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ABSTRACT

BACKGROUND: Zoonotic infections are a serious threat to human health and a direct risk that could potentially be fatal. Animals both domestic and wild serve as reservoirs for zoonotic infections. Thus, frequent contact with animals might occasionally result in the transfer of infections from animals to people. Ghana is especially susceptible to the effects of zoonotic infections due to the increase in the household human-animal ratio. This study assessed the awareness and knowledge level of tertiary students in a selected tertiary institution on zoonotic infections.

METHODS: A quantitative research method was employed making use of a descriptive cross-sectional study design. The target population chosen for the research was mainly students from the University of Ghana. A stratified sampling technique was used in selecting participants for the study. 440 participants were selected for the study. The university's four primary colleges served as the strata for the basis of data collection.

RESULTS: The study revealed a moderate knowledge level among students. The term "zoonoses" was understood by the majority (70%) of the respondents. Respondents knew at least one route of transmission of zoonotic infection. For the spread of zoonotic infections, close contact with infected animals and consumption of contaminated food were seen as ways of spread by a majority.

CONCLUSION: Although the basic strategies required for the control and elimination of the zoonotic diseases in such tertiary institutions are well known and practiced as per the study findings, zoonoses still persists and this can be attributed to low education on the subject. Knowledge and awareness level on zoonoses especially in tertiary institutions such as the University of Ghana could be improved if relevant authorities create adequate enlightenment programs on improving the knowledge of zoonotic diseases through a variety of media including seminars, workshop, television, radio, newspaper and social media.

KEYWORDS: Awareness, human-animal ratio, knowledge, protective factors, reservoir, tertiary students, zoonosis

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Introduction

Domesticated animals have historically aided people in performing their daily tasks.[1] Agricultural livestock are bred to produce milk, meat, and eggs, ensuring people would never become famished.[2] Humans were able to travel great distances and conquered new lands thanks to horses and donkeys.[3] Other animals, like cattle, have made it easier for people to farm vegetables and plow the fields, while sheep have offered wool for making winter clothing to keep people warm. Cats and dogs that live in our houses have formed unique ties with people over thousands of years, keeping us safe from potential threats and providing companionship.[4] Zoonotic infections involve the spread of infections from animals to humans. The World Health Organization (WHO) defines zoonosis as "any disease or infection that is naturally transmissible from vertebrate animals to humans."[5] Due to their proximity to people, the spread of infections to humans is easily facilitated.[6,7] Despite the importance derived, animals both domestic and wild serve as reservoirs for zoonotic infections.[8] Zoonoses are believed to have resulted in 2.7 million human deaths and an estimated 2.4 billion cases of diseases annually.[9] Disease transmission from animals can happen anywhere there are humans, in both urban and rural environments.[10] An increase in the movement of people and goods derived from animals internationally, the need for more food due to the growing human population, intensive human and wildlife migration, intensified animal production using non-traditional methods, and unplanned urbanization have all contributed to a rise in both the kind and frequency of zoonoses in humans. Approximately 75% of newly emerging human diseases and about 60% of all communicable diseases have zoonotic origins and are among the earliest known communicable diseases.[9,11] In recent years, the significance and the consequences zoonoses have on public health have gained widespread recognition.[12] According to the WHO and the majority

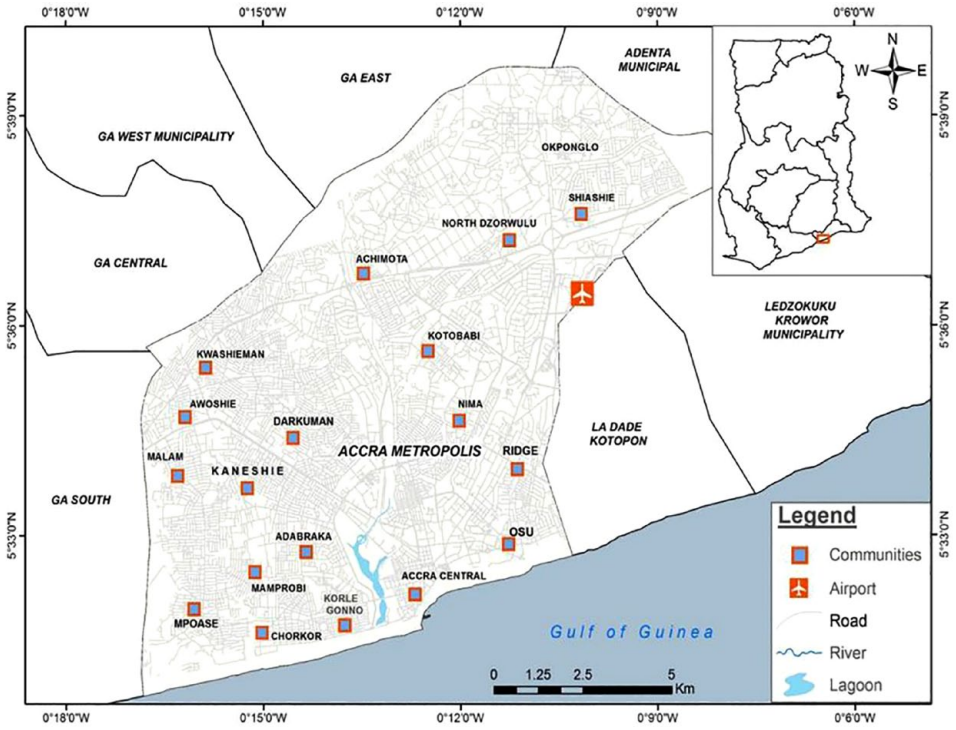

Figure 1. Map of Accra Metropolis.
Source: Accra Metropolitan Assembly.

of infectious disease specialists, zoonotic diseases are expected to be the cause of the next human pandemic, and wildlife is now thought to be the main source.[13]

The magnitude and severity of zoonoses have grown during the past few decades and Ghana is no exemption due to the increase in the household-human-animal ratio.[14] Susceptible to the effects of zoonotic illnesses, 5% of Ghanaians work solely in the production of livestock, whereas 74% cultivate both cattle and crops.[15] In Ghana, there have been confirmed cases of brucellosis, hepatitis E, Q-fever, toxocariasis, and rabies.[16] One of the most popular pets in Ghanaian households is the dog. The viral disease rabies, which has a high mortality rate, is one of the zoonotic infections in dogs that are most frequently recorded in Ghana.[17] Another category of household animals retained by Ghanaians are ruminants raised for income, employment, and a significant source of animal protein.[18] Cases of brucellosis and other diseases have been documented in both large and small ruminants.[19] Due to the rising need for animal protein in the nation, Ghana has also witnessed a boom in pig farms increasing the likelihood of zoonotic transmissions to humans through consumption of undercooked or raw meat.[16] Other zoonotic poultry diseases have all been recorded in Ghana.[20]

To reduce the impact of these zoonotic infections, The One Health concept; which considers the connections between the health of people, animals, and their shared environment uses a more thorough, coordinated strategy to comprehend and lower sickness risks.[21,22] Ghana has however, not formally implemented a national one-health strategy as of yet.[22]

This therefore, necessitated the need to assess the knowledge and awareness level of Ghanaians specifically tertiary students on zoonotic infections due to the lack of standardized policies, underestimation of the health risks and further neglect of some zoonotic infections.

Methodology

Study area and design

The Accra Metropolis was the site of the study. Since its founding in 1898, the A.M.A. has served as both Ghana's national capital and the regional capital for the Greater Accra Region. The population of Accra Metropolitan Assembly (AMA), is one million, six hundred and sixty-five thousand and eighty-six (1 665 086). Males constitute 48.1% and females represent 51.9%.[23] A descriptive cross-sectional study design and a quantitative research approach were used to assess the knowledge and awareness of zoonotic infections among tertiary students in the Accra Metropolitan Area. The map of the Accra Metropolitan Area is depicted in Figure 1. The map of Ghana using the University of Ghana is shown in Figure 2.

The study, which was conducted in a privileged environment with many higher educational facilities, focused on students at renowned tertiary educational establishments. The University of Ghana students were the primary focus of the investigation. The total enrollment includes regular, sandwich, distance learning, and students from linked institutions, totaling around 61 000 students.[25]

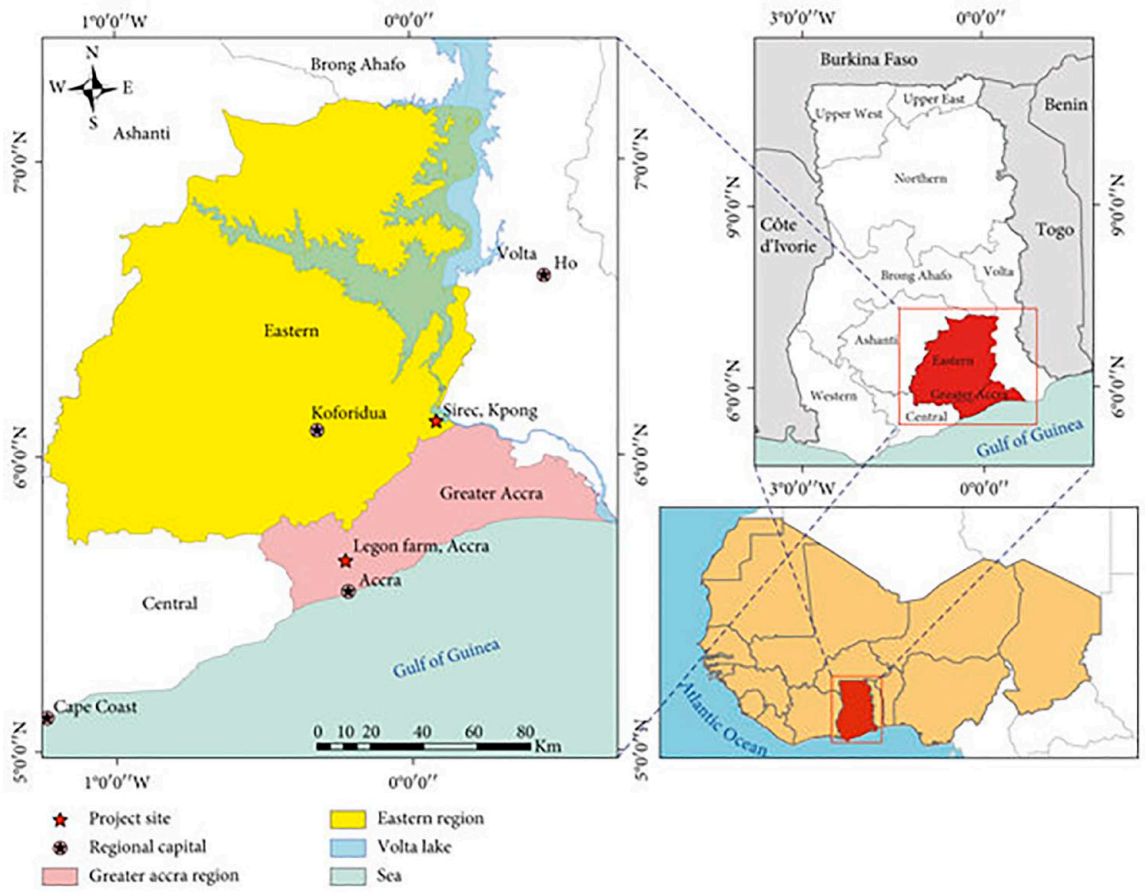

Figure 2. Map of Ghana showing the University of Ghana.
Source: Adapted from MacCarthy et al.[24]

Sample size determination

Yamane's formula was employed in calculating the sample size for this study.

$$n = \frac{N}{1+Ne^2}$$

Where n = Sample size
N = Population Size
e = margin of error

Margin of error (α) was set at 5% and at 95% CI. According to GHS (2014), the total population for the Accra Metropolis is 1 665 086. Hence;

The minimum sample size was calculated as:

$$N=1665086$$

$$e^2 = 0.05 \times 0.05 / 0.0025$$

$$n = \frac{1665086}{1+1665086\ (0.0025)}$$

$$n = 399.90$$

$$\approx 400$$

$$n = 399.9 + (0.1 \times 399.9)$$

$$n = 399.9 + 39.9 = 439.8$$

$$n = 440$$

Table 1. Estimated population of students within the 4 colleges.

COLLEGE	ESTIMATED POPULATION
College of Basic and Applied Sciences	15 250
College of Health Sciences	16 000
College of Humanities	19 750
College of Education	10 000
Total	61 000

Source: Fieldwork 2023.

The sample was made up of 399.90 individuals after the sample size was determined using the Yamane formula. In order to obtain precise results, the sample size was increased by the researcher to 400 individuals. After computation, a 10% non-response rate was included, bringing the minimum sample size to 440. A stratified sampling technique was used in selecting participants for the study. Four primary colleges make up the University of Ghana, Legon, and as a result of the differences between them, the colleges served as the strata.

The estimated population of students within the 4 colleges is shown in Table 1. The number of respondents needed from

Table 2. Strata size determination of colleges.

COLLEGE	ESTIMATED POPULATION	SAMPLE FRACTION * N	STRATA SIZE
College of Basic and Applied Sciences	15250	15250 / 61000 * 400	100
College of Health Sciences	16000	16000 / 61000 * 400	104
College of Humanities	19750	19750 / 61000 * 400	130
College of Education	10000	10000 / 61000 * 400	66

Source: Fieldwork 2023.

the various colleges to take part in the study is displayed in Table 2. From the University's College of Basic and Applied Sciences, 100 individuals were chosen. One hundred four (104) respondents were selected from the College of Health Sciences, 130 respondents from the College of Education, and 66 respondents each from the Colleges of Humanities and Education (Table 2).

Instrument for data collection and procedure for assessing the knowledge and awareness level of respondents on zoonotic infections

A structured questionnaire making use of multiple choice and scale questions was the main data collection instrument for the study. The questionnaire was divided into 3 main sections to obtain information on the knowledge, transmission risk as well as viable measures to control the spread of zoonotic infections.

Prior to initiation of data collection, the researchers sought permission from the school's administration. After gaining approval, the researchers used 4 days to collect data, with 1 day allotted to each college. The students' permission was requested prior to the distribution of the questionnaire. This research utilized google form; a software application to collect primary data. The link of the questionnaire was forwarded to the respondents via email and other social media platforms such as WhatsApp. While the researchers aided the individuals, who had trouble logging into the online form, respondents were allowed to complete the questionnaire at their own convenient time.

Data analysis

The data collected was exported to Microsoft Excel. Errors were double checked and fixed on entries. It was then imported to SPSS for coding and then to STATA version 14 for analysis. Sociodemographic data such as age, religion, level of study, department and sex were obtained using frequencies and percentages via STATA version 14. Some results were displayed in figures and charts using Microsoft Excel 2016. To ascertain the relationship between the independent variables and zoonotic infection control measures, regression analysis was utilized. For all associations, significance level was set at 5% with confidence interval at 95%. Tables with the odds ratio, p-values, and confidence intervals were used to display the results.

Ethical consideration

Ethical approval was sought from the Ghana Health Service Ethics Review Committee. A letter of introduction was obtained from the College of Health, Yamfo and sent to the administration of University of Ghana selected for the purpose of this research for permission. With regards to this study, an informed consent was sought from all respondents hence, respondents were given the right to freely choose whether to participate in the study or not as well as the right to withdraw from the study if they deemed it appropriate. The individual questionnaire was devoid of an allocated portion for the entry of respondent's names and other personal traceable information to improve confidentiality and anonymity. The researchers ensured that respondents had a clear understanding of the purpose of the study and how the data collected would be used.

Results

A total of 440 questionnaires were distributed, and every single one received a response. The socio-demographic information for participants within each college is shown in Table 3 below.

Male participants made up 35.23% of the sample and female participants made up 64.77%. The majority of respondents (53.86%) were between the 21 and 25 years age group. Majority of respondents (90.23%) were Christians. While 2.50% of respondents were in their final year of study, up to 79.77% of respondents were in level 100 (Table 3).

Assessing the knowledge level of students on zoonotic infection

The criteria for the knowledge evaluation included questions about what zoonoses were, how frequently they were acquired, if healthy individuals might contract them, whether humans could also transmit diseases to animals, and, ultimately, whether students could recognize different illnesses as zoonotic.

Seventy percent (70%) of the 440 students properly defined zoonosis as an infectious disease that spreads from animals to humans, 23.2% accurately said that it only spread from domestic animals to humans, and 3.4% of the students were unable to do so.

Majority of the respondents (53.18%) identified that, the most frequent way of getting zoonosis is through the

Table 3. Distribution of socio-demographic characteristics of study participants.

CHARACTERISTIC (N = 440)	FREQUENCY	PERCENTAGE (%)
Gender		
Male	155	35.23
Female	285	64.77
Age		
18-20	134	30.45
21-25	237	53.86
25-30	60	13.64
Above 30	9	2.05
Faculty or Department		
College of Basic and Applied Sciences	120	27.27
College of Health Sciences	110	25
College of Education	70	15.91
College of Humanities	140	31.82
Religion		
Christian	397	90.23
Islam	40	9.09
Traditional/Indigenous	3	0.68
Level of study		
100	351	79.77
200	61	13.86
300	17	3.86
400	11	2.5

Source: Fieldwork 2023.

consumption of contaminated food and water. In identifying whether certain diseases were zoonotic or not, 91.36% representing majority of respondents identified rabies as zoonotic. With Malaria, only 31.14% saw malaria as zoonotic with 68.86% thinking otherwise. Approximately 60.68% of respondents could also not identify COVID-19 as a zoonotic infection. Majority of the respondents identified correctly Bird flu (63.41%), Swine flu (57.7%), Ebola virus disease (69.77%) and Anthrax (57.05%) as zoonotic (Table 4).

Rating of knowledge level of respondents on zoonotic infections

Based on the responses, the respondents' understanding of zoonotic infection was graded (Table 5). Correct answers received a score of "1," while erroneous answers received a score of "0." The following questions formed the basis for the rating: what zoonotic infection referred to, what was the most frequent way of getting zoonotic infection, whether healthy people could get zoonotic infection, whether humans could also transmit infections to animals and finally if students could identify various diseases as zoonotic. Each respondent's scores were added up to produce a composite score, with "10" representing the highest and "0," the lowest. Anyone who scored 8 to 10 questions right was graded as having high knowledge, anyone who answered 5 to 7 questions correctly had moderate knowledge whereas anyone with 0 to 4 answers right was rated as having low knowledge level on zoonotic infections.

From Table 5, the results indicate that majority (54.5%) scored between 5 and 7, which indicate a moderate level of knowledge, while 20.7% had scores that indicate a poor level of knowledge and 24.8% had scores between 8 and 10, which indicate a high level of knowledge.

The researchers assessed students' awareness of the various zoonotic diseases common to the respondents. The result from Figure 3 revealed that, rabies as a zoonotic disease was well-known among majority of respondents while malaria was least known as zoonotic. COVID-19 was identified by only 39.32% as zoonotic. Some however, indicated Bird flu, Ebola Virus Disease (EVD) and Anthrax as zoonotic diseases (Figure 3).

Ways of spread of zoonotic infections

The spread of zoonotic infections is made easy through a number of ways: once an individual gets into contact with an infected animal or its produce, zoonotic infection can occur. Whiles close contact and consumption of contaminated food were seen as ways of spread of zoonotic infections by majority of respondents, only few knew insect bites also contributed to the spread of zoonotic infections. A chart of the spread of zoonotic infections is shown in Figure 4.

Transmission risk of zoonotic infections

Of the 440 students who participated in the assessment on their level of knowledge regarding the risk of zoonotic infection spread, 49.55% identified direct contact as the method by which zoonotic infections spread. Approximately 31.14% identified zoonosis as having multiple routes of transmission (Table 6).

For the spread of zoonotic infections, many respondents identified the consumption of contaminated food as the main route of spread. Approximately, 48.86% of respondents identified insect bites as the means of spread of zoonotic infections. Also, majority of respondents come into contact with their pets on a daily basis with only 41.82% confining their pets. Whiles majority of respondents believed that zoonotic infections spread through close contact with infected animals and eating contaminated food, very few people were aware that insect bites also contributed to the transmission of zoonotic infections.

Table 4. Knowledge level on zoonotic diseases.

CHARACTERISTIC	FREQUENCY	PERCENTAGE (%)
Zoonosis refers to (n=440)		
Disease transmitted from domestic animals to humans	102	23.2
Disease transmitted from all animals to humans	308	70.0
Disease transmitted from humans to humans	15	3.4
Infectious disease from animals to animals	15	3.4
Anyone can get a zoonotic infection including healthy people (n=440)		
Yes	68	15.45
No	372	84.55
Zoonotic infection is mostly through the consumption of contaminated food and water		
Yes	234	53.18
No	206	46.82
Humans also transmit diseases to animals through reverse zoonoses (n=440)		
Yes	190	43.18
No	250	56.82
Which of the following are zoonotic infections (n=440)		
Rabies		
Yes	402	91.36
No	38	8.64
Malaria		
Yes	137	31.14
No	303	68.86
COVID-19		
Yes	173	39.32
No	267	60.68
Bird Flu		
Yes	279	63.41
No	161	36.59
Swine Flu		
Yes	254	57.73
No	186	42.27
Ebola Virus Disease		
Yes	307	69.77
No	133	30.23
Anthrax		
Yes	2 51	57.05
No	189	42.95

Source: Fieldwork 2023.

Table 5. Rating of knowledge of respondents on zoonotic infections.

CHARACTERISTIC (KNOWLEDGE) N = 440	SCALE	FREQUENCY	PERCENTAGE (%)
Low knowledge level	0-4	91	20.7
Moderate knowledge level	5-7	240	54.5
High knowledge level	8-10	109	24.8

Source: Fieldwork 2023.

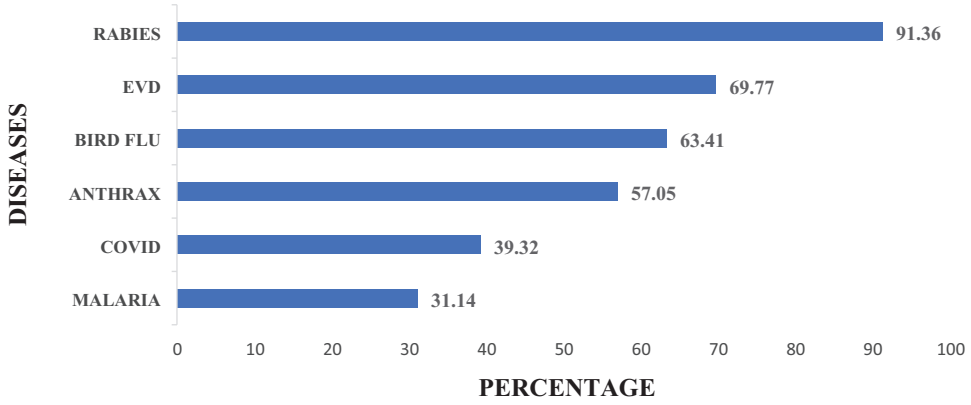

Figure 3. Awareness of zoonotic diseases.
Source: Fieldwork 2023.

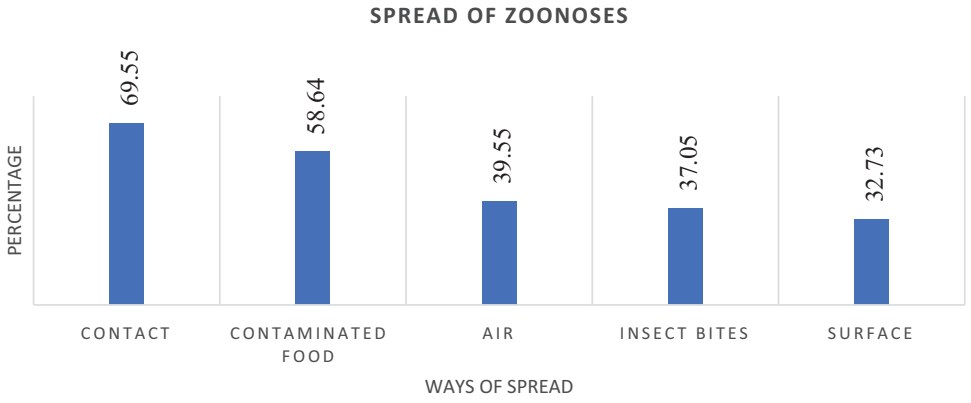

Figure 4. Ways of spread of zoonotic diseases.
Source: Fieldwork 2023.

The researchers evaluated students' understanding of the zoonotic disease transmission routes. Despite the fact that oral, nasal, and direct zoonoses can all be contracted, the majority of respondents (49.55%) selected only direct as the most suitable method of transmission.

Measures to control zoonotic infections

Majority of students indicated vaccinating of animals as a viable control measure against the spread of zoonotic infections (Figure 5).

A greater proportion of respondents intimated that immediate action for a sick or injured animal is a viable control measure against zoonotic infections (Figure 6).

Majority of students indicated that wearing of gloves when handling sick animals could prevent the spread of zoonotic infections (Figure 7).

Majority of respondents indicated that regular hand washing after handling animals could prevent the spread of zoonotic infections (Figure 8).

Association between respondents' demographics and zoonotic control practices

The level of study of respondents was a predictor of the practice of respondents wearing gloves when attending to a sick animal. The level of study refers to the year of study of respondents in the university. The level of students was 1.44 times

Table 6. Knowledge level on transmission risk.

CHARACTERISTICS (N=440)	FREQUENCY	PERCENTAGE (%)
In which of the following ways can zoonotic infections spread?		
Through the air		
Yes	174	39.55
No	178	40.45
Maybe	88	20
Consumption of contaminated food		
No	258	58.64
Yes	135	30.68
Maybe	47	10.68
Touching an area or surface an infected animal touched		
No	144	32.73
Yes	253	57.5
Maybe	43	9.77
Close contact with an infected animal		
No	306	69.55
Yes	105	23.86
Maybe	29	6.59
Through insect bites		
No	163	37.05
Yes	215	48.86
Maybe	62	14.09
Which of the following is the appropriate route of transmission for zoonotic infections?		
Direct (contact)	218	49.55
Multiple (more than one)	137	31.14
Nasal (Respiratory)	48	10.91
Oral route	37	8.41
How often do you come into contact with your pet?		
Daily	236	53.64
No contact	155	35.23
Weekly	49	11. 14
How do you handle your animals?		
Confined	184	41.82
Freely moving	256	58.18

Source: Fieldwork 2023.

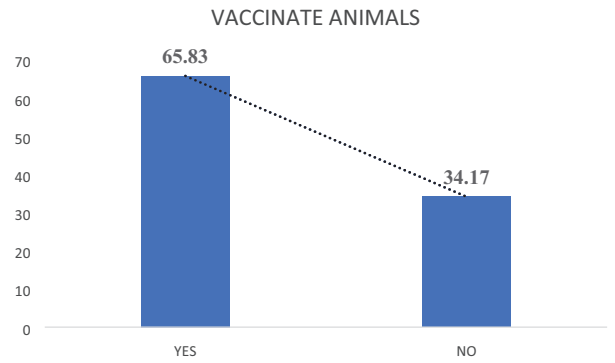

Figure 5. Vaccination of animals.
Source: Authors fieldwork (2023).

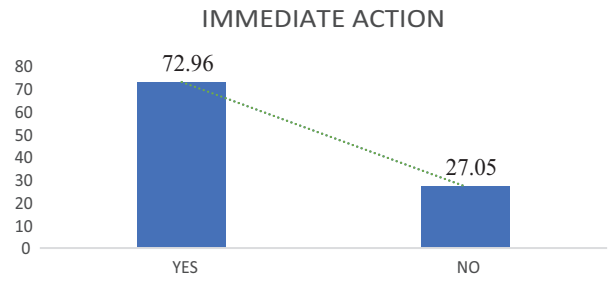

Figure 6. Immediate action.
Source: Authors' fieldwork (2023).

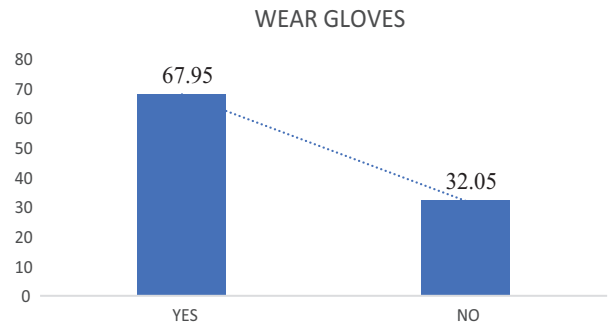

Figure 7. Wearing of gloves.
Source: Authors fieldwork (2023).

more likely to predict the practice of wearing gloves when handling a sick animal as compared to other socio-demographic variables and this was significant (Table 7). Notably, the college students find themselves was also associated with an increased odds of wearing gloves while attending to a sick animal of 1.07. However, this association was not significant. Religious affiliation of students, their ages and gender were not associated with significant odds of wearing gloves while attending to sick animals.

In determining the association between the socio-demographic variables and vaccination of animals regularly, the level of study of students was associated with 1.32 increased odds of vaccinating animals as compared to the age range students fall in. Similarly, the religious affiliation, gender and college students belong to were associated with vaccinating animals as well as sending them to veterinary officers on regular visits.

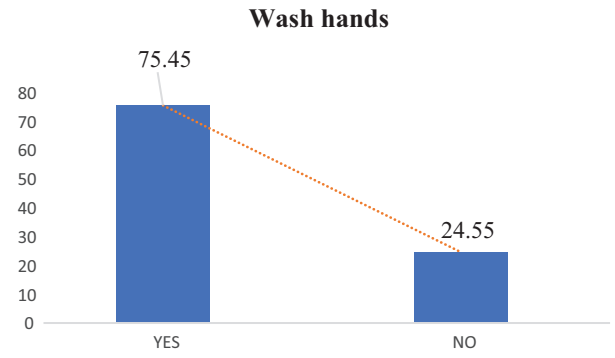

Figure 8. Washing hands.
Source: Authors' fieldwork (2023).

None of these odds had a significant p-value and hence making these associations not significant.

The likelihood of a student to take immediate action for a sick animal was associated with the level of study of the student. This association had an increased odds of 1.27. However, this was not significant. The religion, gender and college of a student were all associated with increased odds of 1.26, 1.15, 1.04, respectively of taking immediate actions for injured animals. These associations were also not significant. Again, there was less likelihood of the age of an individual to determine if they would take actions for an injured animal, however, this association was statistically significant with a *P*-value of .002.

The college a student is affiliated with was associated with students immediately washing their hands when they come into contact with animals even when they did not touch them. This association had increased odds of 1.22 as compared to the gender, age range and religion. This had a significant *P*-value of .048. The level of study also had an increased odds of 1.34 but was however not significant.

Discussion

The bulk of infectious diseases that lately impacted people are mostly transmitted by animals.[9,26] Since the majority of human diseases have animal origins and animal-to-human transmissions of infectious diseases have become more frequent throughout time,[27] it was prudent to conduct a survey to gage public awareness of zoonotic infections.

The focus on tertiary institution for this study is rightly so since the metropolitan sees an 89% literacy rate among the population according to its profile. Also, a large percentage of those not economically active within the metropolitan were students (52.0%). The study also revealed a greater proportion of respondents being females. This concurs with what was stated in the Accra Metropolitan profile as females were dominant.

There are not many studies on students in tertiary institutions' understanding of zoonotic illnesses.

It was established in the study that 54.5% of respondents had moderate knowledge of zoonoses while 24.8 exhibited high knowledge. In contrast, a study conducted in Western Cameroon among 218 herdsmen revealed the level of knowledge about

Table 7. Measures to control zoonotic infections.

CHARACTERISTIC (N = 440)	ODDS RATIO	P-VALUE	[95% CONFIDENCE INTERVAL
Wearing of gloves			
Gender	0.94	.795	0.61-1.45
Age Range	0.77	.088	0.57-1.04
College	1.07	.433	0.90-1.28
Religion	0.73	.372	0.37-1.46
Level of study	1.44	.015	1.07-1.92
Vaccinate animals			
Gender	1.08	.733	0.70-1.65
Age Range	0.98	.901	0.74-1.31
College	1.12	.189	0.95-1.33
Religion	1.22	.528	0.66-2.23
Level of study	1.32	.060	0.99-1.77
Immediate care of animals			
Gender	1.15	.564	0.72-1.82
Age Range	0.60	.002	0.43-0.83
College	1.04	.668	0.86-1.25
Religion	1.26	.492	0.65-2.44
Level of study	1.27	.125	0.94-1.73
Wash hands			
Gender	0.90	.675	0.57-1.45
Age Range	0.74	.068	0.53-1.02
College	1.22	.048	1.00-1.47
Religion	0.97	.930	0.48-1.97
Level of study	1.34	.062	0.99-1.82

Source: Authors' fieldwork (2023).

zoonotic diseases was low. According to their findings, 89.5% did not know the definition of zoonosis.[28]

Findings from this study showed that students (70%) demonstrated vast knowledge about the meaning of zoonosis. This agrees with a study conducted among veterinary students which observed 82% of freshmen knowing the meaning of the word zoonosis.[29] This was a significantly higher figure than that reported in a study in Puducherry, India where only 16.4% of respondents were aware that diseases in animals could be transmitted to people.[30] Also, studies regarding knowledge of zoonosis undertaken in a university in Nigeria contradict the findings of this study as students expressed poor knowledge of zoonosis. According to their findings, of the 246 respondents, only 47 (19.1%) had heard of the term zoonosis.[31]

Apart from 70% of respondents knowing that zoonosis is the term used to describe the spread of specific diseases from animals to people, another 53.18% were aware that zoonosis was frequently contracted by consuming contaminated food and water.

In this study, respondents recognized rabies (91.36%) and anthrax (57.05%) as zoonotic diseases. This research was done in Southwestern Ethiopia to investigate how the general public viewed major zoonotic diseases. Approximately 97.1% of them were aware that rabies is a zoonotic disease that is spread through contact with the saliva and bite of a rabid dog. Of those surveyed, 55.4% were aware of anthrax.[32] The high knowledge of rabies also agrees with studies where 98.2% school children in South Bhutan had heard about rabies and students demonstrated a good level of knowledge (59.7%).[33]

Although most respondents knew animals could transmit diseases to humans and majority could identify 3 or more diseases as zoonotic, the study however, saw a decline in

knowledge level when majority of the respondents disagreed with the notion that a healthy person could get a zoonotic infection. Moreso, malaria and COVID-19 were really not seen by respondents as diseases of zoonotic origin. These findings reflect with that of Table 5 which examines the transmission of zoonotic infections as 37.05% of respondents agreed to insect bites as a way of spread of zoonotic infections. These results show that majority of the respondents do not know about this information on zoonotic diseases. Insect bites have been reported as means of zoonotic disease spread.[22]

The study highlighted various ways of spread of zoonotic: the air, insect bites, touching surfaces of infected animals, consumption of contaminated food and close contact with infected animals.[9,22]

According to this study, the easiest means of transmission of zoonotic infections were identified by the majority of respondents as close contact with sick animals and eating contaminated food; insect bites, motor vehicle contact, and airborne contact were less popular choices. The modes of transmission that respondents chose were comparable to those seen in Northern Tanzania. They questioned participants in their study about the likelihood of contracting these diseases as well as their mode of transmission. Living with animals, eating untreated animal products (such as milk, meat, or eggs), and attending to parturition have all been identified as possible mechanisms of transmission.[34]

According to Murugan,[35] the most frequent methods of zoonotic transmission involve direct contact with the skin and mucous membranes through animal bites or scratches, as well as contact with infected animal feces, urine, saliva, other body fluids, and fomites. This may be explained by the fact that, majority of respondents (49.55%) agreed that only direct contact should be used to transmit zoonotic infections, as well as the fact that close contact with an infected animal (69.55%) was a common way for zoonotic infection to spread.

From the study, 41.82% of respondents confined their pets as a way of handling them whereas 58.18% of respondents have their pets freely moving. This increases the risk of zoonotic infections within such provinces as these pets come into contact with humans on a daily basis (53.64%).

Extensively targeting animal reservoirs in conjunction with public education and awareness campaigns are useful measures to control zoonoses.[36] This study did not observe such findings. However, the findings by[37] that emphasize use of vaccines as an effective way to stop and manage zoonotic illnesses in both domestic animals and people is consistent with findings from this study.

The majority of respondents thought vaccination was the most efficient method for containing zoonotic infections,[38] out of the 3 main prevention strategies mentioned in the study: frequent hand washing, vaccination, and the use of personal protective equipment (PPEs). On a whole, a greater proportion of respondents also consented to all 3 ways as effective.

Also, it was observed that respondents observed sanitary practices which serve as measures to control zoonotic infections. Approximately 65.83% send their pets for regular veterinary visits and vaccinate them accordingly. When caring for sick animals, 67.95% wore gloves and 79.45% washed their hands after coming into contact with animals. These practices as observed by majority of respondents contradict the study conducted amongst livestock workers in Nigeria where they found knowledge gaps with poor practices about zoonotic TB.[39]

Conclusion

The study revealed that majority of students demonstrated moderate knowledge and understanding on the transmission of zoonotic infections. Most students had not received any significant education on zoonotic infections and thus can be concluded that student knowledge of the subject was not adequate. With a moderate knowledge, students however, followed all the safety protocols during and after being in contact with animals. Although the basic strategies required for the control and elimination of the zoonotic diseases in such tertiary institutions are well known and practiced as per the study findings, zoonotic infections still persist and this can be attributed to low education on the subject, its means of spread as well as the underestimation of the importance and impact of these infections to health. This study therefore, recommends intensification of education on zoonotic infection transmission especially among tertiary students in Ghana.

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Authors' contribution

AJB and TYO conceptualized the overall study with its goals and aims. HOA retrieved the requisite data from databases. HOA and ABD played a supportive role in data consolidation. SAB wrote the study background and played a supportive role in data analysis. AAE played a role in designing the methodology. SKA played a vital role in designing the methodology for the study. BPN played a role in writing the discussion of the study. AJB, HOA AND TYO supported the writing, review, and editing of the manuscript. ABD, AAE, and SBA did the data analysis for the study. All authors contributed significantly to the critical revision and approved the final version before the onward submission.

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