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A comprehensive study on occupational exposure to biological hazards, knowledge and infection control practices of Kerala veterinarians regarding zoonotic disease risk

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Abstract

By the nature of their profession, veterinarians are exposed to different occupational health hazards. These hazards can be categorized into physical, chemical, biological, psychological, and ergonomic. To assess these challenges, a comprehensive structured questionnaire was designed based on three group discussions with veterinarians, and its relevancy was evaluated by subject experts. The finalized questionnaire was circulated among the veterinarians working in the Animal Husbandry department of Kerala, using google form. A total of 399 veterinarians from different regions of Kerala participated in the study by responding to the survey questionnaire. The study revealed that veterinarians were most commonly exposure to bacterial, viral, fungal, parasitic hazards such as tetanus (74.18 per cent), dengue fever (41.60 per cent), infection with dermatophytes (75.44 per cent), tapeworm infection (62.91 per cent), and mosquito bites (95.99 per cent) were the most common among arthropod bites. Additionally, 40.85 per cent of veterinarians were received anti-rabies pre-exposure booster vaccination once in five years and 40.60 per cent anti-rabies post-exposure vaccination once in three to five years. Majority of the respondents (96.74 per cent) had a high level of knowledge regarding zoonotic diseases. And 63.91 per cent of respondents followed high level of infection control practices (ICPs). Among these, 96.74 percent stated that they consistently wore face masks and gloves to prevent biological hazards at workplace.

Keywords: Biological hazards, knowledge, ICPs, veterinarians, Kerala

1. Introduction

In India, livestock plays a major role in the agriculture and economic development of the country. Livestock population in India is about 535.8 million, recorded by the 20th Livestock Census (2019) ^[1].

The role of veterinarians in the livestock sector is to provide active guidance to farmers about all the diverse options related to livestock and to draw the maximum benefits out of these resources. Veterinarians working in the field also provide awareness about different government schemes and subsidies for the farmers. Veterinarians also identify the animal sub-population, evaluate surveillance and reporting help in prevention and control of emerging infectious zoonoses.

By the nature of their profession, veterinarians are exposed to various hazards, which can be classified into physical, chemical, biological, psychological, and ergonomic (Prassanna & Mohan, 2019; Parmar *et al.*, 2021) ^[11, 9]. The veterinary practitioner uses his or her skills and knowledge for the prevention and treatment of diseases and the wellbeing of large and small animals.

The demand of the profession exposes veterinarians to various risks that include traumatic injuries while handling animals, exposure to infectious diseases transmitted by the animals or their parasites, exposure to hazardous chemicals and drugs used in veterinary practices. They may also experience allergies while handling animals and animal products and may sustain mental and psychological stress. Despite the critical importance of occupational health

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knowledge and practices in minimizing risks, there is a notable lack of in-depth studies on this topic in Kerala. This study aims to bridge that gap by identifying key hazards and evaluating the preventive measures employed by veterinarians.

Materials and Methods

The present study was conducted from 2021 to 2022 to study the occupational exposure to biological hazards among veterinarians of Kerala. The study aimed to identify the primary sources of occupational exposure to biological hazards among veterinarians and to assess the knowledge and practices of veterinarians regarding infection control and zoonotic disease risks.

Kerala's Animal Husbandry Department operates 1,139 veterinary institutions, including 856 Veterinary Dispensaries (VD), 213 Veterinary Hospitals (VH), 47 Veterinary Polyclinics (VPC), 14 District Veterinary Centers (DVC), and 9 Mobile Veterinary Hospitals (MVH), dedicated to the treatment of livestock and poultry (https://web.cditi.org/animalhusbandry/wpcontent/uploads/2020/02/rti_2015to19). A mixed method of research design was adopted for the study (Prassanna & Mohan, 2019) [11]. In consistence with the objectives set forth for the study, the data were collected from each district of Kerala by using google form questionnaire. The sample size for the research survey was 399 which included veterinarians working in Animal Husbandry Department of Kerala. The sampling area encompassed all 14 districts of Kerala. The data collected from the veterinarians (respondents) were tabulated and analyzed using suitable SPSS 24.0 software programme.

Biological hazards are also known as biohazards which refer to biological substances that pose a threat to the health of living organisms, primarily that of humans. This can include bacterial, viral, fungal, parasitic and arthropod transmitted hazards. These hazards were given in Likert scale format (frequently exposed, sometimes, rarely, never exposed) based on which the responses were collected by using google form survey questionnaire. In addition to the above choices on biological hazards the respondents had the freedom to specify any other hazards experienced by them.

Ranking of biological hazards

For Likert scale format questions, each statement was asked in frequently exposed (FE), sometimes exposed (STE), rarely exposed (RE) and never exposed (NE). The score (4,3,2,1) was given for each statement, four for frequently exposed, three for sometimes exposed, two for rarely exposed and one for never exposed. Based on the score for each statement mean score was calculated. The high mean score statement was given first rank and it was the most important biological hazard.

$$\text{Mean Score (M.S)} = \frac{(\text{FE} * 4 + \text{STE} * 3 + \text{RE} * 2 + \text{NE} * 1)}{\text{Total Number of respondents}}$$

Category wise classification of knowledge level of veterinarians regarding zoonotic diseases

The respondents were classified based on knowledge regarding zoonotic diseases as low (0-5), medium (5-10) and high (10-15) category on basis of score range (score range was calculated by using the sum of the score of statements, high score and low score difference divided by 3). The score (1,0) was given, one for 'Yes' (positive statement) and zero for 'No'.

Category wise classification of infection control practices level (ICPs) of veterinarians regarding zoonotic diseases

The respondents were classified based on level of infection control practices (ICPs) of veterinarians regarding zoonotic diseases as low (0-4.33), medium (4.33-8.66) and high (8.66-13) category based on score range (score range was calculated by using the sum of the score of statements, high score and low score difference divided by 3). The score (1,0) was given, one for 'Yes' (positive statement) and zero for 'No'.

Results

The data collected from veterinarians in the animal husbandry department have been meticulously analyzed and presented below.

Demographic data

For demographic data collection, all the structured questions were asked as closed-ended, focusing on parameters such as the respondents age, gender, work experience in the Animal Husbandry Department, distance traveled between residence and veterinary hospital, district of the workplace, mode of transportation, type of practice, topography of the working area, the number of outpatient cases handled per day, and the number of house visits conducted per day.

Age

The respondents in the survey were categorized into three age groups: up to 35 years, 36 to 50 years, and above 50 years. The majority of respondents (44.36 per cent) belonged to the 36 to 50 years age group.

Gender

To assess the gender of respondents in the survey, participants were categorized into three groups viz., male, female, and others. The majority of respondents were male veterinarians (50.63 per cent), which dominated the females (49.37%).

Work experience

To assess the work experience of respondents, data was categorized into three groups: less than 11 years, 11–22 years, and more than 22 years. The study revealed that the majority of respondents (42.61 per cent) had less than 11 years of experience.

Biological hazards

To identify the major sources of biological hazards among veterinarians working in Animal Husbandry Department, Kerala, variables of the biological hazards included: bacterial hazards, viral hazards, fungal hazards, parasitic hazards and arthropod bites.

Bacterial hazards

To identify the major bacterial hazards exposed by the veterinarians working in Animal Husbandry Department, Kerala, questions were asked in Likert scale format for bacterial hazards such as anthrax, leptospirosis, brucellosis, tuberculosis, tetanus and scrub typhus.

Bacterial hazards of veterinarians working under Animal Husbandry Department, Kerala was analysed and tetanus was reported as perceived bacterial hazard most frequently by 21.80 per cent of the respondents.

Viral hazards

To identify the major viral hazards exposed by the veterinarians working in Animal Husbandry Department,

Kerala, questions were asked in Likert scale format with options Nipah virus, Hanta virus, KFD (Kyasanur Forest Disease), dengue fever and JE (Japanese Encephalitis).

Viral hazards of veterinarians working under Animal Husbandry Department, Kerala was analysed and dengue fever was reported as perceived viral hazard most frequently by 4.51 per cent of respondents.

Fungal hazards

To identify the major sources of fungal hazards exposed by the veterinarians working in Animal Husbandry Department, Kerala, for data collection questions were asked in Likert scale format with options dermatophytes, histoplasmosis and candidiasis.

Fungal hazards of veterinarians working under Animal Husbandry Department, Kerala was analysed and dermatophytes were reported as perceived fungal hazard most frequently by 26.32 per cent of the respondents.

Parasitic hazards

To identify the major parasitic hazards exposed by the veterinarians working in Animal Husbandry Department, Kerala, questions were asked in Likert scale format with options *Entamoeba* (gastrointestinal diseases), tapeworm infection, hydatidosis, leishmaniasis and malaria.

Parasitic hazards of veterinarians working under Animal Husbandry Department, Kerala was analysed and tapeworm infection was reported as perceived parasitic hazard most frequently by 19.30 per cent of the respondents.

Arthropod bites

To identify the major arthropod bites experienced by the veterinarians working in Animal Husbandry Department, Kerala, questions were formulated in Likert scale format with options mites, mosquitos, ticks and lice.

Mosquitos bites were reported as perceived arthropod bite most frequently by 66.67 per cent of the respondents.

Distribution of respondents based on exposure to biological hazards shows below table 1 to 5.

Knowledge of veterinarians regarding zoonotic disease risk

To assess the knowledge levels of veterinarians regarding zoonotic diseases, 15 questions were asked in two-point continuum viz., 'Yes' or 'No' (Appendix.1) and the right questions were positive statements, based on it by score range knowledge of the veterinarians was assessed.

Most of the respondents had more knowledge (98.99 per cent) that consumption of uncooked meat could transmit diseases from animals to humans and majority of the respondents had high level of knowledge (96.74 per cent) regarding zoonotic disease risks followed by medium level knowledge (2.76 per cent) and low-level knowledge (0.50 per cent).

Distribution of respondents based on knowledge level of veterinarians regarding zoonotic diseases shows below table 6.

Practices of veterinarians regarding infection control

To assess the infection control practices levels of veterinarians regarding zoonotic diseases, 13 questions were asked in two-point continuum viz., 'Yes' or 'No, the right questions were positive statements, based on it by score range infection control practices of the veterinarians was assessed.

Most of the respondents (96.99 per cent) washing their hands before eating or drinking and after dealing with each case,

wearing gloves or double gloves and adopting one health approach to prevent biological hazard were reported by 96.24 per cent of the respondents and majority of the respondents followed high level of ICPs (63.91 per cent) regarding zoonotic diseases followed by medium level (34.84 per cent) and low level (1.25 per cent). Majority of the respondents followed appropriate handling technique measures to prevent physical hazards at workplace (90.22 per cent). Majority of the respondents followed elimination (physically remove the hazard) measures to prevent chemical hazards at workplace (67.16 per cent), followed by use of PPE (protect veterinarians with personal protective equipments) (65.66 per cent). Wearing face masks and gloves (96.74 per cent) was the major measures to take to prevent biological hazards at workplace.

Distribution of respondents based on practices of veterinarians regarding infection control shows below table 7.

Discussion

The data collected from veterinarians in the animal husbandry department have been meticulously analyzed and compared with findings from other research studies.

Demographic data

Age

Findings of present study in line with those of Smith *et al.* (2009) ^[17], who conducted a survey on musculoskeletal disorders (MSD) among veterinarians in Queensland, Australia, and found that 53 per cent of respondents were aged between 31 and 50 years. However, the results of the present study differ from those of Rosnah *et al.* (2020) ^[13], who surveyed occupational zoonotic disease among small animal veterinarians in Klang Valley, Malaysia, and reported that the majority of respondents (48.9 per cent) were aged between 20 and 29 years.

Gender

Findings of present study consistent with Fritschi *et al.* (2006) ^[6], who surveyed Australian large animal veterinarians between 1960 and 2000 and found that 56.84 per cent of respondents were male compared to 43.15 per cent female. Similarly, Epp & Waldner (2012) ^[4], in a study on occupational hazards among veterinarians in western Canada, reported that 89.10 per cent of respondents were male and 10.90 per cent were female. Mishra and Palkhade (2020), in their research on occupation-related biological health hazards and infection control practices among large animal veterinarians in Gujarat and Maharashtra, also found that 90.4 per cent of respondents were male, while only 9.6 per cent were female.

Work experience

Findings of present study align with those of Bharwana *et al.* (2012) ^[3], who conducted a survey on the risks of zoonoses among veterinarians working in laboratory practice in Pakistan and their study found that the majority of respondents (30 per cent) had 1 to 5 years of experience.

Biological hazards

Bacterial hazards

The findings of present study were contradictory with the results of Phillips *et al.* (2000) ^[23] who conducted a survey among Australian veterinarians and reported that, eight per cent of the respondents identified leptospirosis, psittacosis and chlamydiosis as a major risk factor. Nienhaus *et al.* (2005) ^[24]

conducted a sample survey among German veterinarians and found that, veterinarians were exposed to zoonotic diseases such as brucellosis (13.6 per cent), lyme disease (9.1 per cent) and psittacosis (9.1 per cent). Prassanna & Mohan (2019) ^[11] conducted a survey among veterinarians working in farm sector in Karnataka and found that, the most common bacterial hazards were *E. coli* (20.00 per cent), staphylococcus infections (16.67 per cent), salmonellosis (16.67 per cent), brucellosis (10 per cent), tuberculosis (3.34 per cent), leptospirosis (3.34 per cent), shigellosis (3.34 per cent), tetanus infection (3.34 per cent).

Viral hazards

The findings of present study were contradictory with the results of Nienhaus *et al.* (2005) ^[24] who conducted a sample survey among German veterinarians and found that, allergic respiratory diseases (rhino virus) were experienced by 21.6 per cent of the veterinarians. Prassanna & Mohan (2019) ^[11] conducted a survey among veterinarians working in farm sector in Karnataka and found that, 10 per cent of veterinarians were exposed to avian influenza and 3.34 per cent exposed to herpes virus. Rood & Pate (2019) ^[12] conducted a survey among Utah clinical veterinarians and found that, most of the respondents indicated slight or no risk for monkeypox virus (96.4 per cent) and rabies (87.7 per cent). Parmar *et al.* (2021) ^[9] conducted a survey on biological hazards among Indian field veterinarians from Uttarakhand, Uttar Pradesh and Punjab and found that, 19.8 per cent of veterinarians had contracted influenza.

Fungal hazards

The findings of present study were consistent with results of Epp & Waldner (2012) ^[4] who conducted a survey on occupational hazards among veterinarians in western Canada and reported that, ringworm infection was the most common zoonosis reported by 47 per cent of veterinarians. Prassanna & Mohan (2019) ^[11] conducted a survey among veterinarians working in farm sector in Karnataka and found that, dermatophytes was the most common zoonotic infection, reported by 20 per cent of veterinarians. However, Rood & Pate (2019) ^[12] reported that, 79.5 per cent respondents suffered from ringworm infection. Rosnah *et al.* (2020) ^[13] conducted survey on occupational zoonotic disease among small animal veterinarians in Klang valley, Malaysia and reported that, dermatophytosis was the commonest zoonotic disease in small animal practice (56 per cent). Parmar *et al.* (2021) ^[9] conducted a survey on biological hazards among Indian field veterinarians from Uttarakhand, Uttar Pradesh and Punjab found that, ringworm infection was perceived as the most important fungal hazard (13.5 per cent).

Parasitic hazards

The findings of present study were contradictory with the results of Phillips *et al.* (2000) ^[23] who conducted a survey among Australian clinical veterinarians and reported that, toxoplasmosis was the most common parasite zoonosis, reported by eight per cent of veterinarians. Prassanna & Mohan (2019) ^[11] conducted a survey among veterinarians working in farm sector in Karnataka and found that, veterinarians were exposed to amoebiasis (13.34 per cent) and *hymenolepis* spp. (3.34 per cent). However, Rood & Pate (2019) ^[12] conducted a survey among Utah clinical veterinarians and found that, most of the respondents indicated slight or no risk for toxoplasmosis (81.9 per cent). Parmar *et al.* (2021) ^[9] conducted a survey on biological

hazards among Indian field veterinarians from Uttarakhand, Uttar Pradesh and Punjab found that, the diseases contracted by veterinarians were amoebiosis (5 per cent) and toxoplasmosis (0.5 per cent).

Arthropod bites

This finding was contradictory with the results of Phillips *et al.* (2000) ^[23] who conducted a survey among Australian clinical veterinarians and reported that, ectoparasites were the cause of occupational allergic rhino-conjunctivitis.

Close contact of veterinarians with the affected animals, intake or ingestion of contaminated water and food, inhalation, abraded skin, missed injection, ectoparasite bites, lack of hygienic practices and improper use of personal protective equipments could be the main reasons for exposure to biological hazards. Hence, the use of infection control practices in clinical practice can prevent exposure to biological hazards.

Knowledge of veterinarians regarding zoonotic disease risk

Findings of these study were consistent with results of Govindaraj *et al.* (2016) ^[20] who conducted a survey on the knowledge, attitude and practices on brucellosis control programme among veterinarians in four states of India viz., Assam, West Bengal, Uttar Pradesh and Punjab, and found that, 84 per cent from Uttar Pradesh, 80 per cent from West Bengal, 76 per cent from Punjab and 60 per cent of the respondents from Assam, were aware of brucellosis transmission. Alhaji *et al.* (2019) ^[22] conducted a cross-sectional survey on the knowledge among Nigerian veterinarians and found that, 92 per cent of veterinarians had much higher knowledge on zoonotic disease. Monje *et al.* (2020) ^[21] conducted a survey among Uganda veterinarians and reported that, 44 per cent of the respondents had sufficient knowledge about rabies. Fifty per cent of the respondents had limited knowledge on infection control practices.

Practices of veterinarians regarding infection control

Findings of these study were in line with results of Fowler *et al.* (2016) ^[5] who conducted a survey on infection control practices among Minnesota veterinary personnel in 2012, and found that, 93 per cent of respondents had received pre-exposure rabies vaccination. Prassanna & Mohan (2019) ^[11] conducted a survey on infection control practices among veterinarians working in farm sector in Karnataka and found that 96.66 per cent of veterinarians followed appropriate handling technique. Parmar *et al.* (2021) ^[9] conducted a survey on infection control practices among Indian field veterinarians Uttarakhand, Uttar Pradesh and Punjab and found that, 70 per cent of veterinarians had taken pre-exposure anti-rabies vaccine and 63.3 per cent veterinarians regularly used PPE during practice.

Correlation between occupational biological hazards, knowledge and infection control practices

The correlation coefficient between knowledge and occupational hazards was positive but not significant. Correlation coefficient between infection control practices and occupational hazards was negative but not significant. Highest correlation coefficient was observed between fungal hazard and parasitic hazard (0.751).

Fungi are eukaryotes and parasitic (many pathogenic fungi are parasitic in humans). In human's parasitic fungi most

commonly enter the body through a wound in the skin, such wounds may be insect puncture or accidentally inflicted scratches or cuts. When exposure to one hazard increases, then exposure to another hazard also increases. In the present study field veterinarians followed good ICPs measures to reduce the exposure to various zoonotic pathogens and risk of contracting the zoonotic diseases, therefore increasing in infection control practice measures resulted in reduced the exposure to various zoonotic pathogens.

Correlation between occupational biological hazards, knowledge and infection control practices shows below table 8.

Association between demographic data and occupational hazards, knowledge and infection control practices

Based on the present study data, there was a significant association ($p < 0.01$) between gender and exposure to fungal hazards. Females were highly exposed than males; there was significant association ($p < 0.01$) between knowledge and work experience. Majority of veterinarians who had high knowledge belonged to less than 11 years of work experience group; there was significant association ($p < 0.01$) between infection control practices and age. Majority of the respondents aged 36 – 50 years followed a high-level of infection control practices at work place.

Association between gender and exposure to fungal hazards (females were highly exposed than males), as female veterinarians. Pregnancy, hormonal imbalance (imbalance of progesterone, estrogen), changes in immune system can make them more prone to fungal hazard.

Association between knowledge and work experience showed that majority of the veterinarians had high knowledge in less than 11 years of work experience group its meaning that, in general more work experience refers to have more knowledge, but knowledge was not limited to work experience, this was may be a reason for veterinarians who had less than 11 years of work experience were associated with the high level of knowledge.

Association between infection control practices (ICPs) and age showed that majority of the respondents, aged 36 - 50 years followed a high-level of infection control practices at workplace with increasing age there was increase in ICPs. As the veterinarians experience increased with age, they would have been exposed to several occupational risk factors which would have made them more cautious and led to the use of infection control practices thereby leading to reduction in exposure to risk.

Association between demographic data and occupational hazards, knowledge and infection control practices shows below table. 9 to 11.

Table 1: Distribution of respondents based on perceived risk of exposure to bacterial hazards n= 399

S. No	Category	Frequently (f)	Sometimes (f)	Rarely (f)	Never (f)	Mean score	Rank
1	Anthrax	1	35	111	252	1.4611	6
2	Leptospirosis	41	155	92	111	2.3157	2
3	Brucellosis	29	130	111	129	2.1478	3
4	Tuberculosis	7	75	129	188	1.7518	4
5	Tetanus	87	136	73	103	2.5187	1
6	Scrub typhus	7	42	102	248	1.5187	5

Table 2: Distribution of respondents based on perceived risk of exposure to viral hazards (n= 399)

S. No	Category	Frequently (f)	Sometimes (f)	Rarely (f)	Never (f)	Mean score	Rank
1	Nipah virus	1	5	61	332	1.1854	4
2	Hanta virus	2	2	51	344	1.1428	5
3	KFD	0	16	45	338	1.1929	3
4	Dengue fever	18	56	92	233	1.6466	1
5	JE	4	19	66	310	1.2907	2

Table 3: Distribution of respondents based on perceived risk of exposure to fungal hazards n= 399

S. No	Category	Frequently (f)	Sometimes (f)	Rarely (f)	Never (f)	Mean score	Rank
1	Dermatophytes	105	111	85	98	2.5588	1
2	Histoplasmosis	5	55	101	238	1.5664	3
3	Candidiasis	56	113	107	123	2.2556	2

Table 4: Distribution of respondents based on perceived risk of exposure to parasitic hazards n= 399

S. No	Category	Frequently (f)	Sometimes (f)	Rarely (f)	Never (f)	Mean score	Rank
1	<i>Entamoeba</i> (GIT disease)	32	108	104	155	2.0426	2
2	Tapeworm infection	77	99	75	148	2.2631	1
3	Hydatidosis	10	46	103	240	1.5639	3
4	Leishmaniasis	3	26	89	281	1.3759	5
5	Malaria	8	35	89	267	1.4586	4

Table 5: Distribution of respondents based on perceived risk of exposure to arthropod bites n= 399

S. No	Category	Frequently (f)	Sometimes (f)	Rarely (f)	Never (f)	Mean score	Rank
1	Mites	100	97	106	96	2.5037	4
2	Mosquitos	266	98	19	16	3.5388	1
3	Ticks	118	130	88	63	2.7593	2
4	Lice	98	125	104	72	2.6240	3

Table 6: Distribution of respondents based on knowledge level of veterinarians regarding zoonotic diseases

S. No	Category	Frequently (f)	Per cent (%)
1	Low (0-5)	2	0.50
2	Medium (5-10)	11	2.76
3	High (10-15)	386	96.74
	Total	399	100

Table 7: Distribution of respondents based on ICPs level of veterinarians regarding zoonotic diseases

S. No	Category	Frequently (f)	Per cent (%)
1	Low (0-4.33)	5	1.25
2	Medium (4.33-8.66)	139	34.84
3	High (8.66-13)	255	63.91
	Total	399	100

Table 8: Spearman's correlation coefficient between occupational hazards, knowledge and infection control practices

		Knowledge	Bacterial hazards	Viral hazards	Fungal hazards	Parasitic hazards	Arthropod bites	ICPs
knowledge	Correlation coefficient	1.000	0.072	0.006	0.093	0.063	0.074	0.095
Bacterial hazards	Correlation coefficient	0.072	1.000	0.534**	0.697**	0.680**	0.560**	-0.028
Viral hazards	Correlation coefficient	0.006	0.534**	1.000	0.497**	0.521**	0.357**	-0.036
Fungal hazards	Correlation coefficient	0.093	0.697**	0.497**	1.000	0.751**	0.578**	-0.018
Parasitic hazards	Correlation coefficient	0.063	0.680**	0.521**	0.751**	1.000	0.581**	-0.009
Arthropod bites	Correlation coefficient	0.074	0.560**	0.357**	0.578**	0.581**	1.000	-0.035
ICPs	Correlation coefficient	0.095	-0.028	-0.036	-0.018	-0.009	-0.035	1.000

** . Correlation is significant at the 0.01 level (2-tailed).

Table 9: Association between fungal hazards and gender

Gender	Fungal hazards						Total	χ^2 - value	P -value
	L		M		H				
	OV	%	OV	%	OV	%			
Female	88	42.7	75	51.4	34	72.3	197	0.001	0.001
Male	118	57.3	71	48.6	13	27.7	202		
Total	206	100	146	100	47	100	399		

($p < 0.01$); L = Low, M= Medium, H= high, OV = Observed value.

Table 10: Association between knowledge and work experience

Work experience	Knowledge						Total	χ^2 - value	P -value
	L		M		H				
	OV	%	OV	%	OV	%			
< 11 years	2	100	2	18.2	166	43.0	170	0.015	0.015
11-22 years	0	0	8	72.7	113	29.3	121		
> 22 years	0	0	1	9.1	107	27.7	108		
Total	2	100	11	100	386	100	399		

($p < 0.01$); L = Low, M= Medium, H= high, OV = Observed value.

Table 11: Association between infection control practices and age (Demographic data)

Age	Infection control practices						Total	χ^2 -value	P -value
	L		M		H				
	OV	%	OV	%	OV	%			
Up to 35 years	2	40.0	25	18.0	90	35.2	117	0.004	0.004
36-50 years	1	20.0	68	48.9	108	42.4	177		
Above 50 years	2	40.0	46	33.1	57	22.4	105		
Total	5	100	139	100	255	100	399		

($p < 0.01$); L = Low, M= Medium, H= high, OV = Observed value.

Conclusion

The study highlights the diverse occupational exposure to biological hazards faced by veterinarians working under the Animal Husbandry Department in Kerala. The study revealed that veterinarians were most commonly exposure to bacterial, viral, fungal, parasitic hazards such as tetanus, dengue fever,

infection with dermatophytes, tapeworm infection, and mosquito bites were the most common among arthropod bites. Additionally, veterinarians were received anti-rabies pre-exposure booster vaccination once in five years and anti-rabies post-exposure vaccination once in three to five years. Majority of the respondents had a high level of knowledge regarding zoonotic diseases. And most of the veterinarians followed high level of infection control practices (ICPs) at workplace.

Conflict of Interest

The authors declare no conflict of interest

Data Availability Statement

The data sets used and analyzed during the current study are available from the corresponding author on reasonable request.

Author's Contribution

NN, SG: Conception and design, supervision.

NN, XL: acquisition of data.

YG, SG: Performed statistical analysis of data.

HM, SG: Performed interpretation of the results.

All authors have approved the final submitted version.

All authors approved to submit the article.

Ethical Approval

The study did not involve live animals or humans participation; therefore, ethical approval was not required as per the institutional guidelines

Use of artificial intelligence tools

During the preparation of this work, the author (s) used google forms to collect the data/ information from the respondents. The analysis was performed with the statistical

software SPSS, version 24.0. After using this tool/service, the author (s) reviewed and edited the content as needed and takes full responsibility for the content of publication

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