

# Knowledge of anthrax infection prevention and its associated factors among livestock owners in Sekotazuria district, Wag-himra zone, northeast, Amhara region Ethiopia: Cross Sectional Study

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## Research article

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# Abstract

**Introduction** Anthrax is an infectious bacterial disease transmitted from infected animal to human by direct or indirect contact with their products like hides or wool. The most efficient ways of anthrax infection preventions are vaccination of livestock, surveillance, and proper disposal of livestock carcasses in domestic herd. Recently, anthrax infection in humans has been reported from several districts spread countrywide and becomes a major public health problem of animals-humans in Amhara region (the study area). **Objective** This study aimed at determining knowledge of anthrax infection prevention and its associated factors among livestock owners in Sekotazuria district. **Method** Community based cross-sectional quantitative study was conducted from April to May, 2018, at Sekotazuria district, Northeast Ethiopia. A total of 844 live-stoke owners were selected from Sekotazuria district using simple random sampling technique. Data were collected using a structured self-administered questionnaire and data were cleaned, coded, and entered into Epi-info version 3.5.3, and transferred into SPSS version 20 for further statistical analysis. A p-value of less than 0.05 at multiple logistic regression analysis was considered statistically significant. **Results** The study revealed that good knowledge of anthrax prevention among livestock owners was 55.8% (95%CI: 54.2, 57.4%). According to multivariable logistic regression analysis, secondary and above educational level [AOR=2.97, 95% CI: 1.07, 8.20], age range of 42 – 80 [AOR=1.47, 95% CI: 1.04, 2.07], and health education about anthrax [AOR=4.25, 95% CI: 2.51, 7.17] were found significantly associated with good knowledge of anthrax infection prevention. **Conclusion** More than half of livestock owners at SekotaZuria District had good knowledge towards anthrax infection prevention, education level in secondary and above, respondents age category 42-80 years, and health education about anthrax were factors associated with knowledge of anthrax infection prevention. Therefore, health education about anthrax shall be strengthening.

## Background

Anthrax is a zoonotic infectious disease caused by *Bacillus anthraci*, a gram positive, non-motile, spore forming rod shape bacteria which primarily affect herbivorous, wildlife and livestock's [1-3]. Anthrax spores can remain viable for decades and this remarkable stability of the spores makes them an ideal bioweapon [4, 5]. Anthrax is transmitted to human via direct or indirect contact with infected animals and their products like hides or wool, though skin contact, ingestion, and inhalation of spores [6]. Human anthrax usually develops after exposure to infected animals and their tissues [7]. Anthrax is globally distributed disease, reported from all continents that are populated heavily with animals and humans. It continues to persist globally with an estimated 20,000 to 100,000 incidence cases yearly, and it is highly affecting rural areas in developing nations [8, 9]. It has a great impact on livelihood of livestock farmers by affecting their health and reducing the quantity and quality of animal products thereby causing huge economic loss, that further resulted impaired economy and loss of livestock product market because of decreased consumer confidence [10, 11].

Anthrax is a serious disease of major health or economic importance and it is estimated that about 1.83 billion people live within regions of anthrax risk areas[12]. Literatures reported that adequate knowledge on anthrax prevention is considered as one of the strategy for anthrax prevention in humans [13, 14]. However, lack of awareness among livestock owners contributed for the burden of the problem and it is also an important hurdle in controlling zoonotic diseases[15]. A study conducted in Bangladesh, 56.67% people had no knowledge about anthrax disease, its outbreak and the consequences, and 50.83% people did not have knowledge on the proper process of carcass disposal[16]. Similarly study on knowledge of anthrax infection prevention among livestock owners indicated that in the level of knowledge on anthrax prevention ranged from 16.8% to 71.5% [17-20]. In Ethiopia, knowledge on anthrax prevention was reported as 94.3% in Addis Ababa [21], 50.5% in West Arsi[22], 54.4% in Jimma[23]and 57.3% in North Shoa, Ethiopia[24]. It was reported by studies that level education were the most significant factor for poor knowledge of anthrax prevention[17, 19, 25-27].

In Ethiopia, human anthrax becomes a great concern for the public and occurs in several farming localities of the country. According to the surveillance done from 2009-2013 by the Ethiopia Ministry of Health and Agriculture, a total of 5,197 of human anthrax cases and 26,737 animal anthrax cases were reported where the highest human case were reported from Tigray region followed by Amhara, South nation and nationalities (SNNPR) and Oromia regions [28]. In Amhara region where the study was conducted, it remains a major health problem with a total of 2,602 cases and 18 deaths were reported between 2010 and 2014. Of these, Waghimra (50.6%), North Gondar (15.8%) and South Wollo Zone (12.8%) contributed the most in the region [29].

## Methods

### Study design and setting

A community-based cross-sectional quantitative study was conducted from April to May, 2018, in Sekotazuria district, Northeast Ethiopia. Sekota is located 462 km far from Bah Dar, the capital city of Amhara region to the North, and 460 Km from Addis Ababa (the capital city of Ethiopia). Sekotazuria district established with 35 rural Kebeles. In 2018, the district population estimated to be a total of 173,026.

### Study Participants, sample size, and sampling procedure

A total of 844 live stoke owners were selected from Sekotazuria district using simple random sampling technique. Sample size was calculated using the single population proportion formula, considering the following assumptions: 50.8 % the prevalence of Knowledge related to prevention and control anthrax

disease from recent community based cross sectional survey in Oromia region [19], 95% level of confidence and 5% margin of error and 5% of non-response rate and 2 design effect. Finally, a minimum sample size of 844 was obtained.

### **Data collection tool and procedure**

Data were collected using a pretested structured questionnaire. To maintain its consistency, the questionnaire was first translated from English to Amharic (the native language of the study) and retranslated to English by a professional translator and public health experts. Data were collected by an interview-administered structured questionnaire. One day intensive training on the objective of the study, and the confidentiality of information was given to data collectors and supervisors.

### **Operational definition and study variables**

**Knowledge:** respondents to know causes, symptoms, mode of transmission and prevention methods of anthrax disease.

**Good knowledge toward anthrax infection prevention:** respondents answered equal to or more than 50% of knowledge measuring questions.

### **Data processing and analysis**

Data were entered into Epi-info version 7 and exported to a statistical package for social science (SPSS) version 20 for further analysis. Data cleaning was done by running frequencies. Descriptive statistics, including frequencies, and proportions were computed to summarize the variables. The logistic regression model was used in the process. A p-value of less than 0.05 at the multivariable logistic regression analysis was considered statistically significant.

## **Results**

### **Socio-demographic characteristics of respondents**

A total of 800 livestock owners were participated in the study with response rate of 94.8%. More than three-fourth of study participants were males (78.5%), farmers (88.9%) and lived in rural residence (87%) (Table1).

Table 1: Socio- demographic characteristics of study participants, SekotaZuria District, Amhara Region, 2018

Category of variables	Subcategory variables	of Frequency	Percentage (%)
Sex	Female	172	21.5
	Male	628	78.5
Age	18-41	439	54.9
	42-80	361	45.1
Marital status	Currently married	696	87
	Currently not married	104	13
Education level	Unable to read and write	428	53.5
	Able to read and write	217	27.1
	Primary education	109	13.6
	Secondary and above	46	5.8
Occupational status	Farmer	711	88.8
	Merchant	43	5.4
	Government employee	19	2.4
	Student	27	3.4
Residence	Rural	701	87.6
	Urban	99	12.4
Health education	Yes	125	15.6
	No	675	84.4
Regulatory control	Yes	240	30.0
	No	560	70.0
Previous infection experience in man	Yes	168	21.0
	No	632	79.0
Previous infection experience in animals	Yes	394	49.3
	No	406	50.7

#### Overall status of livestock owner's knowledge about Anthrax

About 55.8% (95%CI: 54.2, 57.4%) of study participants were found to have a good knowledge on anthrax prevention.(Table2).

Table 2: Participants response related with knowledge measuring questions.

Variables	Category	Frequency (n=800)	Percent (%)
Do you know the disease called anthrax?	Yes	786	98.3
	No	14	1.7
Do you know the prevention method of anthrax?	Yes	539	67.4
	No	261	32.6
Do you know that anthrax can be transmitted from animal to human?	Yes	416	52
	No	384	48
Do you have knowledge about way of transmission?	Yes	342	42.7
	No	458	57.3
Do you know the treatment and control method of the disease in animal and human?	Yes	538	67.2
	No	262	32.8
Do you have knowledge about carcass disposal method of anthrax?	Yes	181	22.6
	No	619	77.4

Regarding with the sign of disease in animals, most respondents observes sudden death (67%) and local swelling on the ventral side of the body parts (56.5%) (Figure3).

Figure 3: Respondent's multiple response related with sign of disease in animal

Considering with knowledge of respondents about anthrax in multiple response questions 48.1% respondents' knew anthrax is transmitted through ingestion, 6.5% through contact and 0.3% through fly (Figure4).

Figure 4: multiple response of respondents about ways of transmission of anthrax disease to human, SekotaZuria district, Ethiopia, 2018.

#### 4.3. Factors associated with knowledge of anthrax prevention among livestock owners of Sekotazuria district.

In bi-variable logistic regression analysis, ten variables; occupation, residence, sex, age, education level, infection experience of anthrax in man, infection experience of anthrax in animal, health education related with anthrax, regulatory control of disease and herd size of respondents were found to have P-value less than 0.25 and included in multi variable logistic regression model for further analysis (table 3).

Multivariable binary logistic regression result showed that respondents whose educational level, people who got health education about anthrax and age of respondents were significantly associated with knowledge of anthrax prevention.

The Odds of good knowledge about anthrax prevention among respondents whose educational level is secondary and above was 2.97 times higher (AOR=2.97, 95%CI: 1.073-8.2) than illiterate respondents.

The Odds of good knowledge about anthrax prevention among respondents with age range of 42 – 80 was 1.47 times higher (AOR=1.47, 95%CI: 1.04-2.07) than respondents with age range of between 18 and 41 years.

The Odds of good knowledge about anthrax prevention among respondents who got health education about anthrax was 4.25 times higher (AOR=4.25, 95%CI: 2.51-7.17) than respondents who didn't get health education.

Table 4: factors associated with livestock owner's knowledge on anthrax prevention in Sekotazuria district, Northeast Amhara Ethiopia, 2018.

Variable	Category	Knowledge		COR 95%)	(CI	AOR (95%CI)
		Good	Poor			
Education level	Secondary and above	39	7	5.12	(2.24-11.71)	2.97 (1.07-8.2)*
	Primary education	62	47	1.21	(0.79-1.85)	1.26 (0.76-2.07)
	Adult education	118	99	1.10	[0.79-1.52]	1.31 (0.91-1.88)
	Illiterates	223	205	1		1
Getting education	Yes	104	21	4.94	(3.02-8.08)	4.25 (2.51- 7.17)***
	No	338	337	1		1
Age	42-80	219	142	1.49	(1.12-1.98)	1.47 (1.04-2.07)*
	18-41	223	216	1		1

## Discussion

The aim of this study was to assess knowledge of anthrax prevention among livestock owners and its associated factors at Sekota district. This study indicates that, the magnitude of knowledge of anthrax prevention among livestock owners was found to be 55.8%. This finding is in line with other studies conducted in Jimma, Ethiopia (54.4%) [23], North Showa, Ethiopia 57.3% [24]. In contrast this finding was lower than study done in Addis Ababa 94.27% [21], Tanzania 62.5% [20], Zimbabwe 71.5% [18] and 69.2% [26], Turkey 64.2% [17]. This study finding was higher than study done in West Arise, Ethiopia 50.5% [22] and India 16.8% [19]. This discrepancy may be due to socio demographic difference and the magnitude of the disease.

The finding of this study shows that the overall practice of respondents towards anthrax disease prevention was found to be twenty five point four (25.4%). This finding was lower than study done in Turkey 51.9% [17], and Zimbabwe 86% [18]. This implies, despite 55.8% of respondents having good knowledge about anthrax disease prevention only 25.4% of respondents were changed their knowledge to practice. This may be due to economic discrepancy between them; the district was one of the food insecure from Wag-Himra Zone.

In this study finding more than half of study participants (55%) know anthrax was transmitted from animal to human in line with this study conducted in India 56% [19]. Transmission through the consumption of infected meat was mentioned by 48% of the respondents, contact 6.5% and fly 0.3%. This is in line with study done in Ethiopia [23] 54.9% ingestion, 14.3% contact and Zimbabwe [26] reported 47% through ingestion and 8.8% through contact with infected animals and study done in India [19] 55% ingestion, 1% contact, aerosol 1% and insect 1%. These low levels of knowledge related with transmission routes of disease exposes livestock owners to the disease.

Considering respondents who have previous infection experience were found to have better knowledge 64.9% (109/168) than those who had no previous infection experience 52.5% (333/632). Similarly study conducted in Jimma zone, Ethiopia anthrax was more mentioned in Sokoru (89%) than Limmu 42% that reported more anthrax case experienced in Sokoru than Limmu [30] and study conducted in Zimbabwe who reported 94% awareness from high risk district and 39.8% awareness in low anthrax risk districts [18] Tanzania (92% from Arusha and 33% from Tanga [20]).

### **Factors Associated with good Knowledge of Anthrax infection prevention**

Based on this finding educational level of respondent's was correlated with knowledge of respondents towards anthrax prevention. Respondents who attend high school and above were 2.97 times more likely to have good knowledge on anthrax disease prevention as compared to respondents who can't read and write. This finding was in line with study done Zambia [19] Turkey [17] and Kenya [25] that reported when the level of education increases the knowledge of respondents found to be significantly increased.

Respondents who got health education about anthrax disease were 4.25 times more likely to have good knowledge of anthrax disease prevention than respondents who couldn't get health education. This finding was in line with other study done in Zimbabwe that indicates low level of knowledge of respondents associated with limited access to health education about anthrax disease prevention[26]. This may be due to the fact that having information about the disease was enhanced the knowledge of respondents towards prevention of the disease.

In this study age of respondents was significantly associated with good knowledge of anthrax disease prevention. The Odds of good knowledge about anthrax prevention among respondents whose age 42 – 80 years was 1.47 times higher than respondents whose age was between 18 and 41 years. This finding was different from other study done in Turkey and Kenya, that reveals age is not associated with their knowledge of anthrax disease prevention[17, 25]. This difference might be due to; in the study area residents gain their knowledge of the disease from their life experience.

## **Conclusion**

More than half percent (55.8%) of live stock owners had good knowledge on anthrax infection prevention; the contributing factors for good knowledge among livestock owners on anthrax infection prevention are educational level is secondary and above, age range of 42 – 80 and health education about anthrax. Therefore health education about anthrax shall be strengthening.

## **Declarations**

### **Ethics approval and consent to participate**

Ethical clearance was secured from the ethical review board of university of Gondar. Before the initiation of data collection permission from all concerned body was obtained based on the letter obtained from university of Gondar. After getting support letter from Sekotazuria district administrative office and veterinary clinic, and kebele administrators, the purpose and objective of the study was informed for all participants and oral informed consent was obtained from each participant to initiate data collection.

### **Consent for publication**

Not applicable

### **Availability of data and materials**

Data will be available upon from the request of the corresponding author

### **Competing interests**

The authors declare no competing interests

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## Authors' contributions

KS, TD and AMS were involved in the conception, design, data Collection, analysis and report writing. TD and AMS assisted with the Design, approved the proposal with some revisions, and participated in data analysis and manuscript preparation.

All authors read and approved the final manuscript.

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## References

1. Kamal, S., et al., *Anthrax: an update*. Asian Pacific journal of tropical biomedicine, 2011. **1**(6): p. 496-501.
2. Sternbach, G., *The history of anthrax*. The Journal of emergency medicine, 2003. **24**(4): p. 463-467.
3. Shadomy, S.V. and T.L. Smith, *Zoonosis update. Anthrax*. J Am Vet Med Assoc, 2008. **233**(1): p. 63-72.
4. Hugh-Jones, M. and J. Blackburn, *The ecology of Bacillus anthracis*. Molecular aspects of medicine, 2009. **30**(6): p. 356-367.
5. Hudson, M.J., et al., *Bacillus anthracis: balancing innocent research with dual-use potential*. International Journal of Medical Microbiology, 2008. **298**(5-6): p. 345-364.
6. World Organisation for Animal Health, WHO, and F.a.A.O.o.t.U. Nations, *Anthrax in humans and animals, 4th edition* 2008.
7. Devrim, İ., et al., *Animal carcass and eyelid anthrax: a case report*. Turkish Journal of Pediatrics, 2009. **51**(1).
8. Swartz, M.N., *Recognition and management of anthrax—an update*. New England Journal of Medicine, 2001. **345**(22): p. 1621-1626.
9. Maudlin, I., M.C. Eisler, and S.C. Welburn, *Neglected and endemic zoonoses*. Philosophical Transactions of the Royal Society B: Biological Sciences, 2009. **364**(1530): p. 2777-2787.
10. Wastling, J., B. Akanmori, and D. Williams, *Zoonoses in West Africa: impact and control*. Parasitology Today, 1999. **15**(8): p. 309-311.

11. Perry, B.D., *Investing in animal health research to alleviate poverty*. 2002: ILRI (aka ILCA and ILRAD).
12. Carlson, C.J., et al., *The global distribution of Bacillus anthracis and associated anthrax risk to humans, livestock and wildlife*. Nature microbiology, 2019: p. 1.
13. John, K., R. Kazwala, and G.S. Mfinanga, *Knowledge of causes, clinical features and diagnosis of common zoonoses among medical practitioners in Tanzania*. BMC infectious diseases, 2008. **8**(1): p. 162.
14. Åsbjer, E., *Dog population management in Malawi and Peru*. 2010.
15. Asokan, G., V. Asokan, and P. Tharyan, *One health national programme across species on zoonoses: a call to the developing world*. Infection ecology & epidemiology, 2011. **1**(1): p. 8293.
16. Hassan, J., et al., *Factors associated with repeated outbreak of anthrax in Bangladesh: qualitative and quantitative study*. Journal of Advanced Veterinary and Animal Research, 2015. **2**(2): p. 158-164.
17. Çakmur H, A.L., . Kahraman E., and Mustafa A., *Evaluation of Farmers' knowledge-attitude-practice about zoonotic diseases in Kars, turkey*. Kafkas J Med Sci, 2015. **5**(3): p. 87-93.
18. Chikerema MS., M.G., Pfukenyi DM., *awareness and attitude toward zoonoses with particular reference to anthrax among cattle owners in selected rural communities of Zimbabwe*. Vector borne and zoonotic diseases 2013. **13**(4).
19. Munisamy B, S.P., and Kannan P, *Knowledge Assessment through Surveying on Cattle Zoonotic Diseases in Dairy Farmers*. Int.J.Curr.Microbiol.App.Sci 2017. **6**(3): p. 783-794.
20. Swai, E., Schoonman L., and Daborn C, *Knowledge and Attitude Towards Zoonoses among Animal Health Workers and Livestock Keepers in Arusha and Tanga, Tanzania*. Tanzania Journal of Health Research 2010. **12**(4).
21. Girma, S., Zewde G., Tafess K., and Jibat T, *Assessment of awareness on food borne zoonoses and its relation with veterinary public health services in and around Addis Ababa, Ethiopia*. Journal of Public Health and Epidemiology, 2012. **4**(2): p. 48-51.
22. Gezmu M., B.A., Mekuria A. , *Assessment of Community Knowledge, Attitude and Practice on Zoonotic Disease in and Around Dodola Town, West Arsi Zone, Ethiopia*. Ethiopian Journal of Veterinary Science and Animal Production (EJVSAP), 2017. **1**(1): p. 57-65.
23. Tesfaye D., F.D., Tigre W, Regassa A and Fekadu A. , *Perception of the public on the common zoonotic diseases in Jimma, Southwestern Ethiopia*. Int. J. of medicine and medical science, 2013. **5**(6): p. 279-285.
24. Seyoum., E.M.T., Kebede N., Gezahegn H., Mehirete T. and Mengesha Z., *Knowledge, Attitude and Practice Among Small Scale Dairy Farmers on Milk-Borne Zoonotic Diseases, North Showa Zone. Ethiopia*. Journal of Foodborne and Zoonotic Diseases, 2016. **4**(2): p. 19-28.
25. Chacha NI, *Knowledge, attitude and practice of anthrax among community members, health and veterinary workers in Maragua, Kenya*. 2017.
26. Gadaga, B.M., Etter E.M.C., Mukamuri B., Makwangudze K. J., Pfukenyi D. M. and Matope G, *Living at the edge of an interface area in Zimbabwe: cattle owners, commodity chain and health workers'*

awareness, perceptions and practices on zoonoses. BMC Public Health, 2016. **16**(84).

27. Singh, B., et al., *Knowledge, attitude and practices relating to zoonotic diseases among livestock farmers in Punjab, India*. Acta tropica, 2019. **189**: p. 15-21.
28. Bahiru, G., et al., *Human and animal anthrax in Ethiopia: A retrospective record review 2009-2013*. Ethiopian Veterinary Journal, 2016. **20**(2): p. 76-85.
29. Bezabih B, O.M., Abraham A and Teklehaymanot G, *Anthrax surveillance data analysis for one health approach intervention, Amhara region, Ethiopia*,. 2014.
30. Addis M., Abebe B. , *community perception towards zoonotic diseases acquired from foods of animal origin among selected districts of Jimma zone, Ethiopia*. Int. J. Adv. Res. Biol. Sci, 2017. **4**(7): p. 137-142.

## Figures

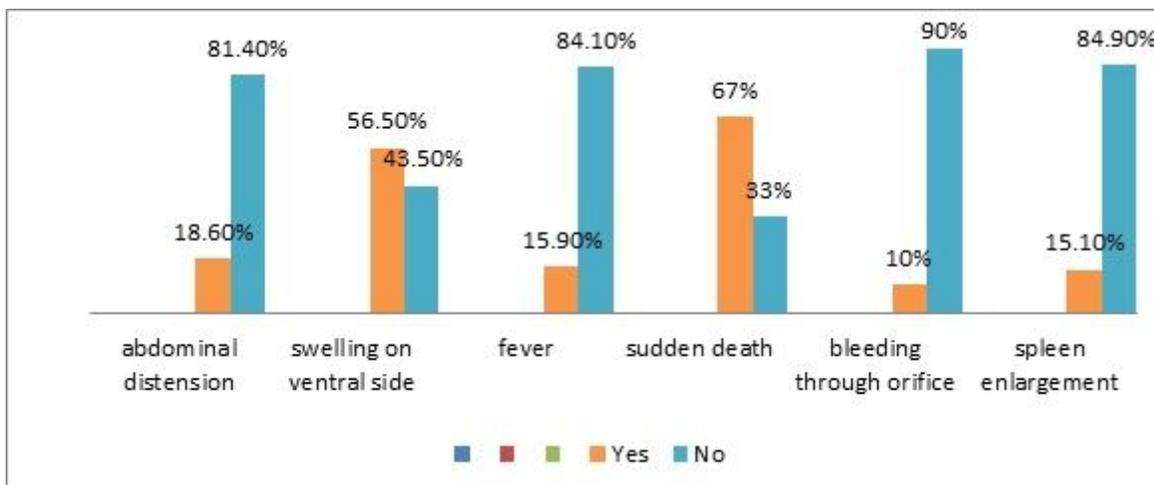
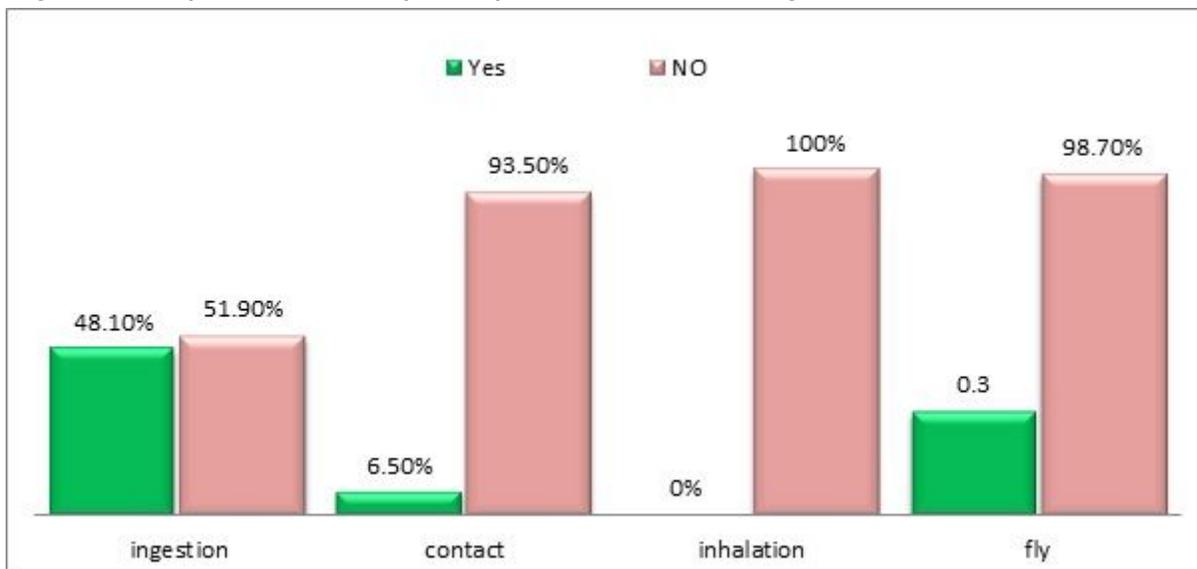


Figure 1

Figure 3: Respondent's multiple response related with sign of disease in animal



## Figure 2

Figure 4: multiple response of respondents about ways of transmission of anthrax disease to human, SekotaZuria district, Ethiopia, 2018.