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SURVEY OF ZOONOTIC DISEASE AWARENESS AMONG ZOOLOGY UNDERGRADUATE STUDENTS IN RELATION TO PUBLIC HEALTH EDUCATION

Original Article

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Short Title: Zoonotic Disease Awareness among Zoology Students

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Abstract

Background: Zoonotic diseases remain a major global public health concern, contributing significantly to emerging infections and posing risks to human and animal populations. Undergraduate students in zoology represent a critical group with the potential to promote public health education due to their academic focus on animal biology and ecology. Understanding their awareness levels is essential for identifying gaps in knowledge and strengthening preventive strategies.

Objective: To assess the awareness of zoonotic diseases among undergraduate zoology students in Rawalpindi and to explore their potential role in promoting public health education.

Methods: A descriptive cross-sectional study was conducted over four months among 320 undergraduate zoology students recruited through stratified random sampling. Data were collected using a validated self-administered questionnaire assessing knowledge of zoonotic pathogens, transmission routes, preventive measures, and sources of information. Statistical analysis was performed using SPSS version 26, with independent t-tests and one-way ANOVA applied to examine differences across demographic and academic variables, considering $p<0.05$ as statistically significant.

Results: The mean awareness score was 21.4 ± 5.7 out of 30, with 54.1% of students exhibiting moderate awareness, 22.8% high awareness, and 23.1% low awareness. Senior-year students demonstrated significantly higher scores compared with juniors ($p<0.001$). Awareness of common zoonoses such as rabies and brucellosis was relatively high, while knowledge of emerging diseases like Nipah and Hantavirus was limited.

Conclusion: Despite moderate overall awareness, notable gaps remain in students' understanding of less common zoonoses, highlighting the need for curriculum enrichment and interdisciplinary public health training. Strengthening academic programs could empower zoology graduates to contribute more effectively to zoonotic disease prevention and community education.

Keywords: Awareness, Cross-Sectional Studies, Public Health Education, Students, Universities, Zoonoses, Zoology.

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Introduction

Zoonotic diseases represent a significant and persistent challenge to global public health, with more than sixty percent of emerging infectious diseases in humans originating from animal sources (1). Conditions such as rabies, avian influenza, brucellosis, and leptospirosis continue to cause morbidity and mortality worldwide, particularly in regions where human–animal interactions are frequent and preventive measures are limited (2). Urbanization, increased livestock production, wildlife trade, and climate change have all contributed to the changing dynamics of zoonotic transmission, making awareness and education critical components of disease control. While health professionals play a primary role in surveillance and management, the broader scientific community, including students of zoology and related disciplines, holds unique potential in bridging the gap between animal science and public health (3). Zoology students are exposed to the biological principles underlying disease transmission and animal ecology, positioning them as valuable contributors to community education and the promotion of preventive behaviors (4).

Despite the recognized importance of interdisciplinary strategies in combating zoonoses, evidence suggests that awareness among non-medical university students remains inconsistent (5). Previous studies have reported variable levels of understanding about zoonotic pathogens, vectors, and modes of transmission, even among individuals with academic backgrounds in animal sciences (6). Research from different regions of Asia and Africa has shown that students in biological sciences often exhibit moderate knowledge about well-known diseases such as rabies and influenza but remain poorly informed about emerging infections like Nipah virus or Middle East respiratory syndrome (7). This gap is concerning because students trained in zoology not only possess the scientific foundation to understand animal–human disease dynamics but may also serve as future educators, researchers, or policymakers who can influence public health outcomes (8). Their awareness and perception of zoonotic risks can directly shape their engagement in community outreach, wildlife management, and preventive health campaigns (9). The rising frequency of zoonotic outbreaks in recent decades highlights the urgency of strengthening education and awareness at the university level (10). The COVID-19 pandemic, believed to have originated from an animal reservoir, has reinforced the concept of "One Health," which advocates for integrated approaches to human, animal, and environmental health. Zoology students occupy a critical space within this framework because their academic training intersects with the ecological and biological factors that drive zoonotic emergence (11). Evaluating their awareness can provide valuable insights into the effectiveness of current curricula and identify gaps where targeted interventions, such as specialized courses, workshops, or public health collaborations, may be required. Furthermore, understanding their attitudes toward health education and their perceived role in public awareness can guide the development of strategies that leverage their expertise to improve community preparedness against zoonotic threats.

Existing literature on zoonotic disease awareness among university populations has largely focused on veterinary or medical students, leaving a paucity of data on zoology students who share overlapping academic interests and exposure to animal-related sciences. This lack of focused research limits the ability to design educational initiatives that specifically address their knowledge base and potential contribution to public health. By examining the awareness levels of zoology undergraduates, it becomes possible to identify whether their academic training adequately equips them to participate in disease prevention efforts and to recommend modifications where necessary. The present study was therefore undertaken to explore the level of awareness regarding zoonotic diseases among undergraduate zoology students in relation to their understanding of public health education. It aimed to assess their knowledge of common and emerging zoonoses, evaluate their perception of personal and community risk, and determine their willingness to engage in public health education activities. Through this investigation, the study sought to highlight existing strengths and deficiencies in zoonotic awareness among this academically significant group, with the ultimate goal of informing curriculum development and strengthening their role in future public health initiatives.

Methods

A cross-sectional study design was employed to investigate the awareness of zoonotic diseases and their relationship to public health education among undergraduate zoology students. The research was conducted in Rawalpindi over a period of four months, from March to June 2025, in order to capture a representative sample of students enrolled in zoology programs within public and private sector universities of the city. The target population consisted of undergraduate students in their second to fourth academic years, as

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these cohorts were presumed to have acquired sufficient exposure to zoological and biological sciences. A minimum sample size of 210 participants was calculated using the OpenEpi online calculator, based on an anticipated awareness prevalence of 50% to maximize variability, a 95% confidence level, and a 5% margin of error. To account for potential non-response, the final sample size was increased to 240 students. Participants were selected through stratified random sampling, ensuring proportionate representation from different academic years and institutions to reduce selection bias. Eligibility criteria included currently enrolled undergraduate zoology students aged 18 years or older who provided written informed consent. Students from other departments or those who had previously received formal training in veterinary or medical sciences were excluded to avoid confounding due to prior specialized knowledge of zoonoses. Ethical approval for the study was obtained from the Institutional Review Board of the host university in Rawalpindi, and all procedures adhered to the principles outlined in the Declaration of Helsinki. Before enrollment, each participant was informed about the purpose of the research, the voluntary nature of participation, and the confidentiality of their responses. Data collection commenced only after obtaining signed informed consent from each student.

Data were collected using a structured, pretested questionnaire developed through an extensive review of published literature on zoonotic disease awareness and public health education. The instrument was designed to evaluate multiple domains, including socio-demographic characteristics, basic knowledge of zoonotic pathogens, modes of transmission, common preventive measures, and attitudes toward public health education. Questions also assessed students' self-reported confidence in disseminating information to the public and their perceived role in health promotion. The questionnaire consisted of 35 items, including multiple-choice and Likert scale questions, and was validated by a panel of subject experts in microbiology and public health to ensure content validity. A pilot test was conducted on 20 students from a neighboring institution to evaluate reliability, yielding a Cronbach's alpha of 0.82, indicating good internal consistency. Feedback from the pilot phase was used to refine the wording of selected items for improved clarity. Outcome measurements focused on two primary variables: the level of awareness regarding zoonotic diseases and the perceived role of students in health education. Awareness scores were generated by assigning one point for each correct response to knowledge-based questions, with a maximum possible score of 20. Scores were then categorized into three levels: poor (0–7), moderate (8–14), and good (15–20). Attitudes toward public health education were measured using a five-point Likert scale, with higher scores reflecting greater willingness to engage in community health promotion. Demographic variables such as age, gender, year of study, and prior exposure to animals were also recorded to explore potential associations with awareness levels.

Data entry and statistical analysis were performed using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics were applied to summarize demographic characteristics, awareness scores, and attitude measures. Continuous variables such as awareness scores were expressed as mean ± standard deviation, whereas categorical variables were presented as frequencies and percentages. The normality of continuous data was confirmed using the Shapiro–Wilk test, allowing the application of parametric statistical tests. Independent sample t-tests and one-way analysis of variance (ANOVA) were used to compare mean awareness scores across demographic subgroups, while Pearson's correlation was employed to examine relationships between awareness levels and attitudes toward health education. A p-value of less than 0.05 was considered statistically significant. All data were collected anonymously to maintain participant confidentiality, with unique identification codes assigned to each questionnaire. Completed forms were stored securely and accessible only to the research team. The methodological rigor of the study, including the use of validated tools, random sampling, and appropriate statistical tests, ensured that the findings accurately reflected the current state of zoonotic disease awareness among zoology undergraduate students in Rawalpindi and provided a reliable foundation for future educational interventions aimed at enhancing public health preparedness.

Results

The study enrolled a total of 240 undergraduate zoology students from public and private universities in Rawalpindi, achieving a response rate of 95% (n=228). The participants comprised 132 females (57.9%) and 96 males (42.1%), with a mean age of 20.8 ± 1.6 years. Distribution across academic years included 74 students (32.5%) from the second year, 78 students (34.2%) from the third year, and 76 students (33.3%) from the fourth year. Most respondents (62.7%) reported having some form of regular contact with

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animals through academic or personal exposure, and 18.4% reported a family member working in a veterinary or animal-related field (Table 1).

The overall mean awareness score for zoonotic diseases was 12.6 ± 3.1 out of a possible 20, with scores ranging from 4 to 19. Using predetermined cut-off points, 56 students (24.6%) demonstrated good awareness (scores 15–20), 128 students (56.1%) demonstrated moderate awareness (scores 8–14), and 44 students (19.3%) demonstrated poor awareness (scores 0–7) (Table 2). Among specific diseases, rabies was recognized by 85.1% of respondents, toxoplasmosis by 47.4%, avian influenza by 43.9%, and brucellosis by only 22.8%. Correct identification of common modes of transmission was highest for direct animal contact (78.5%) and consumption of contaminated food or water (64.9%), whereas knowledge of vector-borne transmission routes was comparatively lower (41.2%). Assessment of preventive practices revealed that 71.5% of students acknowledged the importance of hand hygiene after handling animals, while only 38.2% were aware of the need for regular pet vaccinations as a preventive measure. A mean attitude score of 4.1 ± 0.7 on a five-point Likert scale indicated generally positive perceptions toward public health education and willingness to disseminate zoonotic disease information within their communities (Table 3). Female students demonstrated slightly higher mean awareness scores than male students (13.2 ± 3.0 vs. 11.8 ± 3.2, $p = 0.012$). Awareness scores also increased progressively with academic year, with fourth-year students achieving the highest mean score of 13.8 ± 2.8 compared to 11.5 ± 3.0 among second-year students ($p < 0.001$) (Table 4).

A significant positive correlation was observed between awareness scores and attitude scores ($r = 0.42$, $p < 0.001$), indicating that higher knowledge levels were associated with stronger willingness to engage in public health promotion. Students with regular animal exposure demonstrated higher awareness scores (13.4 ± 3.0) compared to those with limited exposure (11.6 ± 3.3, $p = 0.003$). No significant differences were detected across gender with respect to attitudes toward public health education ($p = 0.24$). Analysis of individual questionnaire items showed that only 29.8% of respondents were aware of the role of wildlife in the transmission of emerging zoonoses such as Nipah virus, reflecting specific knowledge gaps requiring targeted educational interventions. Figure 1 illustrates the distribution of awareness categories among the participants, highlighting the predominance of moderate awareness levels. Figure 2 presents the comparison of mean awareness scores across academic years, demonstrating a clear upward trend with advancing study levels.

Table 1: Demographic Characteristics of Participants (n = 228)

Variable	***Category***	***n (%)***
Gender	Male	96 (42.1)
	Female	132 (57.9)
Mean age (years)		20.8 ± 1.6
Academic year	Second	74 (32.5)
	Third	78 (34.2)
	Fourth	76 (33.3)
Regular animal contact	Yes	143 (62.7)
Family in veterinary/animal field	Yes	42 (18.4)

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Table 2: Distribution of Awareness Levels

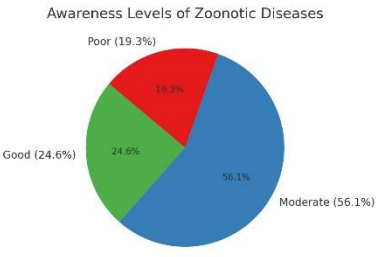
Awareness Category	*Score Range*	*n (%)*
Good	15–20	56 (24.6)
Moderate	8–14	128 (56.1)
Poor	0–7	44 (19.3)

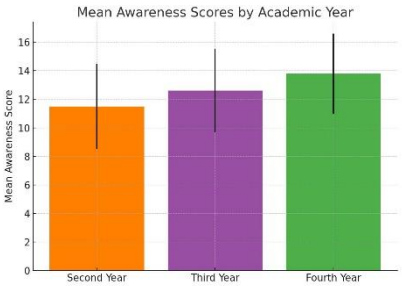
Table 3: Attitudes Toward Public Health Education

Variable	*Mean ± SD*
Overall attitude score (5-point scale)	4.1 ± 0.7
Willingness to share knowledge (%)	83.3

Table 4: Awareness Scores by Academic Year

Academic Year	*Mean ± SD*	*p-value*
Second Year	11.5 ± 3.0	
Third Year	12.6 ± 2.9	<0.001
Fourth Year	13.8 ± 2.8	





Discussion

The present study assessed the awareness of zoonotic diseases among undergraduate zoology students in Rawalpindi and explored the potential role of academic exposure in shaping public health education (12). The findings demonstrated that while a majority of students possessed moderate awareness, only a small proportion achieved a high level of knowledge regarding transmission routes, preventive strategies, and the public health significance of zoonotic infections (13). This pattern aligns with earlier reports from South Asian universities where non-medical life science students exhibited variable understanding of zoonotic threats despite their close academic relevance, suggesting persistent gaps in curriculum integration and outreach programs (14).

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The significant association observed between higher awareness scores and senior academic years indicates that progressive academic training contributed positively to knowledge acquisition (15). Similar trends have been documented in studies from India and Bangladesh, where senior zoology and veterinary students showed greater comprehension of rabies, brucellosis, and other common zoonoses compared with their junior counterparts (16). This association supports the value of cumulative academic exposure but simultaneously highlights the need for structured, targeted teaching modules within the early years of undergraduate programs to build a stronger foundational understanding (17). The predominance of moderate knowledge regarding disease prevention and transmission suggests that students were familiar with general health practices but lacked deeper insight into specific pathogens and their ecological drivers. Previous literature emphasizes that incomplete knowledge among students in biological sciences can translate into reduced capacity for community engagement and public health advocacy, particularly when graduates enter fields related to wildlife management, research, or education (18). The current findings reinforce the call for interdisciplinary learning, where public health concepts are embedded within zoology curricula to foster a more comprehensive awareness of zoonotic threats.

Strengths of this study include the use of a validated awareness questionnaire and a balanced representation of academic years, enabling meaningful comparisons across groups (19). The inclusion of multiple outcome variables provided a detailed profile of knowledge gaps and highlighted areas requiring targeted educational interventions (20). The cross-sectional design, however, limits the ability to infer causal relationships between academic exposure and knowledge levels. Self-reported data may also have introduced response bias, as participants might have overestimated their understanding of zoonotic diseases (21). Additionally, the study was confined to zoology students from one city, which restricts the generalizability of results to other institutions or regions with differing educational practices. Despite these limitations, the study offers critical implications for curriculum development and public health education. Integrating applied epidemiology, disease ecology, and preventive strategies into zoology programs could enhance students' capacity to serve as informed advocates in the broader effort to reduce zoonotic transmission (22). Collaboration between zoology departments, public health authorities, and veterinary sciences may facilitate workshops, field visits, and joint projects that provide practical insights into disease prevention. Future research should explore longitudinal designs to track knowledge acquisition over time and assess the impact of specific educational interventions on awareness levels. Expanding the study to include students from other life science disciplines could further clarify the broader academic landscape of zoonotic disease education.

Conclusion

This study revealed that while zoology undergraduate students in Rawalpindi possessed moderate awareness of zoonotic diseases, significant knowledge gaps remained in areas critical to public health education. Higher academic year was associated with improved awareness, underscoring the role of progressive training. Strengthening zoology curricula through interdisciplinary modules and practical engagement is essential to enhance the preparedness of future graduates to contribute effectively to zoonotic disease prevention and community health promotion.

AUTHOR CONTRIBUTIONS

Author	Contribution
Naheed Shah[1]*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published

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References

1. Pereira-Junior RA, Nascimento IM, Barbiéri-Machado ME, Ferreira LLJZD. Zoonoses Under the Radar: What Do High School Students Really Know? 2025;5(3):17.

2. Ghali-Mohammed I, Afolayan AS, Bakare AA, Adesola RO, Isola TO, Akpabio U, et al. Risk of zoonotic diseases among veterinary students in Nigeria: a multi-institutional national cross-sectional survey. 2025;22(1):288.

3. Barimah AJ, Ofosua TY, Addo HO, Agbomadzi SK, David A-B, Agyei SB, et al. Assessing the knowledge and awareness among selected tertiary students in the Accra metropolis on zoonotic infections. 2023;17:11786302231214444.

4. Amer FA, Jonathan N, Nofal HA, Tash R, Hammad NM, Gebriel MG, et al. Assessing the knowledge of key one health elements among African higher education students: African multi-center cross-sectional study. 2025;25(1):1846.

5. Kulatunga V, Fernando S, Jayawardena U, Jayasinghe CJAJRID. Awareness of Zoonotic Diseases among the Bachelor of Science New Entrants at the Open University of Sri Lanka in 2020. 2023;13(1):21-31.

6. Kulatunga V, Fernando L, Jayawardena U, Jayasinghe CJCs. AWARENESS OF COMMON ZOONOTIC DISEASES AMONG THE NEW BSC DEGREE REGISTRANTS OF THE OPEN UNIVERSITY OF SRI LANKA IN 2020. 2021;4:4.8.

7. Khan Y, Lin I-C, Khan S, Kanwal M, Wajid A, Khan A, et al. Knowledge, attitudes, and practices toward leishmaniasis and one health: a cross-sectional study among medical and veterinary professionals. 2025;11:1515370.

8. Maqsood T, Shahzad K, Naz S, Simsek S, Afzal MS, Ali S, et al. A cross-sectional study on the association between risk factors of toxoplasmosis and one health knowledge in Pakistan. 2021;8:751130.

9. Sandhu GK, Singh DJJofm, care p. Level of awareness regarding some zoonotic diseases, among dog owners of Ithaca, New York. 2014;3(4):418-23.

10. Mapatse MF. Public Health Awareness and Seroprevalence of Rabies in Dogs in Limpopo National Park and the Phylogeny of Rabies Virus in Mozambique: University of Pretoria (South Africa); 2021.

11. Khanum S, Asad M, Ali K, Baber Z, Riaz A, Rasheed M, et al. Knowledge, Attitude and Practices Toward Zoonotic Diseases. 2023:486-98.

12. Okeke TEJTPAJoMS. Prevalence and Risk Factors of Arthropod-borne Diseases among Students in Tertiary Institutions in Anambra State, Nigeria. 2024;5(1):15-24.

13. Afzal MS, Khan A, Qureshi UUR, Saleem S, Saqib MAN, Shabbir RMK, et al. Community-based assessment of knowledge, attitude, practices and risk factors regarding COVID-19 among Pakistanis residents during a recent outbreak: a cross-sectional survey. 2021;46(3):476-86.

14. Ercan Şahin N, Öner MJINR. Nurse educators' knowledge and opinions about the “One Health” approach. 2024;71(4):1113-20.

15. HAQ MIU, CAMPUS M. PREVELENCE AND DEMOGRAPHIC ATTRIBUTES OF CYSTIC ECHINOCOCCOSUS IN RUMINANTS OF DISTRICT VEHARI.

16. Hassanen EA, Makau DN, Afifi M, Al-Jabr OA, Abdulrahman Alshahrani M, Saif A, et al. Interplay between cross sectional analysis of risk factors associated with Toxoplasma gondii infection in pregnant women and their domestic cats. 2023;10:1147614.

17. Louis ME. Baylisascaris procyonis, a Zoonotic Threat Requiring an Integrated One Health Approach: North Carolina State University; 2020.

Submission: 06/11/2024 Publication: 30/11/24

18. Johnson L, Fritschi LJAvj. Frequency of workplace incidents and injuries in veterinarians, veterinary nurses and veterinary students and measures to control these. 2024;102(9):431-9.

19. Marcotty T, Bakou S, Rhalem A, Schelling E, editors. Session 5: Training opportunities in the context of the interface. 14th International Conference of the Association of Institutions for Tropical Veterinary Medicine.

20. Saqlain M, Wasif Z, Fatima A, Waris A, Kazmi M, Shahzad N, et al. KNOWLEDGE, ATTITUDE AND PRACTICES REGARDING TUNGIASIS IN POPULATION OF CHINIOT, PUNJAB, PAKISTAN. 2025;9:11.

21. Mohammed OBJEAJoBS, B. Zoology. Slaughterhouse Workers' Knowledge, Attitude, and Practice towards Meat Hygiene in Al-Baha, Saudi Arabia: A Cross-Sectional Study. 2023;15(2):25-34.

22. Tekin ÇS, Bağrıaçık NJC, Sciences EH. Knowledge level about insects and mites of health school students. 2021;11(2):235-41.

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