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# Analysis of KAP and Associated factors Regarding Zoonotic Disease in Western Hararghe, Ethiopia: A One Health Perspective

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**Article**

**Keywords:** Attitude, Knowledge, Perception, Prevalence, Zoonoses risk factors

**Posted Date:** August 31st, 2026

**DOI:** https://doi.org/10.21203/rs.3.rs-10370671/v1

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**Additional Declarations:** No competing interests reported.

# Analysis of KAP and Associated factors Regarding Zoonotic Disease in Western Hararghe, Ethiopia: A One Health Perspective

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**Abstract**

**Background:** Zoonoses are an infections naturally transmitted between human and animals during preparing and handling food of animal origin and consuming raw or undercooked meat or milk. The community of the study area daily in contact with livestock and their products that expose them to zoonotic pathogens. Knowing the status of the awareness and practice of respondents and identifying the associated risk, helps to establish well planned controlling and prevention techniques. However, very limited study have conducted on the analysis of the KAP and related risk factors of zoonoses among the community of the study area. Therefore, the objectives of this study is to analyze the knowledge, awareness, prevention practices of zoonoses and associated risk factors in selected districts of western Hararghe, Ethiopia.

**Method:** The survey data was collected from October 20223 to September 2024 using a closed-ended questionnaire and interview from randomly selected 349 respondents of three districts of western Hararghe, Ethiopia (Chiro (194), Gemechi (49), Tulo (105) to assess the knowledge, awareness, and prevention practice regarding to zoonoses. Descriptive statistics such as frequency, percentage and charts were used to report the results, and chi-square were used to determine the correlation of demographic factors with knowledge, awareness, and practice of the community and statically significant at a p-value of 0.05.

**Result:** The study revealed that 84.5% of respondents had told that they knew the disease which can be transmitted from animals to human, but no one knew by local terms. Approximately, 62.7%, 49.6%, and 48.0% informants mentioned radio, television and veterinary officials as the sources of information, with radio being the major source of information for rural residents (63.5%), while the major mentioned source of information for urban resident was TV (58.5%). The majority (79.7%) of participants knew that the transmission of zoonotic diseases from animals to humans, and 96.6% of respondents recognized zoonoses as a preventable disease. Higher percentages of informants from Gemechis district told that they perform zoonoses risk practices such as sharing house with animals (97.9%), consumption of raw meat (100%) and milk (73.5%). Regarding the correlation of sociodemographic factors with zoonoses knowledge, higher knowledge were reported by male respondents (60.9%), respondents with a larger family size i.e. 6 and above (62.1%), and respondents with 1-8 education (65.1%), urban residents (65.2%), and students (63.6%). Further, across study districts higher percentages of respondents from Tulo districts (68.6%) stated that they knew zoonoses. Significant association was found for family size, residence, education, occupation, and study districts ($p = 0.05$)

**Conclusion:** The study indicated although promising knowledge and awareness was observed, but the higher prevalence rate of zoonoses risk factors indicate there is a need to provide continuous health education and create awareness about the sources of zoonoses, routes of transmission, and prevention practices. Further the study recommend the implication of one health across zoonotic linked sectors.

**Key words**: Attitude, Knowledge, Perception, Prevalence, Zoonoses risk factors

## 1. Introduction

In many regions of Ethiopia, animals provide essential resources (food, transportation, farming services, and others), but this close interaction, without proper management and awareness, poses significant public health risks and economic consequences (Zinsstag, [20]). Zoonotic diseases are an infectious diseases that transmitted between animals and humans by various pathogenic microorganism such as bacteria, fungi, viruses, and parasites (Çakmur *et al.,* [1]), represent a significant global health concern. These diseases account for a substantial proportion of human infections, with approximately 60% of human infectious agents shared with animals (Bharat et al., [2]), and zoonotic infections comprising about 70% of community-acquired infections. WHO reported that 2.2 million deaths every year occur due to 13 zoonotic diseases (WHO, 2012). Among zoonoses, 10,000-100,000 human anthrax incidences was reported in developing countries such as Chad, Ethiopia, Zambia, and Zimbabwe annually (Pieracci *et al*. (2016). In Ethiopia, anthrax and rabies were reported as the first and the second most prioritized zoonoses (Seid *et al.* (2020). Moreover the study conducted in different districts of current study zone revealed that high frequency of the *cysticercus bovis*, brucellosis (Umer *et al*., 2021) and rabies (Mohammed *et al*., 2022). The emergence and spread of these diseases are influenced by a multitude of factors, including socio-cultural practices, socioeconomic conditions, farming methods, educational levels, dietary habits, the presence of animal reservoirs, and inadequate disease control programs (Asbjer, [12]). Compared to others, developing countries, including Ethiopia, experience disproportionately high rates of zoonotic disease due to a convergence of factors such as close human-animal interaction, consumption of bushmeat and unsafe food and water, limited access to healthcare, and insufficient intersectoral collaboration (Wolfe et al., [3]; Mbugi et al., [4]). Moreover, other specific risk factors for zoonoses in Ethiopia includes shared living spaces with animals especially in rural parts (Ameni and Erkihun [13]), consumption of raw milk and meat, traditional farming practices, the mixing of wild and domestic animals, and unsafe handling of animals and their products ([21, 22]).

Success in reducing the public health impact of zoonotic diseases depends on improved diagnosis, information sharing, joint surveillance, and coordinated training initiatives. herefore, effective disease prevention and control strategies demand a comprehensive One Health approach, integrating human, animal, and environmental health. This approach necessitates capacity building for health professionals, community awareness campaigns, and strengthened collaborations across sectors (Desta, [22]). A crucial first step is to address the knowledge gap regarding community awareness of zoonotic diseases and their risk factors by studying relevant sociodemographic factors to inform effective policy and intervention strategies. Therefore, the objective of this study was to assess community awareness of zoonoses and analyze the association of sociodemographic factors with zoonoses awareness. This will be used to understand the status of community knowledge and awareness regarding zoonoses and to identify risk factors that expose the public to zoonoses, which is important for setting prevention and control strategies.

## 2. Material and Method

### 2.1. Description of the Study Area

The study was conducted from October 5, 2023 to September 7, 2024 in three districts of West Hararghe Zone (Chiro, Gemechis, and Tulo districts). West Hararghe is located in the eastern part of Ethiopia, 317 km far from the capital city of Addis Ababa at latitude of 7° 52′ 15″–9° 28′ 43″ N and longitude of 400 03′ 33″–40° 34″ 13″ E **(Fig. 1.)** with an altitude of 1200–3600 m above sea level. It is also characterized by three agro-climatic Zones, namely, highland, midland, and lowland. The mean annual rainfall of the western Hararghe is from 650 to 1500 mm and the average temperature of 20.5 to 24°C).

The study Zone has a total of 17 districts, of which 4 are pastoralist districts. Based on the 2007 Census conducted by the CSA, this Zone has a total population of 1,871,706, an increase of 47.16% over the 1994 census, of whom 958,861 are men and 912,845 women; with an area of 15,065.86 square kilometers, and has a population density of 124.23 CSA [23].

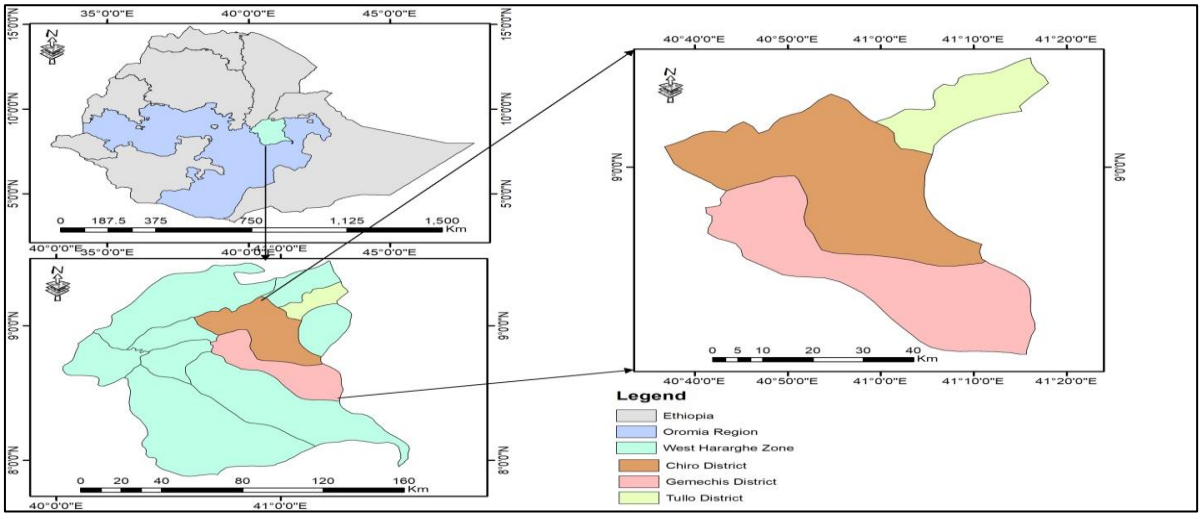



**Figure. 1.** Map of the study area

### 2.2. Study Design and Population

This study employed a cross-sectional design using a structured questionnaire, and interview. The study population is randomly selected inhabitants of three districts of western Hararghe, Ethiopia. The questionaries' involves question related to sociodemographic characteristics of respondents (age, sex, residence, educational level, and occupation), question related to the knowledge, attitude and practices of respondents were involved.

### 2.3. Sampling Technique and Sample Size Determination

A stratified random sampling was used to organize the respondents based on their occupation to be representatives of the community. The total sample size (n) was calculated using Yamane's formula [25]: $n = N / (1 + Ne^2)$, where:

N = the estimated total population, e = the desired level of precision (0.05 or 5%). This formula yielded a total sample size of n = 399. For convenience of the data collection the study assumed 348 as a sample size. The sample size for each stratum (nh) was then proportionally allocated using the following formula: nh = (Nh / N) * n, where: nh = sample size for stratum h, Nh = the estimated population size for stratum h, N = estimated total population across all strata, and n = total sample size. This resulted in the following sample sizes per stratum: Farmers (n = 200), Students (n= 87), government employees (n= 23), and other residents (day labor workers and merchants) (n=38). A total of 348 respondents were randomly selected from three districts (Chiro 194, Gemechis 49, and Tulo 105).

**2.4. Questionnaire Development and Validation**

The questionnaire was developed through a multi-stage process. Initially, a literature review was conducted to identify key concepts and existing validated questionnaires relevant to zoonoses and associated risk factors. This was followed by the development of a draft questionnaire incorporating closed-ended questions on knowledge of zoonotic diseases, hygiene practices, animal ownership, and preventative behaviors of the community. To ensure the quality of data, questionnaires prepared in English were translated into Afaan Oromoo, and for consistency, were re-translated back into English by another individual fluent in both languages. A trial test of the questionnaire was conducted with 5% of respondents from a similar population in a nearby kebele to assess clarity, understandability, and completion time. Feedback from the trial test was used to revise the questionnaire. All methods were carried out in accordance with relevant guidelines and regulations. The questionnaire was administered through face-to-face interviews with 348 respondents recruited from the study area.

**2.5. Data Collection and Analysis**

Data were collected between October 2023 and September 2024 by trained data collectors. Each data collector received rigorous training on questionnaire administration, ethical considerations, and data quality control. Data were collected using paper questionnaires and the questionnaire was administered to randomly selected 348 respondents farmers (n=200), students (n=87), government employee n=23) and other residents (n=38). Farmers and other residents who could not read and write were interviewed using local language (Afaan Oromo). The collected data were double-entered into Excel by two independent data entry assistants to minimize errors and were properly coded by data collectors during data collection and then the data were analyzed using statistical packages for social sciences (SPSS) software version 20. Descriptive statistics such as frequency, percentage and charts were used to report data, and chi-square were used to determine the associations between variables. The relationships between public awareness and practices with sociodemographic factors was analyzed by using chi-square test, and the p value was considered to represent a significant difference at 0.05.

### 2.6. Ethics Approval and Consent to Participate

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and all applicable national and institutional guidelines governing research involving human participants. Ethical approval for the study, including the study protocol, participant recruitment procedures, and informed consent process, was obtained from the Oda Bultum University Research, Publication, and Ethics Committee prior to the commencement of data collection. Administrative permission to conduct the study was also obtained from the Oda Bultum University Research Directorate Office and permission for data collection was obtained from the respective Zonal and District Health Administration Offices. Informed consent was obtained from all participants included in this study before their participation. Because the study involved interviews in settings where written consent was not considered practical, verbal informed consent was obtained from each participant. Before consent was sought, all participants received a clear explanation of the study objectives, procedures, expected duration, and the voluntary nature of participation, and their rights they could decline to participate, refuse to answer any question, or withdraw from the study at any stage. Participants were assured that all information collected during the study would be treated with strict confidentiality and used solely for research purposes. Personally identifiable information was neither collected nor disclosed in any reports or publications arising from the study. All data were anonymized before analysis and presentation of the findings to safeguard participants' privacy and confidentiality. In addition, participants provided consent for the anonymized data collected during the study to be analyzed and published in scientific journals and other scholarly communications.

## 3. Result

### 3.1. Sociodemographic Status of Respondents

A total of 348 respondents were included in this survey study, of this Chiro (n = 194), Gemechis (n = 49), and Tulo (n = 105). The majority of the study participants were male (70.4 %). Considering the residence majority of participants (61.5%) were rural residents (**Table 1).** In terms of educational level, 38.2% respondents were had no formal education, 23.8 % had completed grade 8, 30.7% had completed grade 12, and 7.2% had educational level of diploma and above. About 57.5% of the respondents were farmers followed by students (25.0%), other (10.9%) and government employees (6.6%) (**Table 1**).

**Table 1.** Sociodemographic characteristics of respondents

| Variables | Categories | Chiro | Gemechis | Tulo | Total |
|---|---|---|---|---|---|
| | | Frequency (%) | Frequency (%) | Frequency (% ) | Frequency (%) |
| **Gender** | Male | 120 (61.9%) | 37(77.1%) | 80(76.2%) | 238(70.4%) |
| | Female | 74(38.1%) | 12(24.4%) | 25(23.8%) | 110(29.6%) |

| | | | | | |
|---|---|---|---|---|---|
| **Residence** | Urban | 85(43.8%) | 10(18.8%) | 40(38.1%) | 135(38.5%) |
| | Rural | 110(56.2%) | 39(81.3%) | 65(61.9%) | 214(61.5%) |
| **Education** | No formal education | 53(27.3%) | 33(68.8%) | 48(45.7%) | 133(38.2%) |
| | 1-8 Grade | 50(27.8%) | 13(27.1%) | 21(20.0%) | 83(23.8%) |
| | 9-12 Grade | 71(36.6%) | 2(4.2%) | 34(32.3%) | 107(30.7%) |
| | Diploma and Above | 21(10.8% | 3(6.2%) | 2(1.9%) | 26(7.4%) |
| **Occupation** | Government employee | 13(6.7%) | 2(4.2%) | 8(7.62.0%) | 23(6.6%) |
| | Student | 54(27.8%) | 4(8.2%) | 30(36.2%) | 87(25.0%) |
| | Farmer | 93(47.9%) | 40(83.2%) | 67(63.8%) | 200(57.5%) |
| | Others | 35(18.0%) | 3(6.3%) | - | 38(10.9%) |

### 3.2. Knowledge of Participants Regarding Zoonotic Diseases

The majority of respondents (84.5%) reported that they had knowledge of diseases transmitted from animals to humans. Radio was the most commonly reported source of information on zoonotic diseases (62.7%), followed by television (49.6%), veterinary health professionals (48.7%), teachers (44.1%), newspapers (27.8%), and religious leaders (17.1%). Most respondents (96.6%) believed that zoonotic diseases are preventable. Additionally, 79.7% of respondents reported awareness that zoonotic diseases can be transmitted from animals to humans. The most frequently recognized transmission routes were consumption of raw milk (90.8%) and raw meat (87.4%), followed by drinking water contaminated with animal feces (77.9%), sharing living spaces with animals (68.8%), and handling animals with wounds (47.8%) **(Table 2).**

**Table 2.** Knowledge of respondents regarding zoonotic diseases, sources of information, and perceived transmission routes

| **Variables** | **Categories** | **Frequency (%)** |
|---|---|---|
| Do you know zoonoses? | Yes | 294(84.5%) |
| If yes, where do you get the information about zoonotic disease? | Newspapers | 97 (27.8%) |
| | Radio | 219 (62.7%) |
| | TV | 173 (49.6%) |
| | Veterinary health professionals | 170 (48.7%) |
| | Teachers | 154 (44.1%) |

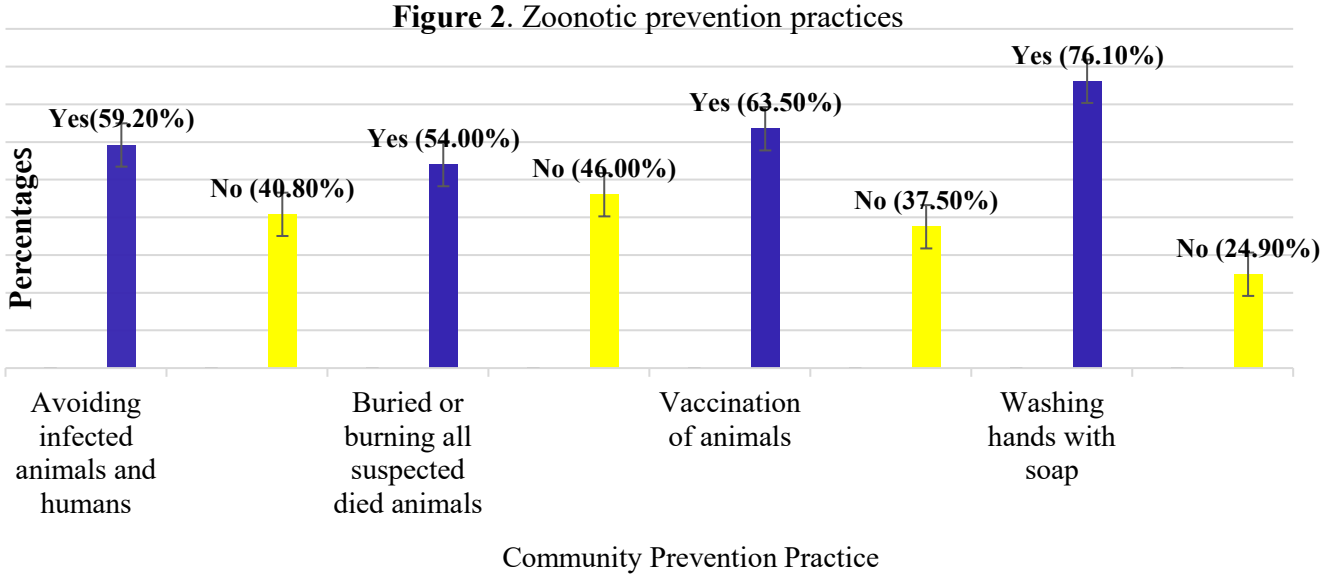
| | | |
|---|---|---|
| | Religious leaders | 60(17.1%) |
| Does zoonoses is preventable disease? | Yes | 337(96.6%) |
| Does zoonoses can be transmitted from cattle to humans vice versa? | Yes | 278 (79.7%) |
| If yes, how? | Drinking contaminated water | 272(77.9%) |
| | Drinking raw milk | 317(90.8%) |
| | Eating raw or under cooked meat | 305(87.4%) |
| | Handling animals with bare hands | 167(47.8%) |
| | Sharing the same room with their domestic animals | 240(68.8%) |

Values are presented as frequency (percentage). Multiple responses were allowed for sources of information and perceived transmission routes; therefore, percentages may not add up to 100%.

### 3.3. Respondents Zoonotic Prevention Practices

Figure 2 presents respondents' knowledge of measures that can prevent zoonotic diseases. The most frequently identified preventive measure was washing hands with soap, reported by 76.1% of respondents. This was followed by vaccinating animals (63.5%). Slightly more than half of the respondents (54.0%) recognized avoiding contact with infected animals or people with zoonotic diseases and burning the carcasses of animals suspected to have died from zoonotic diseases as important prevention measures. These findings indicate that respondents were generally more aware of personal hygiene and animal vaccination as preventive strategies than other recommended measures for reducing the transmission of zoonotic diseases.

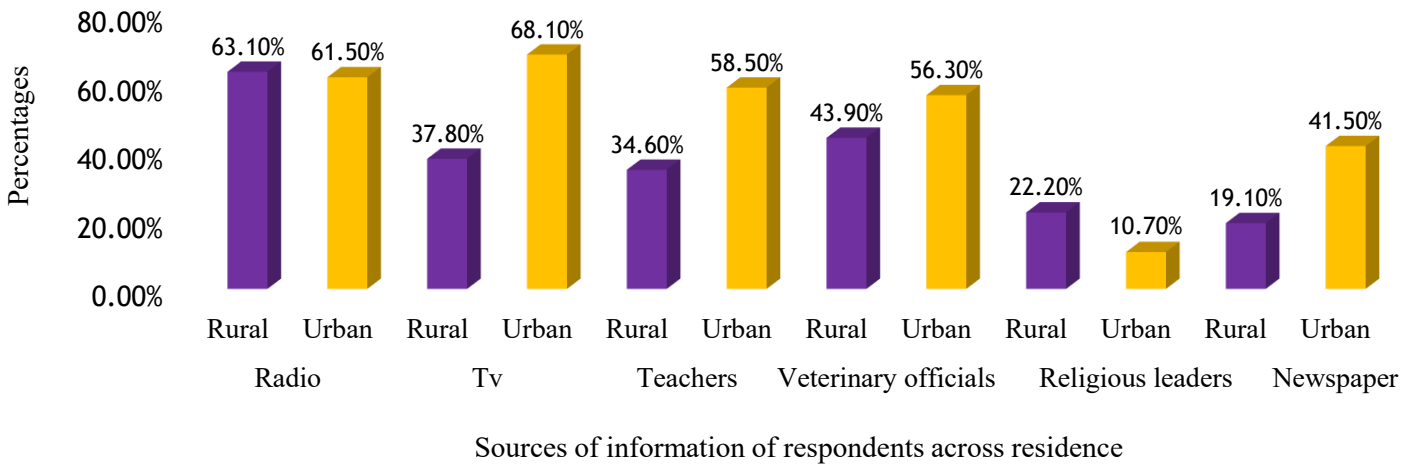
**Figure 2**. Zoonotic prevention practices




### 3.4. Comparison of Respondents' Sources of Information by Place of Residence

The main sources of information on zoonotic diseases varied between rural and urban respondents. Radio was the most frequently reported source in both groups, with 63.1% of rural respondents and 51.6% of urban respondents obtaining information through this medium. Television was reported more often by urban respondents (58.5%) than by rural respondents (34.6%). Similarly, teachers were a more common source of information among urban respondents (56.3%) than rural respondents (43.9%). In contrast, veterinary health professionals were more frequently reported by rural respondents (22.2%) than by urban respondents (10.7%). Religious leaders were identified as a source of information by 19.4% of rural respondents and 41.5% of urban respondents, whereas newspapers were reported by 30.0% of respondents in both residence groups. Respondents' residence was significantly associated with obtaining information from television, teachers, veterinary health professionals, and newspapers ($P < 0.05$). However, no significant association was observed for radio or religious leaders ($P > 0.05$) **(Figure 3).**

**Figure 3.** Sources of information vs residence



### 3.5. Comparison of Zoonotic Disease Prevention Practices Across Districts

The distribution of zoonotic disease prevention practices varied across the three study districts **(Table 3).** The proportion of respondents who reported always washing their hands with soap was comparable across Chiro (71.1%), Gemechis (77.5%), and Tulo (78.1%), with no significant difference among districts ($P = 0.980$). Similarly, the practice of consuming raw milk did not differ significantly across districts, being reported by 67.0% of respondents in Chiro, 73.5% in Gemechis, and 69.5% in Tulo ($P = 0.896$). No significant district-level difference was also observed in the consumption of raw meat ($P = 0.576$). Practices related to the handling of cattle that died from suspected zoonotic diseases differed significantly among the districts ($P = 0.002$). Feeding carcasses to pets was reported by 50.0% of respondents in Chiro, 46.9% in Gemechis, and 5.7% in Tulo. Disposing of carcasses by throwing them away was more frequently reported in Tulo (49.5%) than in Gemechis (34.7%) and Chiro (26.3%). Burial or burning of carcasses was reported by 77.8% of respondents in Chiro, followed by Gemechis (63.3%) and Tulo (47.6%).

The time since respondents had last observed a person affected by a zoonotic disease differed significantly across the three districts ($P < 0.001$). A higher proportion of respondents from Tulo (10.5%) and Chiro (8.8%) reported having seen a person with a zoonotic disease within the previous six months, whereas no respondents from Gemechis reported a recent case. In contrast, the highest proportion of respondents who had observed a zoonotic disease case more than one year earlier was recorded in Gemechis (69.4%), followed by Chiro (60.8%) and Tulo (40.0%). Respondents' intended actions when a person was affected by a zoonotic disease also differed significantly among the districts ($P = 0.008$). Taking the affected person to a health center was the most commonly reported response in Tulo (80.0%) and Gemechis (71.4%), compared with Chiro (51.5%). In contrast, purchasing drugs from a pharmacy without first visiting a health facility was more frequently reported in Chiro (57.2%) than in Gemechis (24.5%) and Tulo (14.3%). Similarly, seeking treatment from a traditional healer was more common among respondents from Chiro (52.1%) than those from Gemechis (28.6%) and Tulo (19.0%).

**Table 3.** Comparison of respondents' zoonotic disease prevention practices across the three study district

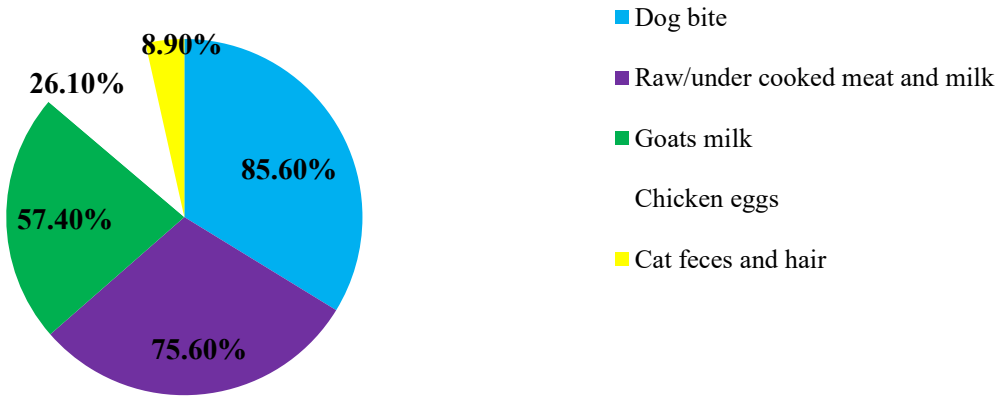
| Variable | Categories | Practice across districts | | | |
|---|---|---|---|---|---|
| | | Chiro | Gemechis | Tulo | |
| | | F (%) | F (%) | F (%) | P-value |
| Washing hands with soap | Yes, always | 138(71.1%) | 38(77.5%) | 82(78.1%) | 0.980 |
| | Yes, when eating foods | 31(16.0%) | 7(14.3%) | 7(6.7%) | |
| Share the same house | Yes they do. | 171(89.2%) | 47(97.9%) | 61(58.1%) | 0.166 |
| Handling cattle died of zoonoses | Use it as a pets food | 97(50.0%) | 23(46.9%) | 6(5.7%) | 0.002 |
| | Throw it | 51(26.3%) | 17(34.7%) | 52(49.5%) | |
| | Buried /burn | 151(77.8%) | 31(63.3%) | 50(47.6%) | |
| Do you consume raw milk? | Yes | 130(67%) | 36(73.5%) | 73(69.5%) | 0.896 |
| Do you consume raw meat? | Yes | 119(61.3%) | 49(100.0%) | 31(28.1%) | 0.576 |
| Have you ever seen a person with zoonoses in your area? | Yes | 115(59.3%) | 46(93.9%) | 80(72.6%) | |
| If yes, when? | Less than 6 months ago | 17(8.8%) | 0(0.0%) | 11(10.5%) | 0.000 |
| | More than 1 year ago | 118(60.8%) | 34(69.4%) | 42(40.0%) | |
| | Don't remember | 67(32.5%) | 14(28.6%) | 52(49.5%) | |
| Action take if a person affected with zoonoses | Take the person to health center | 100(51.5%) | 35(71.4%) | 84(80.0%) | 0.008 |
| | Bought drugs from pharmacy | 111(57.2) | 12(24.5%) | 15(14.3%) | |
| | Take the person to a traditional healer | 101(52.1%) | 14(28.6%) | 20(19.0%) | |

Values are presented as frequency (percentage). P-values were calculated using the Chi-square test. Statistical significance was considered at $P < 0.05$

### 3.6. Respondents' Understanding of the Possible Sources of Zoonotic Diseases

Most respondents recognized dog bites as a potential source of zoonotic diseases, with 298 (85.6%) identifying this route of transmission. Cattle meat and dairy products were identified by 263 (75.6%) respondents, followed by goat's milk 200 (57.4%). In contrast, chicken eggs were less frequently perceived as a potential source, with only 91 (26.1%) respondents identifying them as a source of zoonotic diseases. However, relatively few respondents recognized other potential sources of zoonotic disease transmission **(Fig. 4).**

**Figure 4.** Zoonoses Reseorver animals



### 3.7. Respondents' Perception and Practices Regarding Animal Vaccination across Educational level

Animal vaccination practices varied significantly across respondents' educational levels ($P < 0.001$) (Table 4). The proportion of respondents who reported vaccinating their animals was highest among those with 1–8 years of education (69.5%), followed by respondents with 9–12 years of education (52.3%), those with no formal education (51.9%), and respondents with diploma and above education (36.0%). Regarding the frequency of vaccination, annual vaccination was the most commonly reported practice across all educational groups, ranging from 42.2% among respondents with 1–8 years of education to 64.0% among those with diploma and above education.

The frequency of animal vaccination differed significantly by educational level ($P = 0.035$). Among respondents who did not consistently vaccinate their animals, the main reported reasons were lack of information, absence of veterinary services, financial difficulties, and the long distance to vaccination centers. Lack of information was the most frequently mentioned reason across all educational groups, reported by 53.4% of respondents with no formal education, 46.4% with 1–8 years of education, 38.3% with 9–12 years of education, and 48.0% with diploma and above education. The reasons for not consistently vaccinating animals differed significantly across educational levels ($P < 0.001$). Almost all respondents across educational categories believed that animal vaccination can prevent zoonotic diseases, with responses ranging from 88.0% among respondents with diploma and above education to 100.0% among those with 9–12 years of education. However, no significant association was observed between educational level and awareness of the preventive role of animal vaccination ($P = 0.364$).

Respondents reported different reasons for vaccinating their animals across educational groups. Protecting animals was the most commonly reported reason, particularly among respondents with 9–12 years of education (83.2%), followed by those with 1–8 years of education (68.7%), no formal education (66.9%), and diploma and above education (32.0%). Protecting humans was reported by 43.6%, 41.0%, 37.3%, and 44.0% of respondents with no formal education, 1–8 years, 9–12 years, and diploma and above education, respectively, with no significant difference among educational groups ($P = 0.594$). Vaccinating animals because it was a requirement was less frequently reported across all groups ($P = 0.091$). However, vaccination because others practiced it showed a significant association with education level ($P < 0.001$).

**Table 4.** Respondent's perception regarding animal vaccination across education

| Variables | Education level Vs perception on vaccination | | | | | |
|---|---|---|---|---|---|---|
| | **No formal education F (%)** | **1-8 grade F (%)** | **9-12 grade F (%)** | **Diploma and above F (%)** | **Total F (%)** | **P-value** |
| Do you vaccinate your animals? | Yes | 69(51.9%) | 57(69.5%) | 56(52.3%) | 9(36.0%) | 0.000 |
| How often is vaccination against zoonoses done in your area? | Once per year | 81(60.9%) | 35(42.2%) | 67(62.6%) | 14(64.0%) | 0.035 |
| | Twice per year | 24(18.0%) | 20(24.1%) | 23(21.5%) | 5(20.0%) | |
| | Never available | 26(19.5%) | 7(8.4%) | 4(3.7%) | 5(20.0%) | |
| | Always available | 19(14.3%) | 25(30.1%) | 17(15.9%) | 0(0.0%) | |
| If you do not always take your animals for vaccination, what are the reasons? | Don't get informed | 71(53.4%) | 39(46.4%) | 41(38.3%) | 12(48.0%) | 0.000 |
| | Financial difficulties | 44(33.1%) | 12(14.5%) | 40(37.4%) | 1(4.0%) | |
| | No veterinary services | 64(48.1%) | 34(41%) | 52(48.6%) | 2(8.0%) | |
| | The vaccination center is far | 56(42.1%) | 16(19.3%) | 23(21.5%) | 8(32.0%) | |
| Does vaccination of animals help to prevent zoonoses? | Yes | 131(98.5%) | 81(97.6%) | 107(100.0%) | 22(88.0%) | 0.364 |
| Why did you vaccinate your animals? | Because it is a requirement | 22(16.5%) | 13(15.7%) | 11(10.3%) | 0(0.0%) | 0.091 |
| | Because others do | 51(38.3%) | 17(20.5%) | 25(23.4%) | 1(4.0%) | 0.000 |
| | To protect animals | 89(66.9%) | 57(68.7%) | 89(83.2%) | 8(32.0%) | 0.003 |
| | To protect humans | 58(43.6%) | 34(41%) | 40(37.3%) | 11(44.0%) | 0.594 |

Values are presented as frequency (percentage). P-values were calculated using the Chi-square test. Statistical significance was considered at $P < 0.05$

### 3.8. Knowledge of Zoonotic Diseases with Sociodemographic Characteristics of Respondents

The level of knowledge regarding zoonotic diseases varied across different sociodemographic characteristics of respondents (Table 5). A higher proportion of male respondents reported having knowledge of zoonotic diseases (60.9%) compared with female respondents (46.4%); however, the difference was not statistically significant ($P = 0.180$). Knowledge of zoonotic diseases showed a significant association with family size ($P < 0.001$). The proportion of respondents who reported knowledge of zoonotic diseases increased with increasing family size, with 51.7% among respondents from households with one family member, 56.8% among those with 2–5 family members, and 62.1% among those with six or more family members. Place of residence was significantly associated with

knowledge of zoonotic diseases ($P < 0.001$). A higher proportion of urban respondents (65.2%) reported knowledge of zoonoses compared with rural respondents (51.4%).

Educational level was also significantly associated with respondents' knowledge of zoonotic diseases ($P = 0.001$). The highest proportion of respondents with knowledge of zoonoses was observed among those with 1–8 level of education (65.1%), followed by respondents with diploma and above education (53.8%), those with no formal education (49.6%), and those with 9–12 levels of education (33.6%). A significant association was observed between occupation and knowledge of zoonotic diseases ($P < 0.001$). Students had the highest proportion of knowledge (63.6%), followed by farmers (51.5%), government employees (34.8%), and respondents in other occupational categories (23.7%). Knowledge of zoonotic diseases also differed significantly among study districts ($P = 0.003$). Respondents from Tulo district had the highest proportion of knowledge (68.6%), followed by Chiro (54.1%) and Gemechis (48.9%). Overall, respondents' knowledge of zoonotic diseases was significantly associated with family size, residence, educational level, occupation, and study district, whereas no statistically significant association was observed with sex ($P > 0.05$).

**Table 5.** Association between respondents' knowledge of zoonotic diseases and sociodemographic characteristics **(N=348)**

| **Variables** | **Categories** | **Do you know zoonotic disease?** | | |
|---|---|---|---|---|
| | | **Frequency (%)** | $\chi^2$ | **P-value** |
| Gender | Male (n = 238) | 145(60.9%) | 4.895 | 0.180 |
| | Female (n = 110) | 51(46.4%) | | |
| Family size | 1(n = 116) | 60(51.7%) | 40.694 | 0.000 |
| | 2-5 (n = 146) | 83(56.8%) | | |
| | 6 and above(n = 87) | 54(62.1%) | | |
| Residence | Urban (n = 135) | 88(65.2%) | 49.025 | 0.000 |
| | Rural (n = 214) | 110(51.4%) | | |
| Education | No formal education (n = 133) | 66(49.6%) | 37.357 | 0.001 |
| | 1-8 grade (n = 83) | 54(65.1%) | | |
| | 9-12 grade (n = 107) | 36(33.6%) | | |
| | Diploma and Above (n = 26) | 14(53.8%) | | |
| Occupation | Government employees (n = 23) | 8(34.8%) | 32.933 | 0.000 |
| | Student (n = 88) | 85(63.6%) | | |

| | | | | |
|---|---|---|---|---|
| | Farmer (n = 200) | 103(51.5%) | | |
| | Others (n = 38) | 9(23.7%) | | |
| Study sites | Chiro (n = 194) | 105(54.1%) | 19.537 | 0.003 |
| | Gemechis (n = 49) | 21(48.9%) | | |
| | Tulo (n = 105 ) | 72(68.6%) | | |

Values are presented as frequency (percentage). The Chi-square ($\chi^2$) test was used to assess the association between sociodemographic characteristics and respondents' knowledge of zoonotic diseases. Statistical significance was considered at $P < 0.05$.

### 3.9. Respondents' Understanding of Zoonoses in Local Terms

During interviews, respondents were asked whether they knew the term "zoonosis" or its equivalent in local language. None of the respondents reported knowing the term "zoonosis" in local terminology. However, respondents were able to describe diseases transmitted from animals to humans, particularly those associated with consumption of raw or undercooked animal products. Some respondents recognized specific zoonotic diseases using local names. Rabies was commonly described as “dhukkuba saree marate” (disease caused by dog bite), anthrax was referred to as “abba sangaa,” and tuberculosis was known as “dhukkuba somba” (lung disease). However, none of the respondents mentioned a local name for brucellosis.

## 4. Discussion

This study investigated knowledge, awareness, and practices regarding zoonotic disease prevention among residents of three districts in Western Hararghe Zone, Ethiopia. Our findings reveal a complex picture of both significant awareness and persistent risky practices. Regarding the association of the knowledge of respondents with their sociodemographic factors, higher percentages of male (60.9%), respondents with a family size of 6 and above (62.1%), and urban residents (65.2%) was reported that they knew zoonoses. This finding is lower than the findings urban area Girma *et al*. [26], Wubishet [27], Fesseha and Abebe [28]), but higher than others study in rural settings of Ethiopia (Gezmu et al. [29], Desta [22], Andiappan et al. [30]. These variations in knowledge of respondents likely reflect differences in access to information and awareness campaigns in rural and urban area of the country. Considering association of sex of respondents with knowledge, the current finding were agree with the study conducted in turkey by Çakmur et al. [1] that reported male had higher knowledge of zoonosis, but contrast to the similar study conducted in Kenya was reported that there were no differences among male and females regarding the knowledge about a zoonotic disease, although that the women were in the risk group for the zoonotic diseases Kimani et al. [46]. Moreover this study demonstrated majority of respondents with 1-8 grade education (65.1%) diploma and above level of education (53.8%) and among occupation higher percentages of students (63.6%) reported that they knew zoonosis.

Various studies across the world stated that higher association of knowledge with demographic factors such as education that higher education was linked to higher knowledge of zoonotic disease, more number of family size was linked to higher knowledge and urban residents also were reported by different study to be associated with higher knowledge of zoonoses [32, 2], and Çakmur et al. [1]. Therefore the problems relating knowledge of the current study area needs critical intervention of concerned body and even the words zoonoses must translated into local language by a single words, because the community of the study area including the educated participants do not known the direct meaning of zoonoses in local languages. This needs more deep study by using local languages about general zoonoses and the name of specific zoonoses and including in education curriculum is were found to be important Owiny et al. [47].

Further, across study districts higher percentages of respondents from Hirna districts (68.6%) stated that they had knowledge of zoonoses, followed by the respondents from Chiro (54.1%) and Gemechis (48.9%). This difference among the respondents of the different districts may be due to the facts that there is unequal distribution of sources of information, unequal access to get

education, the relationships of respondents with their domestic animals and resources may be leads to variation in knowledge of community across districts of the same region.

The primary sources of information reported by respondents in current studies were radio (62.7%) and television (49.6%), with radio being more prevalent in rural areas (63.1%) and television in urban settings (58.5%). These findings contrast with Desta's [28] report of 100.0% knowledge acquisition through training and Amenu et al.'s [31] findings emphasizing knowledge from elders and observation. This highlights the need for diverse and accessible information dissemination strategies tailored to different settings.

A majority (79.7%) of respondents had good awareness of the transmission of zoonotic diseases between animals and humans. This is considerably higher than the result of Kuma et al. [38] reported 15.6% in Mana and Limmukosa, Ethiopia suggesting potentially improved awareness in Western Hararghe. The identified transmission routes includes consumption of raw milk (90.8%), raw meat (87.4%), and drinking contaminated water (77.9%), along with close contact with animals (sharing rooms, handling wounded animals). These findings align with Dawit's [39] report that indicated raw/undercooked meat consumption as a significant transmission route (82.3%) and other studies highlighting the risks of raw milk and meat consumption and handling sick animals [22, 39]. Despite this understanding, the continued prevalence of consuming raw milk and meat highlights a significant gap between knowledge and practice. This inconsistency underlines the need for targeted interventions to address cultural misunderstandings and promote safer food handling practices. Strong collaboration between veterinary and human health sectors through a One Health approach is essential to improving these deep-rooted cultural practices. A knowledge gap also exists among human and animal health professionals regarding zoonotic infections in Ethiopia [22]. The most frequently cited prevention methods includes handwashing with soap (76.1%), animal vaccination (63.5%), avoiding contact with infected animals, and safely disposing of animal carcasses. These findings are comparable to Walelign and Birku's [37] study, which emphasized animal vaccination, cooked meat consumption, and avoiding contact with infected animals. However, this study also revealed continued risky practices, highlighting the need for strengthened interventions focusing on practical behavior change.

Most perceived sources of zoonotic diseases was dog bites (85.6%), cattle meat and dairy (75.6%), goat milk (57.4%), and chicken eggs (26.1%). A smaller percentage associated cat feces and hair with zoonotic transmission (8.9%). This results contrasts with Walelign and Birku's [37] findings from Bahar Dar, which showed dogs (47.9%), cattle (7.0%), and cats (3.1%) as a sources of

zoonoses, with 27.3% believing all animals could transmit disease. This variation highlights geographical differences in knowledge, potentially influenced by factors such as educational levels, access to information, cultural practices, and disease prevalence [32, 33].

Based on the association of public practices with various sociodemographic factors, current study identified several key practices related to zoonotic disease risk. Across districts the respondents of Gemechis district reported that they having the practice of sharing their homes with animals (97.9%), far exceeding rates reported in previous studies (Desta [28]: 40.4%; Kuma et al. [38]: 18.8%. Furthermore, all respondents in Gemechis consumed raw meat, and over 67% across all three districts drank raw milk. These practices, while comparable to some prior findings of Wubishet [27]: 99% raw meat, 89.8% raw milk, significantly exceed the findings of Fikirte et al. [40]: 36.8% raw meat, 9.2% raw milk, and those observed in Tanzania by Swai et al. [41]: 40.0% raw milk, 16.3% raw meat, highlighting considerable regional variation in practices likely influenced by cultural and lifestyle factors. This persistent consumption of raw animal products, despite knowledge of associated zoonoses risks, underlines a critical need for government intervention to address cultural misconceptions surrounding the nutritional value and taste of cooked versus raw meats and milk [32, 42]. This misconception appears pervasive, affecting both rural and urban, literate and illiterate populations.

Regarding hygiene practices, while a majority (over 71.1%) washed hands with soap after contact with infected animals, handwashing before eating foods was markedly lower (over 16.0%). This discrepancy comparable with the results of Mengistu's [43] that reported 75.5% post-animal contact handwashing and 5.4% pre-meal handwashing, suggesting limited awareness of foodborne zoonotic disease transmission. This low awareness may contribute to the high rates of zoonotic illnesses and deaths in Ethiopia, Nigeria, and Tanzania [34]. Additionally, this findings indicated that over 48.0% of participants buried or burn dead animals by zoonoses. Notably, 70.0% of study participants had witnessed a zoonotic disease case, with a significant proportion (40.0-69.4%) reporting a case within the past year. Responses to zoonotic illness varied across study districts, with Tulo (80.0%), Gemechis (71.4%), and Chiro districts (57.2%) favoring purchases drug from pharmacy, take the person to healthcare center, and traditional healers, respectively. This contrasts with findings from Addis Ababa (Ali et al. [44]) and other regions of Ethiopia (Digafe [45]), which report greater use of formal healthcare services, reflecting potential variations in education, beliefs, and cultural practices [32].

Regarding the practice of vaccination of animals across education, respondents with primary educational levels reported a higher practice of vaccinating animals (69.5%), with most of them reporting that they vaccinate their animals once per year. Regardless of their education level, nearly 90.0% of respondents were aware that zoonoses can be prevented through animal vaccination. The remaining respondents who did not vaccinate their animals cited various reasons, including lack of information (higher among illiterate respondents, 53.4%), financial difficulties (higher among respondents with 9-12 grade education, 37.4%), lack of vaccination services (higher among respondents with 9-12 grade education, 48.6%), and distance to vaccination centers (higher among illiterate respondents, 42.1%). Similar to this study in Ethiopia Berhe et al. [42], reported that factors like access to veterinary services, knowledge about diseases, and income influenced vaccination decisions, and education levels played a significant role, with higher education correlating with increased vaccination rates and also Abrahim et al. [32] lack of awareness, inadequate veterinary infrastructure, and affordability issues influenced vaccination decisions. It emphasizes the need for targeted interventions to address barriers to vaccination, including financial constraints, limited access to services, and knowledge gaps World Organization for Animal Health WHO [34].

Variations in awareness and practices were observed across different socioeconomic groups and education levels, emphasizing the need for targeted interventions. Measures to reduce zoonotic diseases should consider diverse communication methods and affordable prevention strategies (e.g., mobile vaccination centers). This is because low-income communities in rural areas often face constraints in accessing information and services. The government and NGOs should invest in improving living standards, education, and the economy while providing continuous training, especially for rural communities [32, 33], and adopting a One Health approach [34–36].

## 5. Conclusion

This study showed that the community in the study area had considerable awareness of zoonotic diseases, including their transmission routes and prevention methods. Most respondents recognized that diseases can be transmitted from animals to humans and that zoonotic diseases can be prevented through appropriate measures such as animal vaccination, personal hygiene, and safe handling of animals and animal products. However, the term "zoonosis" itself was not familiar to most community members in local terminology, although they recognized several specific zoonotic diseases through their local names and descriptions. The findings also revealed that important information sources, including radio, television, veterinary health professionals, teachers, and community-based sources, contributed to improving community awareness of zoonotic diseases. Despite the observed level of knowledge, some risky practices remained common, including consumption of raw animal products and inappropriate handling of animals that died from suspected zoonotic diseases. Although many respondents understood the importance of animal vaccination, vaccination practices were affected by limited access to veterinary services, inadequate information, financial challenges, and distance to vaccination centers.

Knowledge, perceptions, and preventive practices differed across sociodemographic characteristics and study districts, particularly by residence, education level, occupation, family size, and location. These variations indicate the need for targeted community education and improved access to veterinary and public health services. Strengthening collaboration between human health, animal health, and community sectors through a One Health approach is important for improving zoonotic disease prevention and reducing the risk of transmission in the study area.

### Study Limitations

This study has some limitations that should be considered when interpreting the findings. First, the cross-sectional design limits the ability to determine causal relationships between sociodemographic factors and respondents' knowledge or preventive practices. Second, information was collected directly from community members through interviews; therefore, responses may have been influenced by participants' ability to recall previous experiences, understanding of questions, or willingness to provide accurate information. Third, the study assessed community knowledge and reported practices but did not include direct observation of behaviors or laboratory confirmation of zoonotic disease occurrence. Fourth, differences in local terminology and understanding of zoonotic diseases may have affected responses during data

collection. Finally, because the study was conducted in selected districts, the findings may not represent all communities in other areas with different social, cultural, and environmental conditions.

**Authors Contribution**

A.A. collected and analyzed and write the data, BB and MT critically reviewed and organized the paper.

**Ethics Approval and Consent to Participate**

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and all applicable national and institutional guidelines governing research involving human participants. Ethical approval for the study, including the study protocol, participant recruitment procedures, and informed consent process, was obtained from the Oda Bultum University Research, Publication, and Ethics Committee prior to the commencement of data collection. Administrative permission to conduct the study was also obtained from the Oda Bultum University Research Directorate Office and permission for data collection was obtained from the respective Zonal and District Health Administration Offices. Informed consent was obtained from all participants included in this study before their participation. Because the study involved interviews in settings where written consent was not considered practical, verbal informed consent was obtained from each participant. Before consent was sought, all participants received a clear explanation of the study objectives, procedures, expected duration, and the voluntary nature of participation, and their rights they could decline to participate, refuse to answer any question, or withdraw from the study at any stage. Participants were assured that all information collected during the study would be treated with strict confidentiality and used solely for research purposes. Personally identifiable information was neither collected nor disclosed in any reports or publications arising from the study. All data were anonymized before analysis and presentation of the findings to safeguard participants' privacy and confidentiality. In addition, participants provided consent for the anonymized data collected during the study to be analyzed and published in scientific journals and other scholarly communications.

**Funding**

Not applicable.

**Consent for publication**

Not applicable.

**Declaration of Competing Interest**

The authors declare that there is no competing interest.

**Acknowledgements**

We thank to Oda bultum University for funding and their support throughout the study. We would like to thank the local people of the three district (Chiro, Gemechis, and Hirna), and all informants for sharing their knowledge about zoonotic disease and their hospitality. We also acknowledge Chiro, Gemechis, and Hirna district Administration Office, veterinary office, and human health office for providing us the support letter to visit the rural kebeles and get assistance from the people.

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