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Knowledge, attitudes, and practices towards dog-associated zoonotic diseases among undergraduate health students, cleaning staff, and security personnel

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Abstract

Background: Zoonotic diseases are a major public health challenge in Ethiopia, particularly in rural and semi-urban areas where human-animal interaction is high. Dogs are the primary transmitters of several critical diseases, such as rabies, echinococcosis, and leishmaniasis. Despite these risks, there is limited research on the awareness levels of high-risk groups within academic settings. This study aims to bridge this gap by assessing the knowledge, attitudes, and practices regarding dog-associated zoonotic diseases among undergraduate health students, cleaning staff, and security personnel.

Methods: A cross-sectional study was conducted from April to June 2025, recruiting 424 participants through stratified random sampling with proportional allocation. Data were collected using a semi-structured questionnaire administered via face-to-face interviews and an online Kobo Toolbox link to assess participants' knowledge, attitudes, and practices. The data were entered into Excel and analyzed using SPSS version 27, with results presented in tables and narrative summaries; chi-square (χ^2) tests were used to assess associations, and p-values less than 0.05 were considered statistically significant.

Result: Among the 424 respondents, 91.7% (n=389) were aged 18–29 years, with 48.6% (n=206) females and 51.4% (n=216) males; most had college/university education (92.0%, n=390). The majority were undergraduate health students (90.1%, n=382), followed by security personnel (6.6%, n=28) and cleaning workers (3.3%, n=14). Most respondents had heard of zoonosis (91.5%, n=388), recognized animal-to-human disease transmission (96.2%, n=408), identified viruses (32.1%, n=136) and believed that dogs pose community risks (82.3%, n=349) and are sources of parasitic infections (84.9%, n=360).

Conclusion: The most participants demonstrated good awareness and positive attitudes toward dog-associated zoonotic diseases. However, gaps in knowledge among some respondents highlight the need for targeted education to promote safer human–animal interactions.

Key Words: dog-associated zoonotic diseases, knowledge, attitudes, practices, University of Gondar, Ethiopia.

Introduction

Zoonotic diseases are a major public health concern and a direct threat to human well-being, often leading to severe illness and potentially death [1]. According to the World Health Organization (WHO), any disease or infection that is naturally transmissible from

vertebrate animals to humans or from humans to animals is classified as a zoonosis [2, 3], these diseases infect humans as a result of direct contact with animals [4].

Zoonotic diseases pose a serious threat to both human and animal health worldwide, representing about 60% of all human diseases and 75% of diseases in animals [5]. Beyond the detrimental impact on human health, Zoonoses are estimated to cause 2.4 billion cases of illness and 2.7 million human deaths annually, primarily affecting the poorest livestock workers in low- and middle-income nations. Moreover, the majority of these illnesses negatively impact on animal health and reduce livestock output [6, 7].

A prime example is rabies, a neglected zoonotic neurological disease that is endemic in many countries. A recent global burden study estimated the human mortality from rabies to be 70,000 per year worldwide [8]. This devastating impact is heavily concentrated, with about 56% of these deaths occurring in Asia and 43.6% in Africa, mostly in rural areas [9-11]. Given this immense burden, rabies remains the top priority zoonotic disease in Ethiopia with an estimated annual incidence of 2700 human cases [12]. Consequently, the international community has called for the world to be canine rabies-free by 2030, aiming for no indigenously acquired dog-mediated human rabies cases [13].

As the global burden of zoonotic diseases grows, so does the urgency of addressing their impact on human health. A wide array of endemic conditions ranging from viral and bacterial infections like rabies and anthrax to parasitic threats such as echinococcosis and toxocariasis remain persistent challenges. Common pathogens including *Giardia* spp. and various coccidians further complicate this public health landscape, highlighting the diverse nature of animal-to-human transmission [14].

While dogs have historically served vital roles in hunting, guarding, and herding, their status has evolved into that of social partners and intimate family members, often sharing the same living spaces as their owners [1]. However, this close proximity becomes a public health liability when inadequate care such as a lack of food or shelter leads to the rise of semi-confined, free-roaming dog populations [15]. These roaming populations

significantly elevate the risk of zoonotic transmission; specifically, dog feces containing infectious larvae, eggs, helminth cysts, and protozoan oocysts act as primary vectors for environmental contamination and human infection [16].

Direct transmission via licking, biting, or physical contact, combined with indirect exposure through contaminated environments, creates a high-risk interface for dog-to-human pathogen transfer [17]. This risk is amplified by the close sharing of skin microbiota and living spaces common in domestic settings [9]. Vulnerability to these zoonoses is most pronounced in "at-risk" populations, specifically children, the elderly, pregnant women, and the immunocompromised [18].

Despite significant research into zoonotic knowledge, attitudes, and practices (KAP) among rural communities on pet owners, university settings remain a neglected frontier. These campuses represent critical contact points where students and staff frequently interact with dog populations. Given Ethiopia's high burden of zoonotic disease and existing gaps in public health education, understanding the KAP of university populations is essential. This study aims to evaluate the awareness and practices of students, security, and cleaning personnel, providing the evidentiary basis needed to design targeted intervention and prevention programs.

Materials and methods

Study Area, Design, and Period

The research utilized a questionnaire-based cross-sectional study design and was conducted at the University of Gondar (UoG) College of Medicine and Health Sciences (CMHS) in Gondar town, Amhara Region, Northwest Ethiopia. Gondar, located approximately 727 km from the capital, Addis Ababa, and has an estimated population of about 487, 224 in 2023 [19]. The UoG, a major Ethiopian university established since 1954. The CMHS is a comprehensive health institution, including a specialized hospital,

offering extensive academic programs: 14 BSc, 28 MSc, 8 PhD, 10 specialization, and 4 sub-specialization programs. Data collection took place over a three-month period, from April to June 2025.

Source population

All undergraduate health science students, cleaning staffs and security personnel at UoG CMHS were a source of populations.

Study population

Volunteer undergraduate health science students, cleaning worker and security personnel working at UoG CMHS.

Eligibility criteria

Inclusion criteria

- Undergraduate health science students
- Cleaning worker
- Security personnel

Exclusion criteria

Cleaning worker, Security personnel, and undergraduate health science students of UoG CMHS who are not willing to participate in the study.

Sample size determination and Sampling techniques

A stratified random sampling technique was employed to ensure proportional representation of all eligible study participants from different occupational groups. The study population was first divided into mutually exclusive and exhaustive strata based on occupation, as this was considered a key variable influencing the measured outcome. The strata were: Students, Cleaning Workers, and Security Personnel. The sample was then proportionally allocated to each stratum based on

its size relative to the total study population. Finally, eligible participants were randomly selected from a comprehensive list within each stratum (occupational group) until the allocated sample quota for that stratum was met. This approach ensures the sample accurately reflects the occupational distribution of the target population. The sample size was determined using the formula proposed by Thrusfield for a single population proportion, as no prior prevalence or relevant study was available in the study area [20].

1. Determine the total population size: Add all strata (groups).

Total population $N=200$ (security personnel) + 100 (cleaning worker) + 2700 (under graduate students) = 3000

2. Use Thrusfield's formula:

The formula for calculating sample size is

$$n = \frac{Z^2 \times P \times (1 - P)}{E^2}$$

Where:

- n = required sample size
- Z = Z-score for the desired confidence level (1.96)
- P = anticipated population proportion (0.5)
- E = desired level of precision (0.05)

Substitute the values into the formula:

$$n = \frac{(1.96)^2 \times 0.5 \times (1-0.5)}{(0.05)^2} = 384.16 \approx 385$$

Add 10% for non-respondents case = $385+39= 424$

3. Calculate the proportion of each stratum:

$$n_h = \frac{N_h}{N} \times n$$

147 Where:

148 n_h =sample size for stratum h

149 N_h = population size for stratum

150 n = total sample size

151 N = total size of stratum

152 Proportion of security personnel: $P1 = \frac{200}{3000} = 0.0667$

153 Proportion of cleaning worker: $P2 = \frac{100}{3000} = 0.0333$

154 Proportion of undergraduate students: $P3 = \frac{2700}{3000} = 0.9$

155 4. Sample size for each stratum by multiplying the total sample size

156 Sample size of the security personnel (n_s): $P1 \times n = 0.0667 \times 424 = 28.28 \approx 28$

157 Sample size of the cleaning worker (n_u): $P2 \times n = 0.0333 \times 424 = 14.12 \approx 14$

158 Sample size of the undergraduate students (n_c) = $P3 \times n = 0.9 \times 424 = 381.6 \approx 382$

159 Total sample size = $14 + 28 + 382 = 424$

160 **Study variable**

161 **Dependent variable**

- 162 - Knowledge
- 163 - Attitude
- 164 - Practice

165 **Independent variable**

- 166 - Age

- 167 - Sex
- 168 - Educational level
- 169 - Occupation/role
- 170 - Monthly income
- 171 - Place of residence
- 172 - Marital status

173 **Data collection tools and Instruments**

174 Data were collected from study participants using a pre-tested, structured, self-administered
175 questionnaire. All randomly selected participants provided informed consent to participate in the
176 study. The questionnaire was divided into two main sections: Socio-demographic data and KAP
177 on Dog-Associated Zoonotic Diseases. The socio-demographic section included seven questions
178 covering sex, age, marital status, educational level, occupation/role, place of residence, and
179 monthly income.

180 The assessment of KAP on Dog-Associated Zoonotic Diseases involved eight questions. Five
181 were closed-ended questions used to assess knowledge. Four of these utilized a Likert scale with
182 three alternatives (agree, uncertain, and disagree), while one question had two alternatives
183 (yes/no). Additionally, three open-ended questions were included, allowing respondents to
184 provide multiple answers. For the Likert scale questions, a correct answer (agree) was awarded
185 three points, an uncertain answer received two points, and a wrong answer (disagree) received
186 one point. For the dichotomous question, the correct answer (yes) was awarded one point, and
187 the wrong answer (no) received zero points.

188 The subsequent section of the questionnaire assessed Attitudes towards Dog-Associated
189 Zoonotic diseases using eight closed-ended questions. Respondents rated statements on a three-
190 point Likert scale: agree, uncertain, and disagree. These responses were scored as 3 points for

agree (representing a positive attitude), 2 points for uncertain, and 0 points for disagree (representing a negative attitude). Total attitude scores ranged from 8 to 24 points and were categorized into three levels: Positive Attitude (19-24 points), Neutral Attitude (14-18 points), and Negative Attitude (8-13 points).

Finally, Practices towards Dog-associated Zoonotic diseases were evaluated using seven questions. This section included six closed-ended questions with dichotomous (yes/no) responses and one open-ended item. The scoring for this section was based on the previously described methodology for practices (correct answer awarded 1 point and incorrect awarded 0 points), resulting in a score range of 0 to 6. These practice scores were then categorized using Bloom's cut-off points [21] as follows: good practices (5-6 points), fair practices (3-4 points), and poor practices (0-2 points). The complete English-language version of the interview guide is provided as Supplementary file 1.

Data collection procedure

To gather data, a semi-structured, pre-tested questionnaire was employed, developed through a comprehensive review of KAP surveys on zoonotic diseases [22]. The instrument was initially drafted in English, translated into Amharic (the native tongue), and then back-translated into English to ensure continuity; it comprised four main sections, primarily consisting of closed-ended questions. The questionnaire was pre-tested on a small sample (students, cleaning workers, and security personnel) representing 5% of the total participants to ensure clarity and understandability, with changes made based on their input to tailor it to the local community. Data were subsequently collected through face-to-face interviews and a self-administered Kobo Toolbox link, utilizing either the English version or the final Amharic version for participants with limited English proficiency.

Data Quality and Analysis

Prior to analysis, the collected data were meticulously checked for completeness and consistency. Any incomplete questionnaires were excluded from the study and accounted for in the non-

response rate. Completed and verified data were first entered into a Microsoft Excel Sheet and then exported to IBM SPSS Statistics, Version 27. The analysis employed frequencies and percentages to summarize numerical data. Socio-demographic variables (including sex, age, educational status, marital status, monthly income, occupation, and place of residence) were treated as predictor variables. The associations between the outcome variables (knowledge, attitude, and practice) and these socio-demographic predictor variables were assessed using the Chi-square (X^2) test. A p-value of less than 0.05 was set as the threshold for statistical significance. Finally, the analyzed results were organized and presented using both tabular and narrative formats.

Ethical consideration

This study was conducted in accordance with the Declaration of Ethical clearance was obtained from the Research and Ethics Review Committee of the University of Gondar (CMHS/SBLS). Participants were briefed on the study's purpose, risks, and benefits before providing written informed consent. Participation was entirely voluntary, with the right to withdraw at any time without penalty. To ensure confidentiality, all data were anonymized and used exclusively for research purposes.

Result

Sociology-demographic Characteristics of Respondents

Out of 424 respondents, 389 (91.7%) of them were between 18-29 years and 30 (7.1%) of them were between 30-44 years of age, and others were between 45-54 years and 55-64 years, accounted 4 (0.9%) and 1 (0.2%) of respondents. There were 206 (48.6) female and 216 (51.4) male respondents to the questionnaire. From level of education 390 (92.0%) of the respondents to college/university followed by Grade 10;-12, covering 29 (6.9%), and grade 1-8, covering 5 (1.2%) of the participants. Majority of respondents, 382 (90.1) were undergraduate health students, 14 (3.3%) were cleaning workers, and 28 (6.6%) were Security personnel. Additionally, 365 (86.1%) were unmarried, followed by

married, covering 34 (8.0%), in relationship, counts 22 (5.2%), and the rests were divorced and widowed, covers 2 (0.5%) and 1 (0.2) respectively. Majority of respondents, 382 (90.1%) were undergraduate health students, 28 (6.6%) were security personnel, followed by 14 (3.3%) cleaning worker [Table 1].

Table 1 Sociology-demographic characteristics of study respondent

Variable	Category	Number(N=424)	Percentage (%)
Sex	Female	206	48.6
	Male	216	51.4
Age	18-29	389	91.7
	30-44	30	7.1
	45-54	4	0.9
	55-64	1	0.2
Marital status	Unmarried	365	86.1
	In relationship	22	5.2
	Married	34	8.0
	Divorced	2	0.5
	Widow	1	0.2
	< 500	112	26.4

Monthly income (birr)	500 - 1500	143	33.7
	1500 - 2500	57	13.4
	>2500	112	26.4
Level of education	Elementary (grade 1-8)	5	1.2
	Secondary (grade 10- 12)	29	6.8
	College/university	390	92.0
Occupation/role	Undergraduate student	382	90.1
	Security guard	28	6.6
	Cleaning worker	14	3.3
Place of residence	Rural	185	43.9
	Urban	239	56.4

Knowledge of dog-Associated zoonotic diseases among study participants

Out of the 442 respondents, majority (91.5%, n=388) reported that they have heard of Zoonoses, while 6.5% (n=36) had not. Nearly all respondents (96.2%, n=408) agreed that diseases can be transmitted from animals to humans, with a small fraction being uncertain (1.4%, n=6) or disagreeing (2.4%, n=10). The majority of respondents recognized that

the causative agents of dog associated zoonosis diseases were viruses (32.1%, n=136), followed closely by a combination of bacteria, parasites, and viruses (30.4%, n=129). Other combinations included parasite and virus (18.9%, n=80), bacteria and virus (7.5%, n=32), bacteria alone (3.8%, n=16), bacteria and parasite (0.7%, n=3), and none (2.1%, n=9). A majority of respondents (78.5%, n=333) agreed that ingestion of contaminated food and water can cause transmission of dog-associated zoonotic diseases, and smaller proportion were uncertain (14.6%, n=62) or disagreed (6.8%, n=29). Two hundred sixty seven (63.0%) of respondents recognized the most common dog-associated disease is rabies. Other diseases such as echinococcosis and leishmaniasis were less commonly known, with 0.2% (n=1) and 0.7% (n=3) respectively. Some respondents recognized combinations of diseases such as rabies with echinococcosis (25.2%, n=107), rabies with leishmaniasis (2.8%, n=12), and rabies, echinococcosis, and leishmaniasis together (7.3%, n=31). A small number (0.7%, n=3) reported knowing none of these diseases. Most respondents (93.2%, n=395) agreed that lack of veterinary attention could exacerbate the occurrence of dog-associated zoonotic diseases. Additionally, 80.4% (n=341) agreed that cleaning up dog feces in public areas helps prevent the spread of such diseases, while 12.3% (n=52) were uncertain and 7.32% (n=31) disagreed. Regarding modes of transmission, The respondents replied that dog associated zoonotic were transmitted, 40.4% (171) through biting , 31.8% (135) through biting and scratches, 8.7% (37) through feeding of under-cooked food, 8.1% (34) through biting and touch, 4.7% (20) through feeding of contaminated food and water, 3.5% (15) through the fecal–oral route, and 2.8% (12) through air [Table 2].

Table 2: Knowledge on dog associated zoonotic diseases among study participants

Variable	Category	Number(N)	Percentage (%)
Have you ever heard	Yes	388	91.5
	No	36	6.5

of Zoonoses?			
Do you think a disease transmits from animal to humans?	Agree	408	96.2
	Uncertain	6	1.4
	disagree	10	2.4
Causative agent of dog associated zoonotic diseases.	Bacteria	16	3.8
	Bacteria and parasite	3	0.7
	Bacteria, Parasite, and virus	129	30.4
	Parasite and virus	80	18.9
	Bacteria and virus	32	7.5
	Virus	136	32.1
	None	9	2.1
Ingestion of contaminate d food and water can cause transmissio	Agree	333	78.5
	Uncertain	62	14.6
	Disagree	29	6.8

n of dog associated zoonotic diseases.			
Common dog associated disease you know?	Rabies	267	63.0
	Echinococcosis	1	0.2
	Leishmaniasis	3	0.7
	Rabies, Echinococcosis, and Leishmaniasis	31	7.3
	Rabies and Echinococcosis	107	25.2
	Rabies and Leishmaniasis	12	2.8
	none	3	0.7
What are the modes of dog	Biting	171	40.4
	Biting and	135	31.8

associated zoonotic disease transmission? 	scratchin g		
	Biting and touching	34	8.1
	Faeco - oral	15	3.5
	Feeding of contamin ated food and water	20	4.7
	Feeding of undercoo ked food	37	8.7
	Air	12	2.8
Do you think that lack of veterinary attention can aggravate the occurrence of dog	Agree	395	93.2
	Uncertain	26	6.1
	Disagree	3	0.3

associated zoonotic disease?			
Do you think that clean up dog feces in public areas prevent the spread of diseases?	Agree	341	80.4
	Uncertain	52	12.3
	Disagree	31	7.32
How do you protect dogs from disease?	Vaccinati on	118	27.8
	Sanitatio n	9	2.1
	Isolation	14	3.3
	All	165	38.9
	Vaccinati on and isolation	14	3.3
	Sanitatio n and isolation	2	0.5
	Sanitatio n and vaccinati on	59	13.9

	Do nothing	43	10.1
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Attitudes and Perceptions of respondents Towards Dog-Associated Zoonotic Diseases

A significant majority of respondents (82.3%, n=349) agreed that dogs pose risks to the community or campus. Meanwhile, 9.9% (n=42) were uncertain, and 7.8% (n=33) disagreed. The majority of participants (84.9%, n=360) agreed that dogs are a good source of zoonotic parasitic diseases. A smaller proportion were uncertain (13.4%, n=57), and 1.7% (n=7) disagreed. Majority of respondents, 42.5% (n=180) believed that benefits of owning a dog outweigh the health risks, opinions were divided: 42.5% (n=180) agreed, 24.8% (n=105) were uncertain, and 32.5% (n=138) disagreed. A majority of respondent (84.4%, n=358) believed that zoonotic diseases associated with dogs are preventable. Only 12.7% (n=54) were uncertain, and 2.8% (n=12) disagreed. Similarly, when asked whether such diseases are controllable, 85.6% (n=368) believed they are manageable, 10.6% (n=45) were uncertain, and 3.8% (n=16) disagreed. Most respondents (83.3%, n=353) agreed that dogs should be dewormed, while 13.2% (n=56) were uncertain and 3.3% (n=14) disagreed. Most respondents, 84.4% (n=358) believed that dogs are a source of disease, 9.7% (n=41) were uncertain, and 5.9% (n=25) disagreed [Table 3].

Table 3: Attitude of the respondent towards dog associated zoonotic diseases

Variable	Category	Number (N)	Percentage (%)
Do you believe that dogs bring more risks to the	Agree	349	82.3
	Uncertain	42	9.9
	Disagree	33	7.8

community /campus?			
Do you believe that dogs are a good source of zoonotic parasite disease?	Agree	360	84.9
	Uncertain	57	13.4
	Disagree	7	1.7
Do you believe the benefits of owning dog is greater than any health risks that occur with owning a dog?	Agree	180	42.5
	Uncertain	105	24.8
	Disagree	138	32.5
Do you think zoonotic diseases on dogs are preventable?	Agree	358	84.4
	Uncertain	54	12.7
	Disagree	12	2.8
Do you believe dogs should be dewormed?	Agree	353	83.3
	Uncertain	56	13.2
	Disagree	14	3.3
Do you think that zoonotic diseases can be controlled?	Agree	366	86..3
	Uncertain	54	12.7
	Disagree	4	0.9
Are you personally believe dogs are source of diseases?	Agree	358	84.4
	Uncertain	41	9.7
	Disagree	25	5.9

Do you believe the health problems caused by dog associated diseases can be manageable?	Agree	368	85.6
	Uncertain	45	10.6
	Disagree	16	3.8

Practices and Exposure Related to Dogs and Zoonotic Disease of respondent

Among 424 respondents, 35.1% (n=149) reported that they sit or play in the same area where dogs sleep or sit. However, hand hygiene practices were suboptimal: only 33.3% (n=141) reported washing their hands with soap and water after contact with dogs or their waste, while 66.7% (n=283) did not practice proper hand hygiene. All respondents (100%, n=424) agreed that encountering stray or ownerless dogs in their daily life in Gondar or on campus. Regarding protection methods for dogs, 38.9% (n=165) believed in using a combination of vaccination, sanitation, and isolation. Vaccination alone was noted by 27.8% (n=118), sanitation and vaccination by 13.9% (n=59), isolation alone by 3.3% (n=14), and sanitation alone by 2.1% (n=9). A notable 10.1% (n=43) reported doing nothing to protect dogs [Table 4].

Table 4: practice of the respondent towards dog associated zoonotic diseases

Variable	Category	Number (N)	Percentage (%)
Do you sit or play in the same area as where the dog(s) sleep or sit?	Yes	149	35.1
	No	275	64.9
	Yes	141	33.3

Do you wash your hands with soap and water after having contact with dogs and their waste?	No	283	66.7
Do you encounter stray (ownerless) dogs in your daily life in Gondar/on campus?	Yes	424	100.0
	No	0	00.0
Do you take dogs to veterinary clinic for diagnosis and treatment?	Yes	229	54
	No	195	46
Have you participated in awareness creation for the community on the prevention and control of zoonotic diseases?	Yes	158	37.3
	No	266	62.7
Are you aware of any programs or initiatives in Gondar to control or manage the stray dog population?	Yes	97	22.9
	No	327	77.1
How do you protect dogs from disease?	Vaccination	118	27.8
	Sanitation	9	2.1
	Isolation	14	3.3
	All	165	38.9

	Vaccination and isolation	14	3.3
	Sanitation and isolation	2	0.5
	Sanitation and vaccination	59	13.9

Association between sociodemographic characteristics and knowledge level on dog associated zoonotic diseases of respondents

The results showed a significant association between the respondent marital status and knowledge level regarding dog associated zoonotic diseases ($\chi^2 = 26.690$, $p < 0.001$). The education level of the respondent showed a significant relationship ($\chi^2 = 28.845$, $p < 0.001$) with the knowledge level. The difference observed between knowledge level with the respondents' age group, sex, monthly income, place of residence, and occupation was not statistically significant ($p > 0.05$) [Table 5].

Table 5: association between knowledge level about dog associated zoonotic diseases and sociodemographic characteristics of study respondents

Variable	Category	Total (N/%)	Knowledge score			X ²
			High (%)	Moderate (%)	Low (%)	
Sex	Female	206 (48.6)	192(93.2)	13(6.3)	1(0.5)	3.78 9
	Male	218 (51.4)	191(87.6)	25(11.5)	2(0.9)	
Age	18-29	389 (91.7)	355(91.3)	32(8.2)	2(0.5)	2.57 6
	29-44	30 (7.1)	25 (83.3)	4(13.3)	1(3.3)	
	45-54	4 (0.9)	2 (50)	2(50)	0(0.0)	
	54-64	1(0.2)	1(100)	0(0.0)	0(0.0)	
Occupation	Undergraduate student	382 (90.1)	347(90.8)	33(8.60)	2(0.5)	0.42 21

	Security personnel	28(6.6)	24(85.70)	3(10.70)	1(3.6)	
	Cleaning worker	14(3.3)	12(85.7)	2(14.3)	0(0.0)	
Place of residence	Urban	185(43.9)	212(88.7)	26(10.9)	1(0.4)	3.05
	Rural	239(56.4)	171(92.4)	12(6.5)	2(1.1)	2
Marital status	Unmarried	365(86.1)	338(92.6)	25(6.8)	2(0.5)	26.6
	In relationship	22(5.2)	14(63.6)	8(36.4)	0(0.0)	90
	Married	34(8.0)	28(82.4)	5(14.7)	1(2.9)	
	Widowed	1(0.2)	1(100)	0(0.0)	0(0.0)	
	Divorced	2(0.5)	2 (100)	0 (0.0)	0 (0.0)	
Level of education	Elementary G 1-8	5(1.2)	3(60.0)	1(20.0)	1(20.0)	28.8
	Secondary G 10-12	29(6.8)	25(86.2)	4(13.8)	0(0.0)	45

	Colleague/ university	390(92.0)	355(91.0)	33(8.5)	2(0.5)	
Monthly income	<500	112(26.4)	97(86.6)	15(13.4)	0(0.0)	7.03 8
	500-1500	143(33.7)	133(93.0)	8(5.6)	2(1.4)	
	1500-2500	57(13.4)	51(89.5)	6(10.5)	0(0.0)	
	>2500	112(26.4)	102(91.1)	9(8.0)	1(0.9)	

Association between sociodemographic characteristics and attitude level on dog associated zoonotic diseases of respondents

This study showed that, there is no significant association ($p > 0.05$) observed between attitude level with sex, place of residence, marital status, and level of education of the respondents towards dog associated zoonotic diseases. The association of attitude level with age of the respondents was significant ($\chi^2 = 38.070$, $p \leq 0.001$). The respondent's monthly income ($\chi^2 = 17.415$, $p = 0.008$), occupation ($\chi^2 = 12.586$, $p = 0.013$) showed a significant association with attitude levels (Table 6).

Table 6: factors associated with attitude level towards dog associated zoonotic diseases among study participants

Variable	Category	Total (N)	Attitude score			χ^2	P-value
			Positive (%)	Neutral (%)	Negative (%)		
Sex	Female	206(48.6)	192(93.2)	12(5.8)	2(1)	0.530	0.767
	Male	218(51.4)	206(94.5)	11(5.0)	1(0.5)		
Age	18-29	389(91.7)	368(94.6)	19(4.9)	2(0.5)	38.070	<0.001
	29-44	30(7.1)	26(86.7)	4(13.3)	0(0.0)		
	45-54	4(0.9)	3(75.0)	0(0.0)	1(25.0)		
	54-64	1(0.2)	1(100.0)	0(0.0)	0(0.0)		

Occupation	Undergraduate student	382(90.1)	359(94.0)	21(5.5)	2(0.5)	12.586	0.013
	Security personnel	28(6.6)	28(100)	0(0.0)	0(0.0)		
	Cleaning worker	14(3.3)	11(78.6)	2(11.3)	1(7.1)		
Place of residence	Rural	185(43.9)	176(95.1)	8(4.3)	1(0.5)	0.918	0.632
	Urban	239(56.4)	222(92.9)	15(6.3)	2(0.8)		
Marital status	Unmarried	365(86.1)	345(94.5)	18(4.9)	2(0.5)	13.934	0.084
	In relationship	22(5.2)	19(86.4)	3(13.6)	0(0.0)		

	Married	34(8.0)	32(94.1)	1(2.9)	1(2.9)		
	Widowed	1(0.2)	1(100.0)	0(0.0)	0(0.0)		
	Divorced	2(0.5)	1(50.0)	1(50.0)	0(0.0)		
Level of education	Elementary G 1-8	5(1.2)	5(100.0)	0(0.0)	0(0.0)	3.859	0.425
	Secondary G 10-12	29(6.8)	27(93.1)	1(3.4)	1(3.4)		
	college/university	390(92.0)	366(93.8)	22(5.6)	2(0.5)		
Monthly income	<500	112(26.4)	104(92.9)	8(7.1)	0(0.0)	17.415	0.008
	500-1500	143(33.7)	136(95.1)	6(4.2)	1(0.7)		
	1500-2500	57(13.4)	48(84.2)	7(12.3)	2(3.5)		
	>2500	112(26.4)	110(98.2)	2(1.8)	0(0.0)		

Association between sociodemographic characteristics and practice level on dog associated zoonotic diseases of respondents

Significant associations ($p < 0.05$) were found between practice level on dog-associated

Zoonoses and all sociodemographic characteristics of respondents except the sex (**Table 7**).

Table 7: Factors associated with practice towards dog associated zoonotic diseases among study participants

Variable s	Category	Total (N)	Practice score			χ^2	P value
			Good (%)	Fair (%)	Poor (%)		
Sex	Female	206(48.6)	45(21.8)	48(23.3)	113(54.9)	0.968	0.616
	Male	218(51.4)	56(25.7)	51(23.4)	111(50.9)		
Age	18-29	389(91.7)	85(2.9)	86(22.1)	21(56.0)	25.508	<0.001
	29-44	30(7.1)	14(46.7)	10(33.3)	6(20.0)		
	45-54	4(0.9)	1(25.0)	3(75.0)	0(0.0)		
	54-64	1(0.2)	1(100.0)	0(0.0)	0(0.0)		
Occupati on	Undergra duate student	382(90.1)	82(21.5)	81(21.2)	219(57.3)	33.717	<0.001

	Security personnel	28(6.6)	14(50)	13(46.4)	1(3.6)		
	Cleaning worker	14(3.3)	5(35.7)	5(35.7)	4(28.6)		
Place of residence	Rural	185(43.9)	43(23.2)	33(17.8)	109(58.9)	6.618	0.037
	Urban	239(56.4)	58(23.3)	66(27.6)	115(48.1)		
Marital status	Unmarried	365(86.1)	75(20.5)	80(21.9)	210(57.5)	34.701	<0.001
	In relationship	22(5.2)	7(31.8)	6(27.3)	9(40.9)		
	Married	34(8.0)	16(47.1)	13(38.2)	5(14.7)		
	Widowed	1(0.2)	1(100.0)	0(0.00)	0(0.0)		
	Divorced	2(0.5)	2(100.0)	0(0.0)	0(0.0)		

Level of education	Elementary G 1-8	5(1.2)	2(40.0)	1(20.0)	2(40.0)	32.810	<0.001
	Secondary G 10-12	29(6.8)	12(41.4)	16(55.2)	1(3.4)		
	College/university	390(92.0)	87(22.3)	82(21.0)	221(56.7)		
Monthly income	<500	112(26.4)	30(26.8)	12(10.7)	70(62.5)	18.925	0.004
	500-1500	143(33.7)	29(20.3)	45(31.5)	69(48.3)		
	1500-2500	57(13.4)	11(19.3)	12(21.1)	34(59.6)		
	>2500	112(26.4)	31(27.7)	30(26.8)	51(45.5)		

Discussion

This study aimed to assess the knowledge, attitudes, and practices towards dog associated zoonotic diseases and their associated factor among undergraduate health students, cleaning staff, and security personnel at University of Gondar, Northwest Ethiopia, 2025. From 424 respondents, the sex distribution was nearly equal, 216 (51.4%) male and 206 (48.6%) female. The majority of respondents, 389 (91.7%) were young adults between (18–29 years), aligning with expectations for undergraduate students. Most were unmarried (86.1%), and over 92% had at least collegiate/university level education.

The study finding showed that most of respondents, 91.5% reported having heard about the term “Zoonoses,” and 96.2% knew disease can be transmission from animals to humans. This find is consistent with previously conducted studies in other Ethiopian studies, and parallels high awareness rates (90–95%) such as Adama (94.5%) [23], and central Gondar (60% high knowledge) [15]. However, understanding the causing agent’s dog associated Zoonoses, varied more: only 32.1% mentioned viruses alone, and only 30.4% identified bacteria, parasites, and viruses together. The variation may be a result of the respondents’ difference in social background, educational level, and professional background. This implies a lack of scientific knowledge, which is consistent with data in central Gondar where 82% of respondents correctly identified the intake of raw meat but had poor levels of basic agent literacy [15]. The study result showed that 72.8% of the respondent reported that the transmission of dog associated zoonotic diseases is through biting and scratching. The recording of the present study is line with the report from Combolcha (70.8%) [24]. similarity in sources of information could be justification for the similarity of this result.

In the current survey the majority of the participants were aware of rabies being one of the dog associated zoonotic diseases. This finding is consistent with previous reports of [24, 25] in Mekelle, [26] from Gonder City, and [27] 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 [28].

In the current study, 42.5 % of the participants believe that the benefits of owning dog is greater than any health risks that occur with owning a dog. Similarly, 24.8% of the participants were not sure whether the benefits of owning dog is greater than health risks. However, 32.5% of respondent believe that benefits of owning dog is no greater than health risk. This indicates that they are not overly concerned about diseases that are spread by dogs. Dogs can spread various zoonotic infections to people, even though the advantages outweigh the risks [29]. A study in Canada showed that 61% [30], and in Western Ethiopia and 76.15% of the respondents [31] respectively, perceived that the benefits of owning dog greater than any health risks associated with dog ownership. Their perception was higher than the current finding. The difference in perception between the studies might be due to the varying cultural and educational backgrounds of the participants in each study. Majority of respondent, 82.5% believe that dogs bring more risks to the community /campus. These data comply the study conducted in Alegre, ES, in which most of the population (83%) highlights that “stray dogs” are a problem in the city and campus [32]. Most of respondents, 84.4%, believe that zoonotic diseases in dogs are preventable. This attitude is crucial, as it implies a willingness to adopt proactive measures to safeguard individuals and communities from these diseases. In this study, majority of the participants, 84.9% reported that dogs are a good source of zoonotic parasite disease. A similar finding was noted by Abebe Tesfaye G. in Central Gondar [15], who indicated that 72.0% of the respondents believe that that dogs are a good source of zoonotic parasite disease [15]. The results of our study indicate that a substantial majority of respondents, 83.3% of believed that dogs should be dewormed, demonstrating a high level of awareness and positive attitude toward one of the most critical preventive measures for controlling dog-associated zoonotic diseases. But, 3.3% of respondents were disagree about the deworming of dogs, and 13.3% of respondents were uncertain. This contrasts significantly with the study was conducted in central Gondar showed that, 36.0% of respondent believed that dogs should be dewormed, 32.0% were disagree, and 32.0% were uncertain [15]. The high belief in dog deworming among

the UoG population compared to Central Gondar is a positive development likely influenced by educational exposure and institutional culture. Participants in the current study (86.3%) believed that dog associated zoonotic diseases are controllable. This result is comparable to the one reported in the Yabello District of the Oromia Regional State and Central Gondar of Ethiopia, which were 69.2% and 64.25% respectively [33]

According to the study, all of respondents (100%) encounter stray (ownerless) dogs in your daily life. Also, 54.0% of the respondents are aware about the practice of taking dogs to the veterinarian for a diagnosis and treatment. The current finding is comparable to the report in Western Ethiopia and Kiflu et al. in Addis Abeba, Ethiopia [31]

In the current study, the participants who had college or university level of education had higher knowledge level than those who had only completed primary or elementary school or secondary level of education. Thus, the association between education level and Knowledge level is attributed to the idea that a deeper knowledge base can positively influence their knowledge about dog associated zoonotic diseases. In addition, a significant variation ($p < 0.001$) observed between the knowledge level with the respondent's marital status. The difference might be due to difference in their educational level, responsibility in the household, and professional background between the study participants. In the current study, people who attend Elementary School had a positive attitude than people who had college/university than secondary school.

Limitation of the study

The present study has had certain limitations such as the authors give attention for literate individuals to measure the perception of the people, the design shows the status of the workers at the point of data collection.

Conclusion

The findings indicate that there is considerable level of knowledge in the study participants. More than half of the study participants are aware of dogs are source of human infection. The majority of cleaning workers have had neutral attitude towards the dog associated zoonotic diseases. In this assessment, the knowledge of respondents was significantly associated with marital status and educational level. The respondents' attitude was associated with age, occupation, and monthly income of the respondents. The practices habit of the study participants was influenced by age, occupation, place of residence, marital status, level of education, and monthly income.

Recommendations

The results show the necessitates of regular awareness creation which plays an important role in dog associated Zoonoses prevention, promoting routine hygiene practices, and dog associated Zoonoses prevention program establishment, community-specific awareness programs, particularly for non-health staff, and integration of One Health approaches in academic and institutional settings are recommended.

List of abbreviation

CMHS: College of Medicine and Health Sciences, KAP: Knowledge, Attitudes, and Practices, NTD: Neglected Tropical Diseases, Spps: Species, SPSS: Statistical Package for the Social Sciences, UoG: University of Gondar, WHO: World Health Organization.

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Declarations

Ethics approval and consent to participate

Ethical approval for this study was granted by the Institutional Ethics Review Board of the University of Gondar (Ref: CMHS/SBLS 2017-956). Written informed consent was obtained from all participants.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they do not have any conflicts of interest.

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Authors' contributions

BBB, YMW, and ZMB conceptualized the study. BBB, YMW, ZMB, TG, ZYK, and NC performed formal data analysis. BBB, ZYK, and ZMB prepared the primary draft of the manuscript. YMW, NC, and TG supervised the study. YMW, NC, and TG

reviewed the paper and provided critical feedback. All authors read and approved the final manuscript.

Additional information

Supplementary file 1 docx.

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