

# Knowledge, Attitude, and Practice Toward Pet Contact Associated Zoonosis in Western Ethiopia

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**Background:** Households consider their dogs and cats as their close friends. They act as companion animals. The contact between pets and their owners results in transmission of zoonotic disease. In Ethiopia, dogs and cats are the most abundant carnivores, and diseases associated with them affect wide parts of the community. There is limited knowledge, practice, and attitude within the communities toward pet contact associated zoonotic disease.

**Methods:** A community-based semi-structured questionnaire complemented with an interview was delivered to 633 household pets' owners in Sibu Sire, Jimaa Arjo, and Wayu Tuqa districts in Western Ethiopia to evaluate knowledge, attitude, and practices toward pet contact associated zoonotic disease.

**Results:** Socio-demographically, 54.6% of the study participants were female. According to this finding concerning common pet contact zoonotic disease, 70% of the respondents had knowledge about rabies, with Echinococcosis, toxoplasmosis, and ring worm also being commonly heard of. Contamination of feed and water (21.71%) and animal bites (21.01%) are the predominant modes of transmission, whereas animal waste, fecal oral route, and touching pets are also common ways for disseminating zoonotic disease. The dominant symptoms noted by respondents were behavioral change, depression, lack of appetite, itching, and diarrhea. In all attitude-related responses, there was a significant association ( $p < 0.05$ ) between the number of respondents and the variable studied. There was also a statistically significant association of KAP score ( $p < 0.05$ ) with educational rank and the work of respondents.

**Conclusion:** This study indicates the importance of pet ownership to the community, which is also associated with transmitting different zoonotic diseases. Moreover, there are inconsistencies on regular veterinary use, pet management, and proper prevention and treatment measures of the disease. Coordinated efforts are expected from different stakeholders in enhancing community KAP level towards pet contact associated zoonosis.

**Keywords:** attitude, community, knowledge, pet, practice, zoonosis, Western Ethiopia

## Introduction

Household pets can be defined as any animal kept by human beings as a source of companionship and pleasure. From prehistoric times until the present, pet keeping has served as a cultural and social need in nearly every society and culture. It is likely that the dog and cat are the most domesticated pet species in many countries, including Ethiopia.<sup>1,2</sup> Ethiopia has as estimated more than 5 million dogs and 150,000 cats. Pets are among the main reservoirs and transmitters of many zoonotic infections caused by viruses, bacteria, protozoa, fungus, and helminthic diseases, such as Rabies, Leptospira, toxoplasmosis, Ringworm, and Echinococcosis, respectively. Zoonotic diseases are said to account for 60% of all infectious diseases and 75% of all emerging pathogens.<sup>3</sup> Pet contact borne zoonoses, like Toxoplasmosis, Rabies, and Echinococcosis, were reported in Ethiopia.<sup>3-5</sup>

Direct contact between household pets and people by petting, licking, and physical injuries, or indirectly through contamination of food and domestic environments, offer favorable conditions for disease transmission. Indeed, bites are one of the most common sources of bacterial skin infection. Frequent sharing of skin microbiota between people and their dogs has been shown, thus emphasizing the role of contact.<sup>1,6,7</sup> Skin wounding via animal bite results in infections

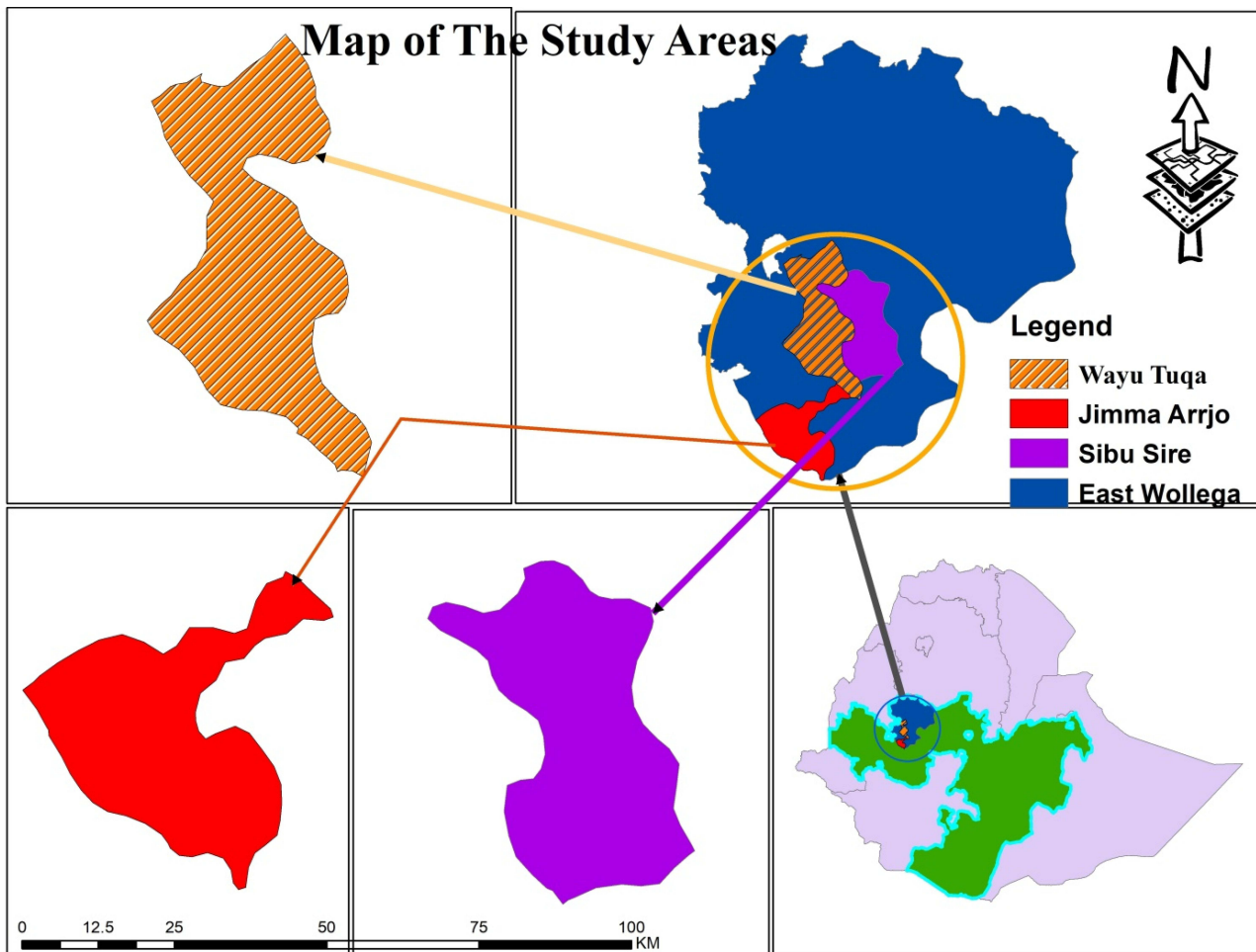


Figure 1 Map showing the study area.

caused by a wide range of bacteria existing in the oral mucosa of pets and skin of the bitten individual. *Pasteurella multocida* and *P. canis* are the most common bacteria transmitted by cat and dog bites.<sup>7,8</sup>

*Toxoplasma gondii* is transmitted to humans through accidental ingestion of sporulated oocyst or consumption of raw or under cooked meat. Cats play an important role in the spread of this disease. The parasite is passed in the cat's feces in an oocyst form, which is microscopic. Kittens and cats can shed millions of oocysts in their feces for as long as 3 weeks after infection. Echinococcosis pass through consumption of under cooked beef or pork meat and dogs play a role in its transmission via completion of its life cycle.<sup>9</sup> Bartonellosis, also called cat-scratch disease, is by far the common zoonotic disease associated with cats.<sup>10</sup> Individuals with compromised immune systems may suffer more severe, even fatal consequences.<sup>11</sup> Rabies is most commonly transmitted by dogs via biting.<sup>1</sup>

Zoonotic diseases are of exceptional alarm for young and old people, pregnant mothers, and immunocompromised groups. Moreover, young children are probably exposed to microorganisms originating from pets due to limited sanitation standards and closer physical contact within the animals' environment, like the floor and carpets.<sup>12</sup> Children frequently put their hands in their mouths, allowing an easy route for bacteria to travel into their system. These groups of individuals most commonly like to play with puppies and kittens which are more likely to carry a disease than older dogs and cats.<sup>13</sup> The soil is an important route of transmission for numerous human pathogens such as *Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostoma duodenale*, *Necator americanus*, and *Strongyloides stercoralis*, which are commonly shed by pets.<sup>14,15</sup>

Nowadays zoonotic diseases, particularly pet borne diseases, affect a population of 1 million and pose huge losses. Zoonotic diseases that occur in Ethiopia in large numbers impact the society in three main ways: they threaten the health

of the animals, resulting in illness, loss of productivity, and death; they threaten the livelihood of a large segment of the population dependent on livestock as a major source of food and income; and finally they cause a large number of illnesses and deaths in people, which is associated with significant economic and societal loss.<sup>16</sup>

Despite the fact that many pets are owned by households, the community has varying opinions on how they should be managed. These days, the community is at risk of many zoonosis outbreaks caused by pet contact. The development and implementation of effective disease prevention and control strategies require a thorough understanding of communities' attitudes and practices regarding contact-borne zoonotic diseases. Thus, awareness of good pet husbandry, sanitation practices, and the risk of zoonotic disease in pets is required for effective disease prevention.<sup>4,17</sup> Therefore, the objective of this study was to characterize the public's knowledge, attitudes, and practice towards pet contact associated zoonosis in western Ethiopia.

## Materials and Methods

### Study Area

A cross-sectional community based study was conducted from October 2019–June 2020 in selected districts of East Wollega Zone (Figure 1). The zone has 17 districts and covers 14,102.5 km<sup>2</sup>, which accounts for about 3.88% of the total area of the Oromia regional state and has a population of 1,199,444. The vegetation type of the area is characterized by riverine vegetation and savanna grass lands. Wild animals found in the vegetation area include baboons, monkeys, African buffalo, bush pigs, warthogs, crocodiles, hyenas, snakes, elephants, giraffes, and apes. Nekemte is the capital of Guto Gida and the zone is found at 328 km west of Addis Ababa, in Oromia regional national state, Ethiopia.

Arjo town is found in Oromia regional state, eastern Wollega zone, 377 km from Addis Ababa and 48 km from Nekemte zonal city. It is located at an altitude of 1,500–2,400 m above sea level. It has a rainfall of 1,800–2,700 mm with a temperature of 15–24°C. Wayu Tuqa district is 316 km west of Addis Ababa. Topographically the district constitutes highlands, midlands, and lowlands with an elevation ranging from 1,729 to 2,740 m above sea level. Sibu Sire district is located 270 km west of Addis Ababa, the capital of the country. It lies at 8°56–9°23'N latitude and 36,035'–3,656' E longitudes. The altitude of the district varies from 1,336 to 2,500 m above sea level. It has an estimated area of 1,132.51 km<sup>2</sup>. About 74.2%, 7.53%, and 18.27% of its surface area belongs to mid-altitude, highland, and lowland agro climates, respectively. The mean annual temperature and rainfall is 25°C and 1,050 mm, respectively.<sup>18</sup>

### Study Design

The study was conducted to assess knowledge, attitude, and practice related to pet contact and associated zoonotic diseases. Assessment approaches include a well-designed interview and questionnaire. A random sampling method was used to select 633 respondents for a questionnaire interview. The semi-structured and open-ended questionnaires were used on either male or female households who were above 15 years old, and own either a dog or cat or both. The questionnaire was designed to evaluate the knowledge of respondents concerning the mode of zoonotic diseases transmission, symptoms of diseases, control, and prevention measures, whereas household concern about children–pet contact, the importance of pets for the family, and the benefits of owning a pet over its risk were attitude questions; regular veterinary service for pets, feeding, sleeping area, offal management, and feces disposal were practice question raised for respondents.

To measure the level of various aspects of KAP, the questionnaire was divided into three distinct categories. The analysis of the category module was done based on a scalar scoring method. There are two types of questions, with some questions having two possible answers, which were given one point for a correct response and zero points for an uncertain response. The other type of question had three levels, of score 0, 1, and 2, representing poor, fair, and good levels of KAP. Total KAP score is used to rank the level of KAP and qualitative analysis was conducted to rank high, medium, and low scores. Overall there were 25 questions in the questionnaire. Those respondents who obtained a KAP

score above 50% were considered as high level, 25–50 was a medium score, while the low score level was if less than 25.<sup>19</sup>

## Sample Size Determination

The sample size was calculated using a single population proportion formula. The respondents were randomly selected from purposively covered districts. The questions were answered by a single adult from a given household. Accordingly, assuming a proportion of knowledge level of 83%, attitude level 52.3%, and practice level 68%,<sup>20</sup> with a margin error of 5%, confidence level of 95%, and 1.5 design effect, the calculated sample sizes for knowledge, attitude, and practice were 217, 383, and 340, respectively. Therefore, the larger sample size among the KAP is taken as appropriate, which is 383 multiplied by a 1.5 design effect and a 10% non-response rate was added. Finally the sample size was determined to be  $(383 \times 1.5) + (0.1 \times 575) = 633$  individuals.

## Data Management and Analysis

Data generated was entered into an MS-Excel sheet and analyzed using IBM-SPSS version 20. Descriptive statistics were used to measure the frequency of distribution of sociodemographic factors, and KAP of the respondents towards pet contact associated zoonotic disease. Moreover, a statistical association between the practice of respondents toward management of pet contact associated zoonosis and educational status of the respondents was analyzed by chi-square test. The KAP score was measured and its association was assessed in relation to household demography using a chi-square test. *P*-values less than 0.05 were considered as statistically significant at a 95% confidence level. Finally the analyzed data were presented in tabular and narrative forms, as per necessity.

## Data Quality Control

The questionnaire was piloted on 10 members of the community with a history of pet contact and we studied a previous report on disease. Close supervision was undertaken during the data collection by the research group. The questionnaire was checked for completeness and consistency before data entry by the investigators.

## Ethical Clearance

Ethical approval for this research was obtained from Wollega University, School of Veterinary Medicine, Nekemte Campus, with minute number WU-SVM-IRB0012, dated September 2019. Before starting the interview, oral consent was also obtained from the pet owners after verbal informed consent was approved by the Wollega University ethics committee. The participants were informed about the purpose of the study and parental/legal guardian informed consent was obtained for participants under the age of 18.

## Results

### Demographic Characteristics of Respondents

Out of 633 respondents, 322 (50.80%) of them were greater than 25 years and 311 (49.20%) of them were below 25 years of age. There were 346 (54.6%) female respondents to the questionnaire, representing the majority. From educational background outlooks, 203 (32.1%) of the households belong to Grade 5–8 followed by Grade 10, covering 30.8% (195) of the participants. The proportion of individuals learning to Grade 1–4 and non-formal educated were 11.7% (74), and 13.8% (87), respectively. Out of 633 respondents, 80% (190) were married. Furthermore, 57.1% (361) of them were farmers (Table 1).

### Pet Ownership and Purpose for Keeping

Among the total participants, 425 (67.08%) and 45 (7.1%) had only dogs or cats, respectively, and 164 (25.8%) respondents had both dogs and cats in their household. From the total pet owners, 245 (38.8%) of them kept their pet for guarding purposes, whereas 87 (13.8%) and 119 (18.7%) of the respondents kept their pet for guarding and pleasure or relaxation, as well as for guarding and hunting, respectively. Also, 166 (26.3%) of them kept them for hunting purposes as is summarized in Table 2.

**Table 1** Socioemographics of the Respondents

Factors	Level	Frequency (%)	P-value
Districts	Sibu sire	33.33	0.93
	Jimma Arjo	33.33	
	Wayu Tuqa	33.33	
Age	≤25	49.20	0.847
	>25	50.83	
Sex	Female	54.60	0.175
	Male	45.40	
Education	College/University	11.70	0.004
	Grade 1–4	11.70	
	Grade 10	30.80	
	Grade 5–8	32.10	
	No formal education	13.80	
Marital status	Married	80.00	0.001
	Unmarried	20.00	
Occupation	Farmer	57.1	0.033
	Merchant	34.2	
	Professional	8.75	

**Table 2** Pet Ownership and Purpose for Keeping

Variables	Category	Number	Frequency (%)	P-value
Which type of pet do you keep?	Dog	424	67.1	0.001
	Cat	45	7.1	
	Both Cat and Dog	164	25.8	
For what purpose do you keep the pet?	Guard	245	38.8	0.001
	Guard and pleasure	87	13.8	
	Guard and hunting	119	18.7	
	Pleasure or relaxation	13	2.1	
	Hunting	166	26.3	
	All activities	3	0.83	

## Knowledge of the Respondents Toward Pet Contact Associated Zoonosis

Out of total participants, 70% of them had heard of rabies as one of the common pet contact associated diseases, whereas 9.32% and 7.08% of them knew about Echinococcosis and ring worm, respectively. Overall, 7.27% of respondents had heard about all the zoonotic diseases surveyed (Table 3). Regarding modes of transmission, 63.3% of the respondents replied that pet contact associated zoonoses were transmitted through biting, 13.75% of respondents noted the fecal–oral route, 5.41% responded that those diseases were transmitted through biting and touch, and 17.5% acknowledged biting and scratches (Table 3).

The source of information was also assessed and 78.8%, 4.2%, and 17.1% of the respondents heard the information from a neighbor, the media, and health professionals, respectively (Table 3). The results also indicated that the most common symptom mentioned was 20%, 17.85%, and 15.48% for behavioral change, loss of appetite, and diarrhea, respectively. Moreover, 23.33, 0.42, and 2.5% of the respondent replied that pet contact diseases were protected by confining and vaccination, confining only, and washing and vaccination only, respectively. From the total respondents, 24.52% use tradition treatments like the use of herbal or medicinal animals to cure diseases like ring worm, rabies, and parasitic zoonosis (Table 3).

**Table 3** Knowledge of Respondents Toward Pet Contact Associated Zoonosis

Variables	Category	Number	Percentage (%)
Which pet contact diseases do you know?	Echinococcosis	59	9.32
	Toxoplasmosis	40	6.32
	Rabies	443	70.00
	Ring worm	45	7.08
	All	46	7.27
What are the modes disease transmission?	Bite	133	21.01
	Bite and scratch	111	17.5
	Bite and touch	34	5.41
	Fecal–oral route	87	13.75
	Animal waste	130	20.54
	Feed and water contamination	134	21.71
Have you got any access to pet management training?	Yes	84	86.7
	No	549	13.3
Where did you hear about pet contact diseases?	Neighbor	498	78.8
	Media	26	4.2
	Professional	108	17.1
	Behavioral change	127	20.0
	Loss of body weight	79	12.48
What are the symptoms of the pet contact disease you acknowledged?	Loss of appetite	113	17.85
	Itching	55	8.69
	Nervous	95	15.00
	Swelling	66	10.42
	Diarhoea	98	15.48
How do you protect pets from disease?	Vaccination	169	26.70
	Sanitation	102	16.11
	Isolation	134	21.17
	All	200	31.59
	Do nothing	28	4.42
How do you treat diseased pets?	Traditional medicine	161	25.42
	Use traditional medicine and drug from pharmacy	90	14.16
	Use both traditional medicine and take to veterinary clinic	338	53.33
	Take to veterinary clinic only	45	7.08
	All	332	52.5

### Attitude of Respondents Toward Pet Management

From the total respondents, 76.15% of them strongly agreed with the benefits of pet owning over its risk. Moreover, 68.09% of respondents strongly agreed with the importance of pets to their family. It is likely that, in 49.13% of the current respondents, removal of a pet from the family by any reason could negatively affect them. In all attitude related responses there was a significant association ( $p < 0.05$ ) between the number of respondents and the variable studied (Table 4).

### Practice of Respondents Toward Pet Management

In the current questionnaire surveys, 64.2% of the respondents had not accessed veterinary regular services for their pets. From the total respondents, 56.67%, 18.75%, and 19.58% brought their pets to a veterinary clinic for vaccination, sickness, and both, respectively. However, 7.5% of the respondents did not take their pet to a veterinary clinic at all.

According to the findings, most respondents (44.2%) feed their pets meat. Regarding the sources of meat, 28.3%, 11.7%, 27.9%, and 19.6% of the respondents provided the feed for their pets from backyard slaughtered meat, hunting,

**Table 4** Attitude of Respondents Toward Pet Management

Variables	Response	Percentage (%)	$\chi^2$	P-value
The benefits of pet ownership over its risk	Strongly agree	482 (76.15)	19.57	0.02
	Somewhat agree	140 (22.12)		
	Strongly disagree	0 (0.00)		
	Somewhat disagree	2 (0.31)		
	Doubtful	9 (1.42)		
Pets are an important part of the household	Strongly agree	431 (68.09)	15.46	0.04
	Somewhat agree	108 (17.06)		
	Strongly disagree	36 (5.69)		
	Somewhat disagree	3 (0.47)		
	Doubtful	55 (8.69)		
Deduction of pets would negatively affect the household	Strongly agree	311 (49.13)	13.39	0.04
	Somewhat agree	162 (25.59)		
	Strongly disagree	21 (3.32)		
	Somewhat disagree	76 (12.00)		
	Doubtful	63 (9.95)		
Concerned about diseases caught from pets	Very concerned	466 (73.62)	18.36	0.03
	Some concerned	133 (21.01)		
	Not concerned	34 (5.37)		
Concerned about diseases transferred from pets to children	Very concerned	491 (77.57)		
	Some concerned	112 (17.69)		
	Not concerned	30 (4.74)		

both back yard and hunting, and from leftovers, respectively. Additionally, 6.2% and 31.7%, respectively, provided milk and both meat and milk. According to this survey analysis, 39.6%, 10.4%, 10.8%, 4.2%, and 35% of the participants replied that pets slept in the living room, outside a compound, within a pet house, both in a pet house and with livestock, and totally with livestock, respectively. Regarding offal management, 47.4%, 27.9%, and 23.7% of respondents replied that they used offal as feed for their pet, threw it away, or put it in a communal dumping area, respectively, as is shown in [Table 5](#).

## Impact of Educational Level on Knowledge of the Respondents Toward Pet Management

There was a significant interaction effect ( $p < 0.05$ ) between the type of pet kept, the purpose for keeping, marital status, education, and occupation of the respondents' with respect to assessed variables. The percentage of non-formal education respondents letting their pets sleep in the living room was 39.6% (251). No individuals without formal education provided independent houses for their pets. However, 10.38% of respondents with grade 5–8 level education provided their pets with independent houses. The level of education of the respondents is also significantly related to their practices of disposing of pet feces, where only 17.18% of non-formally educated and 14.67% of respondents in with gGrade 1–4 education were disposing of the pet's waste in a communal waste disposal. Moreover, there was a significant difference among different educational levels of the respondent on the conditions to take pets to veterinary clinic ([Table 6](#)).

## Relationships Between KAP Scores and Demography of the Respondents

In addition to assessing their knowledge, attitudes, and practices related to pet care, the respondents were also evaluated in relation to their demography. Accordingly, KAP scores were marginally ( $\chi^2 = 8.828$ ,  $p = 0.048$ ) correlated with job type. A statistically significant association between KAP scores and education level ( $\chi^2 = 19.46$ ,  $p = 0.001$ ) was observed. The good scores were higher (60%) in the respondents having graduated college or university ([Table 7](#)).

**Table 5** Practice of Respondents Toward Pet Management

Variable	Category	Number (%)
Do you give Regular Veterinary Service to your pet?	No	177 (64.2)
	Yes	87 (35.8)
When did you take your pets to clinic?	Vaccine	359 (56.67)
	Not at all	47 (7.5)
	Sick	119 (18.75)
	Sick and vaccine	124 (19.58)
What type of feed do you provide to your pet?	Milk	40 (6.2)
	Raw meat	280 (44.2)
	Offals	69 (10.8)
	Both Milk and Raw meat	208 (31.7)
	Scavenge	45 (7.1)
From where do you get the meat used for pet feed	Licensed butcher	42 (6.7)
	Backyard	179 (28.3)
	Backyard and hunting	177 (27.9)
	Hunting	74 (11.7)
	Leftovers	124 (19.6)
	All sources	37 (5.8)
Where do all your pets sleep?	Living room	251 (39.6)
	Outside compound	66 (10.4)
	Pet house	69 (10.8)
	Pet house and with livestock	26 (4.2)
	Totally with livestock	222 (35)
How do you manage different offal	Feed it to Pet	300 (47.4)
	Throw away	177 (27.9)
	Communal dumping	150 (23.7)
How do you dispose of pet's feces?	Anywhere	296 (46.8%)
	Common waste disposal	244 (38.5%)
	Outside compound	93 (14.7%)

**Table 6** Influence of Educational Level Against Practice of Respondents Toward Management Pet Associated Zoonosis

Variables	Educational Status					$\chi^2$	P-value
	No Formal Education	G.1-4	G.5-8	G.10	College/University		
<b>Sleeping area:</b> living room	13	18	31	59	30	15.54	0.0486
Outside compound	13	12	20	23	8		
Pet house only	3	13	23	21	5		
Pet house and with livestock	59	10	13	33	8		
With livestock	43	28	66	56	25		
<b>Feces disposal:</b> Anywhere	44	105	58	50	24	6.04	0.0196
Common waste disposal	32	32	119	111	58		
<b>Offal management:</b> Pet feed	48	48	148	154	54	1.86	0.761
Throw away	27	27	59	46	22		
<b>Regular vet services:</b> Yes	25	58	145	121	47	3.64	0.0457
No	39	19	66	83	30		
<b>Conditions to clinic:</b> Vaccine	32	35	113	107	51	49.85	0.001
Sick	19	19	51	27	5		
Both	5	11	40	56	13		
Not at all	19	11	5	8	6		

**Abbreviations:** G, grade;  $\chi^2$ , chi-square.

**Table 7** Relationship Between KAP Scores and per Study Participants

Variable		KAP Score		Percentage	$\chi^2$	p-value
Educational status	No formal education	Good (%)	Poor (%)	142 (22.4)	19.46	0.001
	Grade 1–4	82 (58.49)	61 (42.59)	211 (33.3)		
	Grade 5–8	108 (51.25)	103 (48.75)	211 (33.3)		
	Grade 10–12	106 (50)	106 (50)	13 (2.1)		
	College/university	8 (60)	5 (40)	55 (8.7)		
Sex	Male	164 (56.88)	124 (43.11)	287 (45.3)	3.38	0.071
	Female	190 (54.96)	156 (45.03)	346 (54.7)		
Age in years	<25	153 (47.54)	169 (52.45)	322 (50.9)	0.44	0.30
	≥25	161 (51.69)	150 (48.30)	311 (49.1)		
Marital status	Married	243 (47.92)	264 (52.08)	506 (79.9)	1.067	0.33
	Unmarried	71 (56.25)	55 (43.75)	127 (20.1)		
Job type	Farmers	185 (51.09)	177 (48.90)	362 (57.2)	8.828	0.048
	Merchant	119 (18.8)	98 (15.5)	217 (34.3)		
	Health professionals	45 (80.97)	11 (23.53)	55 (8.7)		

**Abbreviations:** KAP, knowledge, attitude and practice;  $\chi^2$ , chi-square.

## Discussion

This study aimed to assess household knowledge, attitudes, and practices related to pet contact associated zoonosis among selected districts of East Wollega. Most of the respondents were female and aged over 25 years, indicating the importance of the female in the household controlling the whole family information. This finding is consistent with previous studies conducted by Wale<sup>21</sup> around Bishoftu and Weldegerima et al<sup>22</sup> in Mekelle city, in which female participants were found to total 56.6% and 56.4%, respectively.

Moreover, in the current study, most of the households kept dogs; indicating this pet was found to be one of the most easily adapted pets from all animals in Ethiopia. This might have resulted in the occurrence of direct contact between these common household pets and human beings.

In the current survey the majority of the participants were aware of rabies being one of the pet contact associated diseases. This finding is consistent with previous reports of Weldegerima et al<sup>22</sup> in Mekelle, Reta<sup>23</sup> from Gonder City, and Bingham et al<sup>13</sup> from Texas, where veterinarians and public health officials considered rabies to be a serious problem. This clearly supports that rabies is a well-established zoonotic disease in Ethiopia.<sup>24</sup> Most of the respondents believe rabies to be solely transmitted by dogs and exercise different traditional management if a dog bites a human or animal member. As reported previously by Bingham et al<sup>13</sup> from Texas and Fontaine et al<sup>24</sup> from Georgia, the public appear informed about rabies, but less informed about other diseases like toxoplasmosis, hydatidosis, and ring worm.

According to the current study, biting, scratching, and wound contact with saliva are the common routes of transmission for rabies, as noted by Yimer et al,<sup>25</sup> from Addis Ababa. Hands could be a source of yoxoplasma infection if they are not washed thoroughly, especially after contact with soil or cat feces, as this poses a risk of intentional ingestion of oocysts.<sup>26</sup> Livestock, particularly sheep, serve as intermediate hosts for transmission of hydatidosis, while dogs act as a definitive host and transmit the diseases to humans through the fecal–oral route when oocysts are accidentally ingested.<sup>27,28</sup> Ring worm can be transmitted from pets to humans during playing with pets and petting if a person is unable to properly their wash hands, especially to young children.<sup>29</sup> Children especially have close contact with the fecal matter of pets because of walking bare foot or their normal play being around areas with pet feces. In this regard, addressing safe pet interaction training and rabies prevention strategies need to be addressed.

The majority of the respondents acquired information about pet associated zoonosis from their neighbor or informal social network. There are few respondents who got formal training from health professionals. Conversely, studies conducted by Bingham et al<sup>13</sup> in the United States and Palmer et al<sup>30</sup> in Australia indicate that media outlets and professionals are the two most common sources of information. This finding is in line with the previous reports of Abraham et al,<sup>31</sup> Deressa et al,<sup>32</sup>

Wudu et al,<sup>33</sup> Tadesse et al,<sup>34</sup> and Admasu and Mekonnin,<sup>35</sup> conducted in different corners of Ethiopia in which for the majority of respondents information was from informal sources, traditional healers, and friends. Recently, a pet contact associated zoonosis control program has been very rare in Ethiopia, which could probably explain the limited knowledge about those diseases and their prevention and control. The limited zoonotic disease knowledge of the public is a serious issue because awareness of the risk of zoonotic diseases is a prerequisite for effective prevention.

One fourth of the respondents indicated use of traditional medicine in order to treat and control pet contact associated zoonosis. This finding was in agreement with a report by Kiflu et al<sup>36</sup> in Addis Ababa. In Ethiopia a wide range of conventional treatments for bites by dogs suspected of being rabied were utilized, focusing mostly on human patients, but dogs and other domestic animals were also treated before being rabied. The purgative impact of giving the traditional drug through the oro-gastrointestinal tract was considered to be the basis for traditional medicine remedies. The non-standardization of ingredients, purity, and efficacy of these traditionally used antirabies herbal treatments are the major difficulties documented by Ethiopian health institute research.<sup>36</sup>

Most of the respondents strongly agreed with the benefits of pet ownership, with the death of them negatively affecting the household in one or different ways. On the other hand, they were very concerned about diseases transmitted from pets. Though the benefits outweigh the risk, pets can bring different Zoonotic infections to households, particularly cats carry the toxoplasma parasite which can get into the brain and cause toxoplasmosis. People with a compromised immune system are especially vulnerable to this. Pets can also cause allergic reactions in some pet owners.<sup>37,38</sup> Dogs can be a host for different numbers of pathogenic flea, louse, mite, tick, fly ectoparasite, tape worm, and gastrointestinal endoparasites.<sup>39</sup> Therefore, effective control and hygienic programs need to be practiced to ensure the good welfare of humans and animals.

Raw feed is becoming increasingly popular with companion animals, which can pose a serious zoonotic risk. These diets and their ingredients have been found to be contaminated with pathogenic microorganisms, as indicated in a study conducted by Larry et al.<sup>40</sup> From the current result, it is revealed that the majority of the respondents provided raw meat for their pets as food. There is a greater amount of feeding raw meat to pets in the current report than in a previous report in Canada which revealed only 28% of pet owners' feed raw meat to dogs.<sup>6</sup> Feeding a raw meat to dogs is important in the completion of the lifecycle of hydatidosis.

In Ethiopia, pet management patterns are extremely difficult to define, which is mainly due to them not being controlled with strict sanitation. This indicates that the likelihood of transmission for pet contact associated zoonosis to humans is very high. Moreover, the practice of allowing dogs to roam freely both outside and in living room would facilitate the spread of pet associated diseases, according to Larry et al.<sup>40</sup> In line with this, most of the respondents mentioned that they used offal as a source of pet food, as also reported by Reta<sup>23</sup> around Gondor. Because of a large number of stray dogs and inappropriate offal management in the community it is very likely that garbage offal is eaten by dogs, increasing the rate of zoonotic disease from pets.

Management aspects of pets, as well as respondents' education levels, were assessed to measure how well they knew, perceived, and practiced pet management. The educational findings is generally were found to be consistent with previous studies by Kiflu et al<sup>36</sup> and Memon et al.<sup>19</sup> There was a significant association between KAP scores with respect to education level and job types.

## Conclusion

The current study characterized and assessed household knowledge, attitude, and risks related to pet contact associated zoonosis. In conclusion, the respondents indicated that rabies was a common pet contact associated zoonosis, along with toxoplasmosis, hydatidosis, and ring worm. Moreover the study also indicated the importance of pet ownership though transmitting different zoonotic disease. The tradition of providing raw meat to pets was found to be common, which may result in creating a favorable environment for completing the lifecycle of zoonotic parasites. The flow of information via informal ways resulted in different knowledge, attitudes, and practice levels of households. Finally, different intervention to improve the awareness of households on knowledge, attitude, and practices toward pet contact associated zoonotic disease needs to be implemented.

## Data Sharing Statement

The data used to support these findings are included within the article.

## Ethics Approval and Consent to Participate

Before starting the interview, oral consent was obtained from the pet owners after verbal informed consent was approved by the Wollega University ethics committee. The participants were informed about the purpose of the study and parental/legal guardian informed consent was obtained for participants under the age of 18.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare that they have no competing interests in this work.

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