs in one house hold in Gog woreda (we have called it "*Dog Condominium*").

However, the small puppies are in a very poor BCS and not supported by the program to get food and water, so that it is difficult to determine their survival and are dying.

Conclusion and recommendations

Guinea worm infection among animals was increasing but the containment rate was low. The right stakeholders were not yet collaborating to front line on animal infection. Therefore, we advise the following recommendations 1) The program should be a holistic and multi sectoral 2) should improve reporting and documentation in government sectors 3) animal welfare should be considered all time 4) the intervention should be transparent to the community; take responsibilities and risks 5) should work on potential intervention challenges; like, feeding, water, housing, veterinary facilities, communities food security issue, vaccination, operational research, cash reward, attitude and practice, should consider puppies and Finally, we request the program either to apologize or compensate the community for the death of dogs.

Competing interest: The authors declare that they do not have competing interest.

References

- Donald RH, Ernesto RT, Mark LE, Sharon LR & Adam JW (2017). Progress toward global eradication of Dracunculiasis, Pp. 1327-1331
- Bulto GB (2015) Hydatidosis in ruminants and Echinococcosis in dogs: Epidemiology, Histopathology and public Health significance in Debrezeit, Oromia, Ethiopia, 161:21-46
- CDC (2016). https://www.cdc.gov/parasites/guinea_worm/gen_info/faqs.html
- CDC (2016): https://www.cdc.gov/parasites/guinea_worm/gen_info/faqs.html
- CDC (2010) Renewed transmission of dracunculiasis Chad, 2010. MMWR Morb Mortal Wkly Rep, 60:744–8.
- CSA (Central Statistical Agency) (2014): Report on livestock and livestock characteristics (Private peasant holdings) 573, Statistical Bulletin 2:9-22.
- Eberhard ML, Ernesto RT, Donald RH, Corey F, Fernand T, Adam WP, et al. (2014). The Peculiar Epidemiology of Dracunculiasis in Chad. *American Journal of Tropical. Medicine and Hygiene*, 90(1):61–70.
- Watts SJ (1986). Dracunculiasis in Africa in: its geographic extent, incidence, and at-risk population. *American Journal of Tropical Medicine and Hygiene*, 37:119–25.
- Sandy C, Ralph M & Nevio Z (2002). Dracunculiasis and the eradication initiative: Clinical microbiology reviews. *American Society for Microbiology*, 15(2):223–246.
- Guinea Worm Eradication Program (2019). https://www.cartercenter.org/resources/pdfs/news/health_publications/guinea_worm/wrap-up/260.pdf
- Habtamu BB, Abyot B, Aman S, Yehenew AE, Zelalem D, et al. (2017). Elimination of Guinea worm disease in Ethiopia; Current status of the disease's, eradication strategies and challenges to the end game. *Ethiopian Medical journal*, 55(Supp1):15-31.
- Leach MC & Main DCJ (2008). An assessment of laboratory mouse welfare in UK animal units. *Animal Welfare*, 17:171-187.
- Mulatu M & Kebede A (2017) Epidemiology of cystic Bovine hydatidosis: Emphasis on abattoir findings in Ethiopia. *Journal of Veterinary Medicine*, 5:1-5.
- Sebastian E (2012). Health Management of animal welfare in disease outbreaks. *Heath*. doi: 10.2527/af.file:///F:/LITERATURE/GW%20Literature/Animal%20welfare%20in%20outbreaks.pdf
- WHO (2018). <https://www.who.int/dracunculiasis/disease/en/>.