Original Research Article

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Knowledge, Attitudes and Practices on One Health among Veterinary Undergraduate Students in Kerala

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Abstract

Using a structured questionnaire, the study assessed veterinary students' knowledge, attitudes and practices regarding One Health. Overall, the students demonstrated satisfactory awareness, particularly regarding antimicrobial resistance and zoonotic diseases, though deficiencies were noted in identifying specific zoonotic pathogens. Students showed strong interest in learning about One Health, recognising the importance of government support for related initiatives. While students showed adequate antibiotic stewardship, there was room for improvement in personal hygiene and vaccination practices. Statistical analyses revealed a significant association between the students' year of study and knowledge scores, emphasising the importance of educational progression. Additionally, gender differences were observed in practice scores, with females exhibiting better One Health-related practices. The study highlighted the necessity for enhanced education and awareness initiatives to cultivate One Health understanding among future veterinary professionals. Promoting One Health-related activities and societies within veterinary colleges could effectively prepare graduates to contribute to the profession and tackle complex public health challenges.

Keywords: One Health, BVSc & AH Student, KVASU, Kerala

Introduction:

One Health (OH) is a multisectoral approach encompassing the human, animal and environmental health sectors to address significant public health challenges (WHO, 2017). Currently, global health is facing several public health threats, such as emerging and re-emerging zoonoses, antimicrobial resistance (AMR), food-borne infections and environmental hazards, which demand attention from an OH perspective (Garcia et al., 2020; Buttke et al., 2011). Studies show that 61% of the infectious diseases of humans are zoonotic in origin, highlighting the role of animal-human interactions in OH (Taylor et al., 2001). Antimicrobial resistance has become the biggest threat to human and animal health, evidenced by increased deaths due to antimicrobialresistant pathogens (Murray et al., 2022). The risk posed by food-borne pathogens is a significant concern, which intensifies with the evolution of drug resistance in these pathogens (Newell et al., 2010). These issues have attracted global attention and the OH approach's role in addressing them is undoubtedly essential.

Veterinarians have played an essential role in the materialization of OH. They constitute a vibrant group of

professionals with expertise in diverse disciplines, including public health (de Melo et al., 2020). Veterinary Public Health (VPH) is a discipline born out of the need to address the challenges arising at the human-animal interface. Veterinary Public Health emphasizes topics relevant to public health, such as emerging zoonoses, AMR, environmental contamination, public health policy, disaster risk reduction and sustainable ecosystem conservation (Ortega et al., 2007). Therefore, it is essential to impart knowledge of VPH to veterinary students, who constitute the future OH workforce. The undergraduate veterinary degree in India is a Bachelor of Veterinary Science and Animal Husbandry (BVSc & AH). It is a five-and-a-half-year professional course incorporating a syllabus that includes 18 subjects about veterinary and animal sciences. Veterinary Public Health has been incorporated into this syllabus as a (3+1) credit course in the third professional year according to Minimum Standards of Veterinary Education, 2016 (VCI, 2016).

Kerala has grabbed national attention following the outbreak of Nipah in 2018 and the first positive case of COVID-19 in India in 2020 (Yadav et al., 2022; Jaya et al., 2022). It was one of the first states in India to release

a state action plan on AMR (The Hindu, 2022). Therefore, OH has a leading role in addressing the public health challenges in Kerala. Kerala Veterinary and Animal Sciences University is the only veterinary university in Kerala with two constituent veterinary colleges, one at Mannuthy and another at Pookode (KVASU, 2018). Using a cross-sectional survey of knowledge, analysis and practices related to OH, our study aimed to assess the awareness of OH among undergraduate veterinary students of Kerala. This will help them become more knowledgeable about OH and be better prepared to contribute to the OH profession.

Material and Methods:

The survey was conducted among the BVSc & AH students of Kerala Veterinary and Animal Sciences University. A structured questionnaire was created using Google Forms (Google LLC, Mountain View, CA, USA). The form was divided into two sections: (1) asking respondents for their agreement and (2) asking KAP (Knowledge, Aptitude and Practice) questions. There were thirty-three questions: seven focused on knowledge, seven on demographics, nine on attitudes and ten on practices relevant to OH. The questionnaire link was distributed to students using social media sites. Participation in the survey was voluntary. A scoring system was used and responses were given based on correct or appropriate responses. The normality of data was checked using the Shapiro test. Non-parametric tests were carried out to discern the association between the demographic characteristics of the students and their KAP scores. The Mann-Whitney U test / and Kruskal-Wallis H test were used to determine the statistical significance. The test's null hypothesis posited no difference in the mean ranks among the groups. A significant difference was inferred at a p-value ≤ 0.05 . Data was analyzed using R 4. 3. 3 (R core team, 2024).

Results and Discussion:

Demographic Details

A total of 261 students participated in the survey, of which majority 72% (n=188) were females. Most respondents belonged to the 21-25 age group (76.6%). Most respondents were in their first year of study (34.1%). Most of the students belonged to the College of Veterinary and Animal Sciences Pookode (65.5%). Demographic details have been summarised in Figure 1.

Students' Perception of One Health Knowledge

Veterinary students should be well-versed in OH as they will make up most of the state's workforce after graduation (Pillai and Reji, 2023). Thus, we attempted to assess the knowledge of veterinary students on OH. A total of 71.3% (n=186) and 79.3% (n=207) of the

students correctly identified the dates of commemoration of OH day and rabies day, respectively. Among the participants, 68.3% (n=110) knew that 60% of human infections were zoonotic (Taylor et al., 2001). Similarly, 97.3% (n=254) of the students understood that zoonoses are diseases that do not pose health risks to plants. The students were found to have an excellent basic understanding of AMR and zoonoses. Most of the students (96.9%) knew indiscriminate antibiotic use would lead to treatment failures. The questionnaire attempted to understand students' knowledge of zoonotic diseases. Among the participants, 45.2% identified Salmonellosis as a food-borne zoonotic disease. Diseases like Leptospirosis, Brucellosis, Nipah and Avian Influenza were identified as zoonotic by 70.1, 65.1, 88.1 and 59% of students (figure 2). In a survey conducted in the veterinary colleges in Nepal, 83.2%, 83.5% and 88.5% of the students identified Salmonellosis, Leptospirosis and Brucellosis as zoonotic diseases (Subedi et al., 2022). Poor knowledge of diseases of zoonotic importance is a concern in the backdrop of increasing cases of zoonotic infections (Sanyaolu et al., 2016; Bardhan et al., 2023). African swine fever, being non-zoonotic, was considered zoonotic by 36% of the students. More than half (56.7%) of the students had pets at home and most (87%) were aware of the zoonotic potential of ticks on animals. Only 13% of students were not aware of tick-borne zoonoses. As tick-borne zoonoses have gained much attention in the OH approach, awareness of this aspect is imperative and our respondents seemed to have satisfactory awareness of it (Springer et al., 2021).

Student's perception on One Health Attitudes

The attitude of veterinary students towards OH is crucial as it is instrumental in efficiently adopting the concept of OH. In all, 55.2% of students said they were very interested in learning about One Health, while 30.7% said they were moderately interested. This suggested that veterinary students should be encouraged to become more informed about OH and contribute substantially. A study on veterinary and medical students in Nigeria revealed a similar high interest in learning about OH among veterinary students (Terrigbade and Babalobi, 2020). Most of the students (99.6%) rightly believed that wildlife is a part of OH. Since wildlife is an essential component of OH, it deserves special consideration when spillovers and newly emerging diseases from wildlife have severely threatened population health (Kruse et al., 2004; Cunningham et al., 2017). A whopping 98.9% of students concurred that the government should support OH more effectively and that distinct departments should be coordinated to address OH-related issues. As the role of policymakers in OH is well endorsed, this kind of attitude among students seemed promising. The students were made to prioritize the role of OH in addressing challenges such as food safety and security, climate change and global warming, zoonotic disease emergence, AMR, biodiversity and species conservation and environmental pollution. A total of 83.5 percent of the students ranked the importance of OH's role in addressing food safety and security issues as 'high', while 15.7 percent ranked it as 'medium'. While 75.1% said that OH would play a 'high' role in tackling AMR, 88.9% perceived that OH has a high priority when dealing with the rise of zoonotic diseases. This shows that a more profound comprehension of zoonoses and AMR mitigation related to the OH approach is necessary. Merely 58.2% of the students thought OH had a significant role in reducing global warming and climate change. The OH has a "high" priority when tackling the issues of biodiversity, species conservation and environmental pollution, according to 67.8% and 65.1% of respondents, respectively. The OH has a significant role in these areas, which is evident from the basic idea of OH being inclusive of humans, animals and the environment (WHO, 2017). Climate change and disturbances in natural habitats and biodiversity affect public health issues like zoonotic disease emergence and human-wildlife conflicts (Zinsstag et al., 2018; Mekonen, 2020).

Similarly, environmental pollution that deteriorates environmental health considerably impacts public health (Heederik, 2019). Based on the observations above, it is recommended that veterinary students' understanding of OH as a remedy for problems such as environmental pollution and biodiversity protection should be improved. These findings demonstrated how well-versed veterinary students were in using OH as a tool to address significant public health concerns.

Student's Perception of One Health Practices

The study also analyzed how veterinary students' understanding of OH translates into their practices. Among the respondents, 67% of the students do not take antibiotics without a doctor's prescription. Only 5% of the students were found to take antibiotics without a prescription. In the wake of the threat posed by AMR that resulted from the injudicious use of antibiotics, awareness of the use of antibiotics is of more importance than ever (Llor and Bjerrum, 2014; Sobierajski et al., 2023). Our study revealed that the veterinary students in Kerala have an appreciable understanding of the consequences of indiscriminate antibiotic use. A survey among veterinary students in Poland regarding OH awareness and AMR highlighted that awareness of OH and AMR are inextricably linked (Sobierajski et al., 2023). Among those who had pets at home, 56.5% (n=100) always

washed their hands after handling them, while 40.1% (n=71) of the students did it less often. This suggested increased awareness of personal hygiene and its role in human health and disease prevention (Singh et al., 2023). Only 70.6% of the students had vaccinated their pets against Rabies. However, only 65.1% (n=170) of the students were vaccinated against rabies. Rabies has gained attention in recent years for its importance in public health in the purview of OH (Amoako et al., 2021; Swedberg et al., 2022). Veterinary students get to handle animals during their clinical practice; thus, their rabies vaccination is imperative. Therefore, it is pertinent to uphold the importance of immunization among veterinary students. Good awareness was observed among the students regarding food consumption practices. 89.7% and 95.8% of the students were not used to consuming raw milk and raw/half-cooked meat, respectively. The majority of the students (80.8%) used to check the expiry dates of food items whenever they bought a packaged food item. Most of the students (86.6%) preferred wellcooked eggs to consume, while 13.4% preferred halfcooked eggs. It was found that 44.4% of the students seldom drank unboiled/ unfiltered water, while 14.6% used to do that often. Consumption of raw foods, especially those of animal origin, has exacerbated the incidences of foodborne diseases. Such infections can be prevented by adequately cooking raw food and boiling water (Onyeaka et al., 2021; Callejoón et al., 2015). From an OH point of view, food safety is of great significance. Thus, awareness of food hygiene practices must be enhanced among the students (Garcia et al., 2020). Our study demonstrated that veterinary students of Kerala have appreciable food hygiene practices, substantiating their contribution to OH.

Knowledge, Attitude and Practices (KAP) Analysis

Statistical significance in KAP scores was analyzed among first, second, third and fourth years and internship and statistically, the results were compared using the Kruskal-Wallis H test. The knowledge of respondents was assessed based on seven questions. The overall knowledge score was 1.15 ± 1.0 . The knowledge scores of the students in the fourth year were significantly higher (p = 0.001). The attitude of students about OH was assessed based on 9 questions. The overall attitude score was 1.61 ± 0.6 . Attitude scores increased as the students progressed through the years, the highest being in internship students, but they differed insignificantly (p = 0.07). The practices of respondents regarding OH were analyzed based on 10 questions. The overall practice score was 1.50 ± 0.6 . Practice scores increased as the year of study progressed, the highest being among internship students, but they were found to differ insignificantly among different years of study (p = 0.83). The increase in

awareness of progress in academic years was consistent with previous studies (Subedi et al., 2022; Sobierajski et al., 2023). The lack of significant differences in practices and attitudes regarding OH among the students of different years despite the increase in knowledge of OH highlights the necessity of more practical approaches to bring OH to the daily life of veterinary students in Kerala.

Mann-Whitney U test was carried out to compare the KAP scores of males and females. The mean knowledge score was higher in males (1.16) than in females (1.14) but not significant (p = 0.87). In attitudes, females fetched a higher score of (1.62) than males (1.57) but did not differ significantly (p = 0.10). Regarding practice scores, females were found to have better practices about OH, with a mean score of 1.52 compared to the mean score of 1.43 for males. A significant difference was observed regarding practices (p = 0.002). These results were inconsistent with the survey conducted in Nepal, where males and females were found to have similar levels of awareness (Subedi et al., 2022).

Conclusion:

The current study examined the veterinary students' awareness of OH-related elements in Kerala using independent assessments of knowledge, attitudes and practices linked to OH. It was observed that the students' understanding of numerous OH questionnaire-based KAP indicators was satisfactory. The lack of knowledge in some key areas was identified and the need for better awareness has been highlighted. The suggested recommendation will help the veterinary students become more knowledgeable about OH and be better prepared to contribute to the OH profession. To deal with it, OHrelated activities and societies must be promoted in veterinary colleges. In summary, in a scenario that demands versatile stakeholders to uphold OH, a better understanding of OH among future veterinary professionals is imperative, which can be brought about by better education and awareness.

Conflict of interest:

Not applicable.

Authors' contribution:

AK, MEM, PN,VPSP, SAR, AR and DSL designed the study. **VPSP, SAR, AR and DSL** conducted the study and wrote the manuscript. **AK, PN** and **MEM,** guided the research and reviewed the manuscript.

Ethical approval:

Not applicable.

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Table 1: Knowledge of OH among veterinary undergraduate students				
Knowledge parameters	Correct Answer	Percentage (%)		
When is the world one health day?	186	71.3		
Approximately% infectious diseases that known to affect humans are of	110	68 3		
animal origin and are called Zoonotic diseases.	110	00.5		
What do you think happens, by increased use of antibiotics?	253	96.9		
Do you know about some ticks on your pets that can transmit diseases to you?	227	87.0		
When is the World Rabies Day?	207	79.3		
Zoonotic diseases may be a health risk to all of the following except	254	97.3		

Table 2: Attitude towards OH among veterinary undergraduate students			
Attitude parameters	Count	Percentage (%)	
Do you think Wildlife is a part of One Health?			
Yes	260	99.6	
No	1	0.4	
How interested are you in learning more about the One Health concept?			
Very interested	144	55.2	
Moderately interested	80	30.7	
Somewhat interested	32	12.3	
Not at all interested	5	1.9	
One Health concept should be promoted by the government and we			
need to have a separate One Health Department?			
Agree	258	98.9	
Disagree	3	1.1	
Prioritize the health challenges based on how One Health will have a			
leading role to play Food safety and security			
High	218	83.5	
Medium	41	15.7	
Low	2	0.8	
Climate change and Global warming			
High	152	58.2	
Medium	92	35.2	
Low	17	6.5	
Zoonotic disease emergence			
High	232	88.9	
Medium	22	8.4	
Low	7	1.7	
Antimicrobial resistance			
High	196	75.1	
Medium	59	22.6	
Low	6	2.3	
Biodiversity and species conservation			
High	177	67.8	
Medium	75	28.7	
Low	9	3.4	
Environment pollution			

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High	170	65.1
Medium	65	24.9
Low	26	10

Table 3: OH practices among the veterinary undergraduate students				
Practice Parameters	Count	Percentage		
If you have pets, do you wash your hands immediately after handling them?				
Always	100	56.5		
Sometimes	71	40.1		
Never	4	2.3		
Are you vaccinated against Rabies?				
Yes	170	65.1		
No	91	34.9		
Have you vaccinated your pet against Rabies?				
Yes	125	70.6		
No	52	29.4		
Do you drink raw milk at home?				
Yes	14	5.4		
No	234	89.7		
Sometimes	13	4.9		
Which of the following do you prefer?				
Raw egg	0	0.0		
Half cooked egg	35	13.4		
Well cooked egg	226	86.6		
Do you eat raw/half cooked meat at home?				
Often	0	0.0		
Sometimes	11	4.2		
Never	250	95.8		
Do you check the expiry date of Packaged food items when bought?				
Always	211	80.8		
Sometimes	44	16.9		
Never	6	2.3		
Do you drink un-boiled/unfiltered water?				
Often	38	14.6		
Less often	107	41.0		
Never	116	44.4		
Do you use antibiotics without doctor's prescription?				
Often	13	5.0		
Less often	73	28.0		
No	175	67.0		

Table 4: Demographic characteristics and associated KAP scores						
Variables	Mean Knowledge Score	P- Value	Mean Attitude Score	P-Value	Mean Practice Score	P-Value
			Year of Study			
First year	1.01		1.59		1.49	
Second year	1.08		1.61		1.50	
Third year	1.18	0.001	1.56	0.071	1.48	0.831
Fourth year	1.31		1.59		1.51	
Internship	1.28		1.71		1.54	
			Gender			
Male	1.16	0.874	1.57	0.103	1.43	0.002
Female	1.14	-	1.62		1.52	

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Figure 1: Demographic details of respondents. a) Year of study; b) Age; c) Gender; d) Institution



Figure 2: Knowledge of veterinary undergraduate students on zoonoses

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