

Guinea worm eradication: Evaluation of animal infection surveillance system in Abobo and Gog woredas, Gambella region, Ethiopia

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Abstract

Introduction: Guinea worm is a Neglected Tropical Disease caused by a parasitic worm *Dracunculus medinensis*. It was recognized only as a disease of humans for many years, however recently it was identified as a zoonotic disease. In Ethiopia, animal guinea worm infection have been reported since 2013 and now have become a new challenge. Surveillance was the primary intervention strategy conducted by Ethiopian Dracunculiasis Eradication Program. Strong surveillance in animals could be an important part of guinea worm elimination in the country; if the surveillance system is functional and regularly evaluated.

Objectives: To evaluate animal guinea worm infection surveillance system in Abobo and Gog woredas of Gambella Region, Ethiopia, from April to March 2019.

Methods: Cross-sectional study design was used. Data were collected via interview using structured questionnaire, document review and observation. The Carter Center Ethiopia and regional livestock sector were the data sources.

Result: Rumor investigation, outbreak investigation and response, case management and containment, as well as analyzing animal surveillance data were found to be the major surveillance activities conducted in the study area. However, the surveillance system lacks important functioning tools like; standard guide line, operating procedure, case registry book, standard animal infection case definition and written feedbacks. There was also no integrated surveillance system with the livestock sector. The animal infection containment rate was low (39%) between 2013 – 2019; which could impact the high probability of transmission. About 1,507 suspected animals were reported from January - February 2019. Government involvement on handling the animal infection especially the livestock sectors was found to be minimal. There were no documented surveillance data found in the livestock sectors, however, functional surveillance system and surveillance data are the basic criteria for disease free certification process.

Conclusion: Multisectoral collaboration like with livestock sector is crucial for effective surveillance program. A separate SOP, guidelines, case definitions, written feedback form and registry book for animal guinea worm infection surveillance should be developed and used. Livestock sector should be increase its participation since it can play a vital role in the eradication program.

Key words: Guinea worm eradication, animal infection, surveillance, Ethiopia, Neglected Tropical Diseases

Introduction

Dracunculiasis (Guinea worm disease) is a zoonotic-Neglected Tropical Disease (z-NTDs) caused by *Dracunculus medinensis*, a parasitic worm. 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. Pain and secondary bacterial infection can cause temporary or permanent disability (Donald 2017; Sandy 2002). The disease is targeted for global eradication (Habtamu et al. 2017). The campaign to eradicate dracunculiasis worldwide began in 1980 at CDC. After the global eradication program begun the number of endemic countries was reduced to only four which were Chad, Ethiopia, South Sudan and Mali. However, the animal infection has persistently increased. Between 2012 and 2018, a total of 3,625 dogs and 31 cats' infections were reported worldwide.

Ethiopian Dracunculiasis Eradication Program (EDEP) was established in 1992 and since then human cases were reduced to few in number. Animal infections were reported since 2013. Dogs, cats and olive baboons were found infected with the worm (Desalegn et al. 2020). Infection among olive baboons was first reported in Ethiopia (Habtamu et al. 2017). Animal disease surveillance is an important part of disease control, prevention and eradication program (European-CDC 2014). It is used to monitor disease trends, facilitate the control of disease or infection, and provide data for use in risk analysis for animal or public health purposes (Saville 2016).

Regular surveillance-response approaches to monitor sustained progress are required to eradicate the disease (Robert et al. 2015). An eradication program generally needs extremely sensitive and rigorous surveillance systems. This is because they have to

detect all cases including those imported from the neighboring countries (Ruiz-Tiben 1991) as well as in between regions in the same nation. Hence, improving surveillance systems to detect all cases and report all rumors, become extremely more important than ever to follow decline of diseases incidence.

Therefore, for any surveillance system to be functional and effective there are major core surveillance functions and criteria that need to be fulfilled and evaluated; i.e. availability of national surveillance manual, case detection and registration, data reporting, data analysis, outbreak investigation, epidemic preparedness, responses, feedback, supervision, training, resources or budget (Buehler et al. 2004). Thus, this assessment was conducted to evaluate core functions on animal guinea worm infection surveillance system and review livestock sector contribution and to forward recommendations towards improvement and acceleration of the eradication of guinea worm in Ethiopia.

Materials and Methods

Study design: A cross sectional study was used in Gog and Abobo woredas of Gambella region, Ethiopia, during March – April, 2019.

Study area: Most Ethiopians have owned dogs to protect their farms, as safety guards or pets (Mulatu and Kebede 2017; Bulto 2015). The study was conducted in Gambella region which is located 766 kms southwest of Addis Ababa with an altitude that ranges from 300-2,300 asl. The region shares borders with Oromia to the North and East, SNNPR to South and South Sudan to the west (Adugna). Gambella is the only guinea worm endemic region in Ethiopia in only two of its woredas namely Abobo and Gog; which were our study sites. The total dog population in the two woredas is around 11,300 (TCCE).

Data collection and analysis: Facility based data collection; using structured questionnaire based interview, document review and observation. The carter center Ethiopia (TCCE); EDEP woreda coordinators, regional and woreda livestock bureau and offices were the sources of data. The existing surveillance system was evaluated for the availability of basic surveillance criteria or core surveillance functions such as task force formation or human resources structure, availability of standard case definition, availability of national surveillance manual, case detection and registration, data reporting, data analysis, outbreak investigation, epidemic preparedness, responses, feedback, supervision, training, resources or budget and collaboration with other sectors. The livestock sector had the mandate and responsibility to conduct

any animal infection surveillance within its hierarchical structure at zonal, regional and kebele levels and so its activities were assessed. The availability of the required core functions was verified using data documentation and observation. The collected data results were evaluated with standard surveillance system core functions and briefly described. Tables, graphs and charts are the statistical tools used to show findings.

Ethical clearance: Ethical clearance was obtained from Ethiopian public health institute institutional review board, EPHI-SERO. Permission letter to collect the data was also obtained from EPHI and submitted to Gambella regional agriculture bureau and TCCE.

Result

Animal surveillance system evaluation in EDEP: EDEP has three surveillance level categories based on the disease condition; level I, II and III. Surveillance level I category includes woredas endemic to guinea worm disease, two woredas were currently under this category namely Abobo and Gog. Level II surveillance category is identified based on fear of importation of cases from areas endemic to Guinea worm and 14 woredas were under this category. The rest 817 woredas of the country with no history of Guinea worm were in surveillance level III category.

In this study, Level I woredas; Gog and Abobo of Gambella region were assessed and evaluated. There were 148 villages and 20,303 households under active surveillance (Table 1).

Table 1: General information of the human resource capacity of EDEP in Abobo and Gog woreda

	Abobo 20,112.00	Gog 25653
Total population		
# of Village	80	68
# of VAS	80	27
# of GWO	23	31
# of VBV	249	654
# of Abet Captain	3	9
# of Kebele	19	16 + (2 refugee camps)

VAS: Village under surveillance GWO: Guinea Worm Officer
VBV: Village Based Volunteers

Evaluation and description of the core functions of animal infection surveillance system

- a. **Case detection, Registration, Guideline and SOP:** Cases and infections are detected and registered through the program using tools designed for humans. This is because national surveillance guideline for animal infections have not yet been developed and there was no standardized operating procedure for animals (Table 2(A)).

b. Surveillance Data Reporting and Analysis:

Surveillance and intervention data were analyzed by place, person and time monthly in the program. Animal census for dog and cat in VAS and NVA were conducted annually with monthly update. Animals'

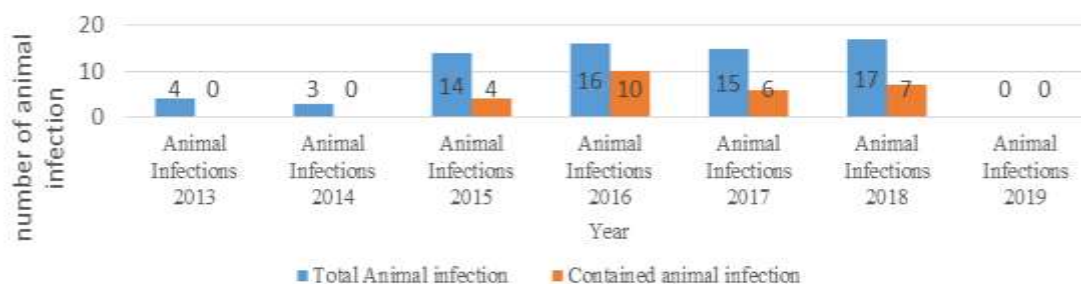
guinea worm infection surveillance data report was never sent to the regional, zonal, and woreda levels of livestock sectors. Email, telephone and hard copy were mentioned as the ways to deliver the report.

Table 2(A): Evaluation of core animal guinea worm surveillance system functions

Core functions of animal surveillance system	Observed/Verified result	
	Yes	No
Availability of national surveillance manual		
Is there national GW animal surveillance guideline at this site?		No
Does the district have separate GW infection animal surveillance line list, epidemic reporting form, and rumor log book?		No
Case detection and registration		
Is there animal GW infection rumor logbook prepared for animals?		No
Is there animal GW infection case management procedure form?	Yes	
Do you have SOP for overall animal GW surveillance and case management?		No
Data reporting		
Was animal guinea worm infection data reported and notified to the livestock sector at regional or federal level?		No
Data analysis		
Do you describe data by person, time and place?	Yes	
Do you conduct animal census?	Yes	
Do you conduct data analysis?	Yes	

c. Animal Guinea Worm infection and containment: A total of 69 animals were detected and confirmed for guinea worm infection from 2013 to March 2019; of these infections only 27(39%) were contained.

High containment rate was reported in 2016 which was 10/16 (60%). In contrary zero containment rate was observed in 2013 and 2014.

**Figure 1: Distribution of animal guinea worm infection and containment rate from 2013 up to 2019 in Abobo and Gog woreda, Gambella, Ethiopia****d. Rumor identification, reporting and Investigation:**

A total of 1,507 suspected animals were identified and reported from January- February 2019 in Abobo and Gog woredas. Greater numbers of suspects were reported from Gog woreda compared to Abobo.

guinea worm officers and supportive stake holders in the region (Table 2 (B)).

e. Epidemic preparedness, Response and Feedback:

The program has epidemic preparedness plan supported by budget. Internal evaluation of surveillance response was conducted monthly through guinea worm officers' meeting, monthly report and annual guinea worm review meeting. The feedback system of the surveillance did not have a written feedback mechanism for

- f. Training, Supervision and Resource:** Training was given to animal health workers on guinea worm surveillance. Six supervisory visits were made for six months by EPHI and FMOH, one visit per month. In addition, supervisory visit was made by senior TCC project coordinator and technical advisors. The program provided basic logistics for activities, such as vehicles, electricity generator, computers and others. Poster, megaphone, screen, projector, signboard, GW ID, billboard and t-shirts were the type of information communication materials that were widely used.

Table 2 (B): Evaluation of core animal guinea worm surveillance system functions

Core functions of animal surveillance system	Observed/Verified Result	
	Yes	No
Epidemic Preparedness		
Is there epidemic preparedness and response plan in EDEP?	Yes	
Is there budget line or access to funds for animal infection/disease response?	Yes	
Responses		
Do you have a standard case definition for animal guinea worm infection?		No
Does the district respond within 24 hours after notification of most recently reported animal infection?	Yes	
Did you evaluate your preparedness and response activities during the past year?	Yes	
How many feedback bulletin or reports has the district/region received in the last year?		No
Feedback		
Are there written feedback reports that the district/region has produced within the last year?		No
Case Definition		
Is there a standardized animal GW infection case definition?		No

Animal guinea worm disease surveillance system in the livestock sector

Guinea worm disease surveillance by animal sector: Animal disease surveillance system was found to be un-functional and unable to detect GW infection in animals since dogs and cats were not considered as valuable animals in Ethiopia. Eventhough, the disease was identified in 2013; the sector has not been regularly notified of infections by the program or its woreda structure. Animal health workers in woreda livestock offices have recently participated in the EDEP program but they did not report activities to their respective offices.

Discussion

This is the first evaluation assessment conducted on animal guinea worm infection surveillance system in EDEP. TCCE and EPHI are playing a vital role in the surveillance system and elimination program. The program has better surveillance activities on case detection, rumor investigation, outbreak investigation, registration, response and data analysis of animal infections. However, our study had evaluated the standards of surveillance core functions; thus, findings showed that the surveillance system lacks basic tools like animal infection standard case definition, animal surveillance guidelines, rumor log book, reporting formats and suspect registration form and SOPs for animals. Surveillance data of animal's infection are collected using formats designed for humans, which are difficult for analysis and are not standardized for animals. The livestock sector doesn't include guinea worm in the disease surveillance system; this is because the infected animals were not considered valuable food animals.

Our finding showed that, a total of 69 animals were positive during 2013 – 2019 and the containment rate was found low i.e., only 27(39%) animals were contained. This finding has coincided with WHO/CDC surveillance principle; surveillance aimed to detect and report cases including the last case should be followed by rigorous containment and

management of every case. Case containment is one of the hall-marks of an effective eradication program (WHO/CDC 2007).

A case definition is a set of standard criteria used to separate true infections (those animals with the disease) and suspected ones (Ashton et al. 2016). The EDEP surveillance system lacks standard case definition for animal infection. Similarly, a study done by (Niyi 2015) supported our result as case definition is another area of improving active surveillance schemes. Case definition adopted by eradication programs should comply with standard definitions to facilitate detection and reporting. If surveillance is not accurate and complete, cases may be missed.

A total of 1,507 suspected animals were reported from January – February, 2019 in Abobo and Gog woredas. Since, guinea worm is under global eradication, it is required (Robert 2015) to detect all cases and animal infections including those imported from the neighboring countries. Improving surveillance systems to detect all suspects, cases and rumors becomes extremely more important than ever for the decline of diseases incidence (Ruiz-Tiben 1991).

EDEP has analyzed surveillance data by place, person and time. Whereas, in government sectors, data analysis and documentation were found to be very poor and lacking uniformity. Similarly, a study conducted by Habtamu emphasized our findings; documentation of Guinea worm data has been weak across the endemic region (Habtamu 2017). Program assessment can help to identify the training needs of different categories of staff, which in turn can be used to draw up a training plan (Alertresponse 2006). Our finding confirmed that animal health workers had taken training on GW surveillance and dog disease management topics. Supportive supervision has also numerous functions for surveillance activities (WHO/CDC 2007) and several supervisions were made on EDEP by several federal sectors.

Reporting refers to the process by which surveillance data moves through the surveillance system from the point of generation (German et al. 2001). In this study, it was confirmed that there was a gap on surveillance data sharing and notification of the government sectors; data was sent and compiled at zonal, regional and federal livestock sectors. However, involvement and integration of the livestock sector and documentation of the surveillance data with in this sector is a mandatory criteria for global certification process. Certification will be considered to have been achieved when adequate surveillance systems have not discovered any evidence of transmission in the country and availability of well documented surveillance data are fundamental (WHO, 1990).

EDEP has been conducting internal evaluation through, monthly GWO meeting and monthly report and annual GW review meeting. However, an external monitoring and evaluation and written feedback mechanisms were not adequate and need to be conducted regularly. There should be a system of surveillance evaluation for every response activity (Buehler et al. 2004).

In Ethiopia, a poor surveillance system and government involvement is believed to have led to low intensity transmission persisting in Gambella region to date (EDEP 2015). Similarly, our finding showed that, the livestock sector has notified about animal GW infection in 2019 after 5 years of its emergence; since the first infection was during 2013. This showed that, the surveillance system in the livestock sector was very weak and unable to detect the emergence of such infections in animals. Thus, the livestock sector needs to evaluate its surveillance system at the ground and include GW to its system and support the eradication.

Conclusion and Recommendation

Animal GW infection is a new challenge for EDEP. Two woredas in Gambella region are still reporting new cases and infections. Thus, functional surveillance and regular evaluation system is required to halt transmission. A separate SOP, guidelines, case definitions, written feedback form and registry book for animal guinea worm infection surveillance should be developed and used. Therefore, integrating and collaborating the livestock sector with EDEP should be strategized for effective program. Livestock sector should increase its participation since it plays a vital role in the animal surveillance and be part of the eradication program (EDEP).

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