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Research Article

Knowledge, Attitude, and Practices towards Anthrax among Public in Ethiopia

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Abstract

Introduction: Understanding public knowledge, attitudes, and practices towards anthrax in Dessie, Ethiopia is crucial due to limited studies. This enables tailored interventions, enhances public health, mitigates risks, and empowers communities through informed decision-making and proactive measures. Therefore, this study aimed to assess public knowledge, attitudes, and practices towards anthrax in Dessie City, Ethiopia.

Methods: a descriptive cross-sectional study assessed anthrax knowledge, attitudes, and practices in Dessie City, Ethiopia. Five kebeles were randomly selected, with 40 households interviewed from each, totaling 190 respondents. Data were collected *via* structured questionnaires and analyzed using Excel. Descriptive analysis highlighted community awareness and risk factors, revealing significant knowledge gaps and areas for improvement in anthrax prevention.

Results: Among 190 respondents, 65.2% were male and 34.7% female. Most were Muslim (63.6%), followed by Orthodox (36.3%). Anthrax awareness was at 55.2%, with 28.4% knowing raw meat as a transmission route. Key signs identified were sudden death (46.8%) and not eating or drinking (19.5%). About 51.1% acknowledged treatment challenges, 31.5% recognized grazing pastures as infection sources, and 54.1% understood Anthrax's seriousness. Notably, 79.4% adopted safety measures, 87.8% knew about animal vaccination, and over 65% vaccinated their animals.

Conclusion: The study revealed significant gaps in community knowledge about anthrax, especially regarding its causes, transmission, signs, and control. This ignorance leads to raw meat consumption, neglecting livestock vaccination, and poor awareness of human anthrax. Veterinarians have improved awareness but lack collaboration with medical professionals. Prioritizing community education on anthrax risks and prevention is crucial.

Keywords: Anthrax; Attitude; Dessie city; Ethiopia; Knowledge; Practice

Abbreviations

°C: Degree Centigrade; FAO: Food and Agriculture Organization; KAP: Knowledge, Attitude and Practice; M.a.s.l: Meters above sea level; Mm: Millimetres; WHO: World Health and Organization

Introduction

Anthrax is a zoonotic bacterial disease caused by *Bacillus anthracis*, a gram-positive rod-shaped and capsulated bacillus [1]. It is the most common bacterial disease in sub-Saharan countries [2]. The name of the bacterium is derived from "anthracis", the Greek word for coal, because anthrax in humans causes black, coal-like lesions on the skin at the site of inoculation [3]. The bacterium forms spores when exposed to oxygen and allowing it to remain viable in the environment for many years before coming into contact with a susceptible host and when exposed to a nutrient-rich environment, such as the tissues or blood of an animal or human host [4].

The disease in animals is characterized by septicemia and sudden death with exudation of tarry blood from the natural orifices of the cadaver. Failure of the blood to clot, the absence of rigor mortis, and the presence of splenomegaly are the most important necropsy findings of the disease. Before the development of the anthrax vaccine and antibiotics, it was the foremost cause of uncontrolled mortality in different species of animals worldwide [5].

Animal anthrax is an endemic disease and seasonal in Ethiopia which occurs in May and June every year in different localities of the country. Several districts of the country are reporting suspected cases of anthrax outbreaks in animals, few of which are confirmed by laboratories [6]. Several factors such as changing rainfall patterns, soil disturbance, increased animal and human populations, and poor grazing systems and human behavior have been reported to be associated with outbreaks of anthrax. Interaction of wildlife with livestock and humans has also been reported as a key predisposing factor of anthrax among humans and livestock. Disease usually re-occurs in areas where there has been a previous outbreak, making vaccination the recommended form of control [7].

Understanding public knowledge, attitudes, and practices towards anthrax in Dessie, Ethiopia is vital due to a lack of comprehensive studies in the region. Addressing this gap provides valuable insights into the community's understanding of anthrax, enabling tailored interventions for prevention and control. By bridging this knowledge deficit, we can enhance public health outcomes, mitigate anthrax risks, and empower local communities through informed decision-making and proactive measures. Therefore, this study aimed to assess public knowledge, attitude, and practices towards anthrax in Dessie City, Ethiopia.

Materials and Methods

Study area and period

The study was conducted from June 2022 to September 2022 to assess the level of knowledge, attitudes, and practices towards Anthrax

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in Dessie city, Amhara regional state, Ethiopia. Dessie city has a total of 8 kebeles which are located 410 km away from Addis Ababa, the capital city of Ethiopia the City is found at a longitude of 380E and latitude of 11-40°N with an elevation or altitude of 2,470 m to 2,550 m above sea level (m.a.s.l). The area receives an annual rainfall of 1000 mm to 1400 mm. The average temperature is 15°C-17.5°C (CSA, 2005). Based on projections from the 2007 Ethiopian national census, the 2018/19 total population of the city was estimated to be 200,000 with an area of 161,828 square kilometers. The city livestock population is estimated to be 23,750 cattle, 27,096 sheep, 23,406 goats, 8,231 equines, and 125,252 poultry [8].

Study design and population

A cross-sectional study design was applied. The source population of all animal owners who have lived in Dessie City was study populations. The study population was animal owners who have lived in randomly selected kebeles of Dessie City. (Gerado, Tita, Kurkur, Boru, and Boruselase) as permanent residents for more than six months. Both male and females in the age group above 18 years of age was included in this study.

Sample size determination, sampling techniques, and data collection tools

To generate sufficient information on the knowledge, attitudes, and practices regarding anthrax among community members in Dessie City, the sample size was determined by using Slovin Formula for quantitative data of small sample size with a margin error of (e=8%) with an average household size of 1250 livestock in one kebeles and a total of 10,000 livestock population size in the study population in the total kebeles (Adam 2020). Generally, the sample size of the study can be calculated by using the general formula for small-size qualitative data:

n=N/((1+N*e2))

Where, n=sample size; N=the size of the population; e=the margin of error (margin of error=8%)

Therefore the sample size of the study would be n=10000/((1+10000*(0.08)2))=154-200

As a result, 190 respondents were selected as the study population by adding a 10% non-response rate; thus, the total sample size was 209 subjects. From the entire primary sampling unit that is, 8 kebeles (lowest administrative structure), five were randomly selected using the lottery method. Then, 40 households were selected and interviewed from each kebeles using the systematic random sampling method, as there was no significant difference in the number of households. Whenever the selected household was found locked, the next household (on the right side) was substituted automatically for the interview. A pretested structured questionnaire consisting of closed-ended questions was used for this study. The data were collected *via* face-to-face interviews. The questionnaire was first developed in English and then translated into Amharic language (native language) for appropriateness and easiness in approaching the study participants.

Data quality, data management, and analysis

Before the beginning of the full study, a pre-test was performed on some participants to see the applicability of the questionnaire. Each questionnaire was checked for incompleteness, missed values, and unlikely responses, and then manually cleaned upon such indications. The data was cross-checked for consistency and accuracy. After collection, the data were cleaned and checked for completeness. Those incomplete and inconsistent were corrected when possible and removed otherwise. After a complete check-up, the data were coded and entered into a Microsoft Excel sheet and analyzed by using Excel. The frequency distribution of both dependent and independent variables was worked out by using descriptive statics techniques.

Results

Sociodemographic characteristics

Two hundred nine (209) heads of household were interviewed during the study period. Of these, the data collected from nine tin respondents were found to be incomplete and excluded from the analysis. Only data from 190 households were considered for the analysis. The majority of the respondents was male 124 (65.3%) and was above 15 years of age, of which 28% and 37.9% were between 15 to 30 and 31 to 46 years old, respectively. The majority of the respondents 121 (63.6%) were Muslim followed by Orthodox 69 (36.3%). Concerning educational status, 58 (33.5%) of the participants were illiterate (cannot read and write). Of the participants, 49 (25.7%) and 56 (29.4%) were in primary school and secondary school, respectively. In addition, these 27 (14.2%) were in higher education. The majority of the respondents were farmers 97 (51%) (Table 1).

Table 1: Socio-demographic information of the study participants, Dessie City, Ethiopia, 2022.

Socio-Demographic Variables	Frequency	Percentage %
Sex		
Male	124	65.2
Female	66	34.7
Religion		
Muslim	121	63.6
Orthodox	69	36.3
Educational status		
Illiterate (cannot read and write)	58	33.5
Primary school	49	25.7
Secondary school	56	29.4
Higher education	27	14.2
Age		
15-30	64	33.7
31-46	73	38.4
>46	53	27.8

Knowledge of participants related to the cause and host range of Anthrax

Of the total respondents, 105 (55.2%) had awareness of Anthrax. Thirty-nine (20.5%) of respondents knew that Bacteria is the cause of Anthrax. The majority of the participants 137 (72.1%) responded that they did not know the causative agent, however, fewer numbers of respondents 14 (7.3%) were found to have a miss-perception about a causative agent which was the virus (Table 2). The majority of the respondents 132 (69.4%) knew that Cattle can be affected by the disease (Figure 1).

Source of information about Anthrax

Out of 190 respondents, 84 (44.2%) did not know about Anthrax 67 (35.2%) got the knowledge from a veterinary clinic, 9 (4.7%), and 3 (1.6) of the respondents had awareness from Books\magazines and social media respectively. However, 14 (7.4%) and 13 (6.8%) of the respondents had awareness through formal ways (such as radio and television) and informal (such as traditional healers, neighbors, friends, and relatives respectively (Figure 2).

Knowledge of participants related to modes of transmission, clinical signs and symptoms, and treatment

of Anthrax

Sixty-four (33.7%) respondents didn't know the means of transmission from animal to human. While 54 (28.4%) and 22 (11.5%) of them know that eating raw meat and slaughtering infected animals transmit diseases from animal to humans respectively (Figure 3). Sudden death 89 (46.8%) followed by stopping eating and drinking 37 (19.5%) were described as a major clinical sign of Anthrax in animals by the majority of the respondents (Figure 4). Ninety-seven (51.1%) of the respondents knew that the disease could not be easily treatable. Of the participants, 101 (54.1%) were aware of the fact that Anthrax is a very serious disease in humans and animals (Table 3).

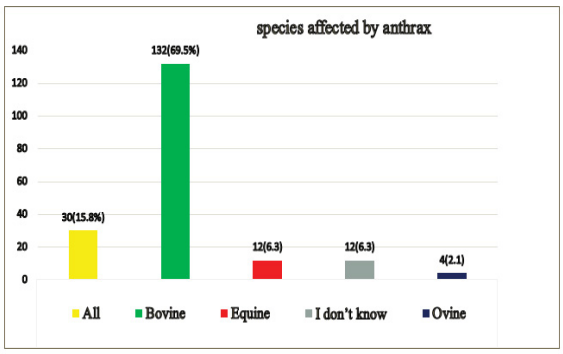

Figure 1: Inflammatory changes and bowel wall thickening centred.

Table 2: Knowledge of participants related to cause and host range on Anthrax, Dessie City, Ethiopia, 2022.

Awareness on anthrax	Frequency	Percent
Yes	105	55.2
No	85	44.7
Cause of Anthrax		
Bacteria	39	20.5
Virus	14	7.3
I don't know	137	72.1

Table 3: Knowledge of participants related to severity and treatment of Anthrax, Dessie City, Ethiopia, 2022.

Knowledge Related Variables	**Frequency**	**Percentage**
Have you ever gotten training		
Yes	27	14.2
No	163	85.7
How serious a disease in humans and animals		
very serious	101	54.1
somewhat serious	41	21.5
Not very serious	17	8.9
I don't know	31	16.3
Easily treatable after onset of clinical signs		
Yes	93	48.9
No	97	51.1

Knowledge of participants about Human Anthrax

The majority of the respondents 178 (93.6%) were not seen as human with Anthrax while 12 (6.3%) were seen as human with Anthrax. A greater number of the respondents 180 (94.7%) didn't know the clinical signs observed in infected humans. While 10 (5.2%) know that skin ulcers with black centers were described as a major clinical sign of human Anthrax. 167 (87.8%) were aware of animal vaccination as a means of Anthrax prevention. A greater number of the respondents 121 (63.6%) were willing to use the Anthrax vaccine for their animals (Table 4).

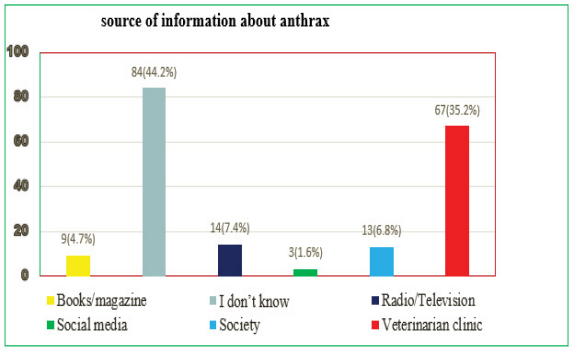

Figure 2: Source of information about Anthrax, Dessie City, Ethiopia, 2022.

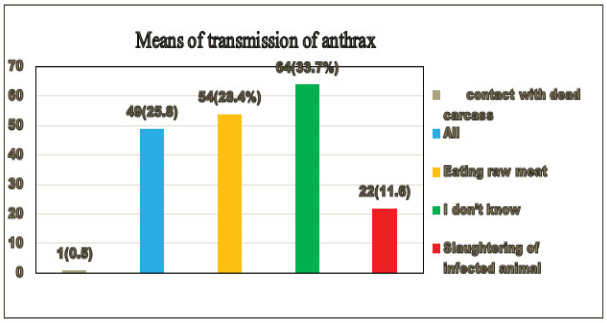

Figure 3: Frequencies and percentages of modes of transmission on anthrax, Dessie City, Ethiopia, 2022.

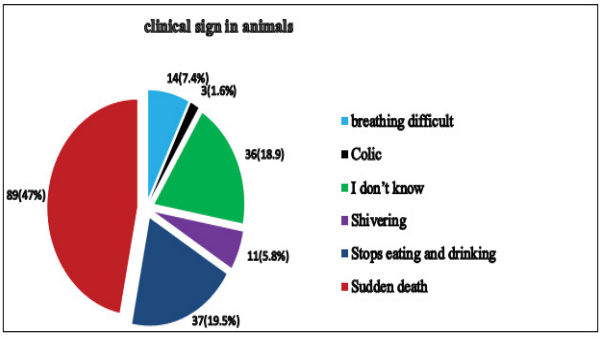

Figure 4: Percentage of clinical signs of anthrax in animals, Dessie City, Ethiopia, 2022.

Attitudes of participants towards Anthrax

Eighty-eight respondents (46.3%) strongly agree that the Consumption of raw meat and animals is the source of infection for human anthrax. 38 (20%) respondents agrees that the Consumption of raw meat of an animal is the source of infection for human anthrax. Fewer of the respondents 20 (10.5%) disagree that the Consumption of raw meat from an animal is the source of infection for human anthrax. 60 (31.5%) respondents agree that grazing pasture is the source of infection for the animal. Majority of the respondents 99 (52.1) uncertain that grazing pasture is the source of infection for animals. One hundred twenty-three respondents (64.7%) strongly agree that Anthrax can be prevented through the vaccination of animals. Fewer respondents 10 (5.2%) were uncertain that vaccination of animals

can prevent Anthrax. 116 (61.1%) respondents strongly agree that Anthrax can be controlled through burying of dead animals and 66 (34.7%) agree that Anthrax can be controlled through burying of a dead animal (Table 5).

Practices of participants towards Anthrax

Out of 190 respondents, one hundred twenty-one (63.6%) use indoor management for their animals while 69 (36.3%) don't use indoor management for their animals. 128 (67.3%) respondents vaccinate their animals while 66 (34.7%) didn't vaccinate their animals. The majority of the respondents 167 (87.8%) know that vaccination of animals helps to prevent anthrax. Regarding safety measures, 151 (79.4%) respondents took any safety measures when they were caring for anthrax suspected animals while 39 (20.5%) respondents didn't take any safety measures when they were caring for anthrax suspected animals (Table 6).

Table 4: Knowledge of participants about Human Anthrax, Dessie City, Ethiopia, 2022.

Knowledge Related Variables	Frequency	Percent
Have you ever seen a human with Anthrax		
Yes	12	6.3
No	178	93.7
What kind of signs could be observed in infected human		
Skin ulcer with black center	10	5.2
Don't know	180	94.7
How can a person prevent him from getting Anthrax?		
avoid anthrax infected animal	17	8.9
Burn all suspected anthrax animal carcasses	15	7.9
Bury all suspected anthrax animal carcasses	66	34.7
Vaccinate animals annually	23	12.1
I do not know	101	53.1

Table 5: Attitudes of participants towards Anthrax, Dessie City, Ethiopia, 2022.

Attitude Related Variables	Frequency	Percent
Grazing pasture is a source of infection for animal		
Strongly agree	24	12.6
Agree	60	31.5
Uncertain	99	52.1
Disagree	7	3.7
Anthrax can be prevented through vaccination of animal		
Strongly agree	123	64.7
Agree	52	27.3
Uncertain	10	5.2
Disagree	5	2.6
Anthrax can be controlled by burying dead animal		
Strongly agree	116	61.1
Agree	66	34.7
Uncertain	6	3.1
Disagree	2	1.1

Table 6: Practices of Participants Towards Anthrax, Dessie City, Ethiopia, 2022.

Practice Related Variables	Frequency	Percent
Do you use indoor management for your animals		
Yes	121	63.6
No	69	36.3
Have you ever vaccinated your animals?		
Yes	128	67.3
No	66	34.7
In your opinion does vaccinating animals help to prevent anthrax		
Yes	167	87.8
No	23	12.1
Any safety measures taken in caring for anthrax suspected animal patients?		
Yes	151	79.5
No	39	20.5

Discussion

The study was aimed at assessing public knowledge, attitudes, and practices towards anthrax in Dessie City. In this study, a total of the respondents (55.2%) had knowledge of Anthrax. This finding is lower than the findings of different studies done by [9] in South Gonder [10], in Northern Ethiopia [11], and (Chacha, 2017) in Maragua, Kenya [12], which reported knowledge rates of 71%, 62% and 96.3%, respectively. These differences could be associated with the awareness level of the community, educational status, and information access. In this study (33.7%) and (28.4%) of respondents didn't know the means of transmission of anthrax from animals to humans and eating raw meat transmitted the disease from animal to humans which is 43.16% and 47% respectively with the findings of [12] in selected rural areas of Bangladesh and Few participants mentioned that the disease was caused by microbes/germs [10]. In this study (46.3%) respondents strongly agree that the consumption of raw meat and animals is the source of infection for human anthrax. (20%) of respondents agree that the consumption of raw meat of an animal is the source of infection for human anthrax. This result was consistent with [11]. About 75.2% of the participants reported that they would not consume meat from cattle found dead because they were discouraged by veterinary authorities but there were high cases of consumption of meat from an anthrax-related carcass [13].

More than 35% of respondents in this study obtained information from the veterinary clinics (4.7%) and (1.6%) of the respondents had the awareness from Books\magazines and social media respectively. This finding is higher than the findings of (Chacha, 2017) 21.0% from veterinarians and veterinary Paraprofessionals and 15.1% from the radio [11].

Sudden death was mentioned as a major clinical sign by the majority of the respondents which is in line with Dutta et al. (2021). Stop eating and drinking was described as a second major clinical sign in this study next to sudden death [13]. (72.1%) participants responded that they did not know the causative agent while (20.5%) of respondents knew that bacteria was the cause of Anthrax. However, fewer numbers of respondents (7.3%) were found to have a misperception about a causative agent which was a virus. Consistent with this study, (Opare et al. 2000) showed that most respondents do not know the causes of anthrax but recognize the signs of the disease. Moreover, in the questionnaire survey, the number of respondents who knew the clinical signs was higher than that of respondents who knew the cause of the disease [14].

Since anthrax is zoonotic and its main transmission to humans is from animals then animal keeping becomes one of the major risky practices towards anthrax in animals and humans [11]. This study (54%) of the respondents thought that anthrax was a very serious disease; (21.5%) of them thought that anthrax was somewhat serious while only (8.9%) thought that anthrax was not a serious disease. This concurs with a study by [15].

In livestock, anthrax can be prevented largely by vaccination of all grazing animals in the endemic area and implementation of control measures during epizootics Vaccination should be done 2-4 Weeks before the season when outbreaks may be expected [16].

In this study More than half of the respondents vaccinate their

Animals and know that vaccination of animals helps to prevent anthrax. Similar study from Maragua, Kenya, and Tigray Vaccination of animals helps to prevent their animals against anthrax; almost all (98.0%) participants agreed that indeed vaccination helps. A few (2.0%) said no while giving reasons for vaccine failure [11].

Proper and early diagnosis is one of the important components for treatment, prevention, and control of anthrax. However diagnostic facilities were insufficient in the endemic districts, which is similar to the observations from other studies in Asia and Africa [17,18]. It was revealed that timely diagnosis can control the outbreak of anthrax [19]. It is important to respond quickly to eliminate anthrax-confirmed or suspected carcasses by immediate incineration since spores are rapidly formed and spread by flies and scavengers, especially vultures that may transmit anthrax over long distances [20]. It is necessary to ensure increased public awareness of vaccination of the livestock population along with sufficient coverage of the anthrax vaccine that will make a large contribution to the control of anthrax outbreaks [13].

Conclusions and Recommendations

This study revealed that there were some gaps in the community concerning knowledge of anthrax in the study area by community members on cause, transmission, signs, and control. Due to this people continue to consume raw and un-inspected meat, and fail to present their animals for vaccination. In addition, there is also a lack of knowledge about humans with Anthrax and the clinical signs observed in infected humans. The knowledge among the community members has been enhanced over time by awareness created by veterinarians in the area where the major risk factors of consumption of anthrax-related meat, failure to vaccinate their livestock, and poor disposal of carcasses contributed to anthrax transmission. There was a gap between medical and veterinary personnel collaboration in terms of anthrax control given the fact that this disease needs a multidisciplinary approach, especially from the two professionals for effective control. Educating the community about the health risks of anthrax and the ways of prevention should be given priority by health extension workers, veterinary professionals, and the government at large.

Based on the above conclusions the following recommendations are forwarded

- Creating awareness for the community on the causes, transmission, signs, and control of anthrax disease.
- Creating awareness for the city health office to enhance the surveillance system so that anthrax cases could be identified earlier and increase livestock vaccination.
- With the availability of resources, additional studies should be extended to other regions of Ethiopia to compare findings and wholesome intervention measures for the disease
- The capacity of Veterinary and Medical workers should be strengthened in the diagnosis of zoonotic diseases for early outbreak detection and subsequent interventions
- Medical and veterinary personnel should be collaborating in a multidisciplinary approach for the prevention and control of anthrax.

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