International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 4, April 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.4.2025.117

ORIGINAL RESEARCH

Familiarity of Medical Fraternities of Central India with Rabies and its Management

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Received: 18 March, 2025 Accepted: 29 March, 2025 Published: 15 April, 2025

ABSTRACT

Background: The World Health Organization states that Rabies claims the lives of an estimated 59,000 people each year globally, out of which 20,000 are in India. In India, about 15 million people are bitten by animals every year and need post-exposure prophylaxis (PEP) for rabies, a universally fatal but 100% preventable disease, which represents the main concern with animal bites. One of the important factors associated with successful treatment is the knowledge of the caregiver, who is the first line of contact following an animal exposure, in the proper management of animal bites and rabies vaccination. **Material and Methods:** A predesigned semi-structured questionnaire was used for collection of data from the study subjects, i.e., medical faculties and postgraduates of Medicine, Surgery, and Pediatrics departments, veterinary doctors, casualty medical officers of different health centers, and interns who have completed their rotatory internship in any one of the above-mentioned departments. **Results:** The majority of study subjects with the designation as medical officers were aware of the epidemiological determinants of rabies, while knowledge about pre-exposure prophylaxis was comparatively less. In the case of post-exposure prophylaxis, maximum knowledge was seen in postgraduate students. Veterinary doctors demonstrated the least awareness regarding both pre- and post-exposure prophylaxis. Only 29.33% of all participants were aware of the correct wound-washing duration, and less than half (49.3%) knew the intramuscular PEP regimen correctly. Awareness of intradermal PEP and immunoglobulin dosage was also found to be suboptimal. **Conclusion:** The results of the study reveal that there are significant gaps in the knowledge regarding the management of animal bite injuries and immunization. Targeted training and continuous medical education are necessary to bridge these gaps and improve rabies prevention and control efforts.

Keywords: Rabies, Post-exposure prophylaxis, Animal bite management, Healthcare workers, Epidemiological knowledge.

INTRODUCTION

Rabies is a deadly viral disease that affects the central nervous system and continues to pose a serious public health threat in many parts of the world, especially in developing countries. Characterized by nearly 100% fatality once clinical symptoms appear, rabies remains one of the most preventable diseases. It is caused by the *Lyssavirus* type 1 and is primarily transmitted to humans through the bites or scratches of infected animals, most commonly dogs. The disease has a zoonotic nature, predominantly affecting warm-blooded carnivores such as dogs, cats, jackals, and wolves. In many endemic countries, the domestic dog remains the principal source of transmission to humans, accounting for the majority of human rabies deaths [1].

India shoulders a disproportionately high burden of rabies-related mortality and morbidity. The country accounts for a significant portion of the global rabies deaths each year, largely due to the high population of stray dogs and limited public awareness regarding appropriate preventive and therapeutic measures [2]. Each year, millions of people in India are exposed to animal bites, necessitating urgent post-exposure prophylaxis (PEP) to prevent the onset of the disease. Despite the availability of effective vaccines and immunoglobulins, timely administration of PEP remains inconsistent, often due to lack of knowledge, awareness, or access to healthcare services [3,4].

Rabies is entirely preventable through vaccination, both in animals and humans. Human rabies prevention is focused on two strategies: pre-exposure prophylaxis

DOI: 10.69605/ijlbpr_14.4.2025.117

(PrEP) for individuals at high risk and PEP following potential exposure. PEP is most effective when administered promptly after exposure, consisting of wound cleaning, administration of rabies immunoglobulin (in certain cases), and a full course of rabies vaccination [5]. Failure to adhere to these protocols often results from lack of awareness among the public and even among healthcare providers [6].

Healthcare workers, particularly those working in emergency care, outpatient departments, and rural or primary health settings, are frequently the first point of contact for individuals seeking care after an animal bite. Therefore, their knowledge, attitude, and practices regarding rabies prophylaxis are crucial in preventing human deaths from rabies. It is not just the presence of protocols and vaccines that saves lives, but the application of that knowledge in time-sensitive situations. This highlights the importance of adequately training medical professionals, interns, and healthcare workers in recognizing potential rabies exposures and providing correct treatment promptly [7].

Studies have consistently revealed that there are gaps in knowledge among healthcare providers regarding various aspects of rabies management, including wound care, vaccination schedules, use of rabies immunoglobulin, and special considerations in pediatric or immunocompromised patients. These gaps are not uniform but vary across designations, levels of training, and geographic locations. For instance, medical interns may lack practical experience, while senior doctors might not be up to date with the latest guidelines and protocols. Additionally, veterinarians, who often serve as the first responders in animal bite incidents, also need to be well-versed with the human aspects of rabies prevention, particularly when interacting with bite victims [8].

Urban and rural divides further complicate the situation. While urban centers may have better access to vaccines and training, rural healthcare facilities often suffer from shortages in both resources and trained personnel. Moreover, in many parts of India, rabies remains a neglected disease due to underreporting, lack of surveillance systems, and the low priority given to it in public health planning. The disease remains underdiagnosed and mismanaged, leading to unnecessary fatalities that could have been avoided with proper awareness and timely intervention [9].

Given the high stakes involved and the entirely preventable nature of the disease, it is imperative to evaluate the existing knowledge base of those responsible for implementing prophylactic measures. Assessment studies from various parts of India have shed light on how different healthcare cadres—ranging from interns and postgraduate students to general practitioners and medical officers—understand and manage rabies. These assessments provide insight into both strengths and deficiencies, thereby offering opportunities to refine training modules, improve continuing medical education (CME) programs, and standardize rabies prophylaxis protocols across healthcare settings [10].

Educational interventions, regular workshops, and updated clinical guidelines are essential to bridge these knowledge gaps. Moreover, incorporating rabies management into the medical curriculum in a more practical and case-based format can enhance understanding and application. Interdisciplinary collaboration among public health officials, veterinarians, and clinical healthcare providers can also foster a more cohesive and effective approach to rabies control.

The need for this study arises from the pressing demand to evaluate the current level of awareness among healthcare providers in Central India, particularly in urban centers like Raipur. Raipur, being a rapidly developing city with a mix of urban and peri-urban settlements, experiences frequent human-animal interactions, thereby increasing the risk of animal bites and rabies transmission. By understanding the extent of knowledge and preparedness among medical personnel in this region, targeted strategies can be developed to address existing gaps and improve the overall response to rabies cases.

MATERIALS AND METHODS

The study was conducted in various health centers located within Raipur city, Chhattisgarh, India. The study population comprised interns, casualty medical officers, veterinary doctors, and postgraduate students from the departments of Medicine, Surgery, and Pediatrics. A cross-sectional observational study design was employed to assess the knowledge and awareness regarding rabies and its management among the selected medical fraternities. The data collection was carried out over a one-month period, from April 1st to April 30th, 2023. A total of 275 participants were included in the study. Purposive sampling was used to recruit participants based on their relevance and willingness to contribute to the study.

Inclusion Criteria

Participants who were willing to give informed consent and participate in the study were included.

Exclusion Criteria

Participants who were not willing to provide consent or complete the questionnaire were excluded from the study.

Methodology

A predesigned, semi-structured questionnaire, consisting of 25 questions, was utilized for data collection. The tool was carefully developed based on existing literature, national guidelines, and expert consultations to ensure relevance and content validity.

DOI: 10.69605/ijlbpr_14.4.2025.117

It was divided into multiple sections to comprehensively assess participants' knowledge regarding various aspects of rabies, including modes of transmission, risk factors, and clinical manifestations. Additionally, it evaluated awareness about epidemiological determinants, preventive strategies, and appropriate management protocols such as pre-exposure prophylaxis (PrEP) and post-exposure prophylaxis (PEP). The questionnaire included both closed-ended and open-ended questions to capture objective knowledge as well as individual perceptions. Prior to full-scale administration, the tool was pre-tested on a small group of similar participants to refine the language, improve clarity, and ensure reliability. The final version was administered in a face-to-face setting to allow clarification of doubts and ensure accurate responses.

Statistical Analysis

The collected data were entered into Microsoft Excel and subsequently analyzed using the Statistical Package for the Social Sciences (SPSS) version 21. Descriptive statistics were used to summarize the data, and relevant graphical representations were generated to illustrate findings.

Scoring

Each correct answer was allotted 1 marks and 0 marks was given to incorrect answers. Mean of total scores of all the study subjects were taken. The study subjects who scored less than the mean value was categorised as having inadequate knowledge and vice versa.

RESULTS

Table 1: Socio-demographic Profile of Study Subjects (n = 275)

The study's demographic data reveals a diverse group of 275 participants. Among them, the largest age group was 20–25 years, comprising 56% (154) of the participants. This indicates that a significant portion of the study's subjects were in the early stages of their careers or education. The next largest age group was 26–30 years (13.3%, 37 participants), followed by the 31–35 years group (10.7%, 29 participants), and those older than 35 years, making up 20% (55 participants). This shows a considerable representation of younger individuals, but also some diversity in age.

In terms of gender, the majority of participants were male (68%, 187 individuals), with females making up 32% (88). This imbalance in gender distribution may reflect the specific fields or demographics from which the participants were drawn. The participants' professional roles were also varied, with 40% (110) being interns, 20% (55) veterinary doctors, 20% (55) medical officers, and 20% (55) P.G. students. This distribution of professional backgrounds allows for a broad perspective on knowledge levels across different stages of professional development.

Table 2: Overall Knowledge of Study Subjects (n = 275)

The overall knowledge score of the participants had a mean score of 14.75. When categorized by scores above and below the mean, the study showed that 49.3% (136 participants) scored at or above the mean, while 50.7% (139 participants) scored below the mean. This suggests a relatively balanced distribution in terms of knowledge, with nearly half of the subjects possessing knowledge above the average, while the other half scored below the average, indicating variability in knowledge across the participants.

Table 3: Overall Knowledge of Study Subjects – Category Wise

When broken down by professional designation, the study found that P.G. students exhibited the highest level of knowledge, with 80% (44 out of 55) scoring at or above the mean. Medical officers followed, with 66.7% (37 out of 55) achieving scores above the mean. Interns had 43.3% (48 out of 110) scoring above the mean, which is lower than the other groups. Veterinary doctors had the lowest proportion of participants scoring at or above the mean, with only 13.3% (7 out of 55). This suggests that individuals in postgraduate training or those with more advanced professional roles tend to have higher knowledge scores compared to interns or veterinary doctors.

Table 4: Knowledge Regarding Epidemiological Determinants

For knowledge regarding epidemiological determinants, the mean score was 4.48. Among the different professional groups, medical officers had the highest proportion of participants (80%, 44 out of 55) scoring above the mean. In contrast, interns had the lowest proportion, with only 33.3% (37 out of 110) scoring above the mean, indicating that interns may lack sufficient knowledge in this area. Veterinary doctors and P.G. students had intermediate proportions, with 60% (33 out of 55) of veterinary doctors and 40% (22 out of 55) of P.G. students scoring above the mean. This highlights a significant difference in knowledge about epidemiological determinants, with more experienced professionals generally showing higher knowledge levels.

Table 5: Knowledge Regarding Pre-Exposure Prophylaxis

The mean score for knowledge regarding pre-exposure prophylaxis was 1.37. Medical officers had the highest proportion of participants scoring above the mean, with 53.3% (29 out of 55) of medical officers and 60% (33 out of 55) of P.G. students showing higher knowledge. Interns showed a relatively balanced split, with 46.7% (51 out of 110) scoring above the mean, and 53.3% (59 out of 110) scoring below. Veterinary doctors had the lowest knowledge in this category, with only 13.3% (7 out of 55) scoring above the mean, which suggests a lack of

DOI: 10.69605/ijlbpr_14.4.2025.117

awareness about pre-exposure prophylaxis in this group.

Table 6: Knowledge Regarding Post-Exposure Prophylaxis

For knowledge regarding post-exposure prophylaxis, the mean score was 8.89. The P.G. students demonstrated the highest knowledge, with 80% (44 out of 55) scoring above the mean. This suggests that advanced students have a strong understanding of post-exposure protocols. Medical officers also performed well, with 60% (33 out of 55) scoring above the mean. Interns had a more balanced performance, with 53.3% (59 out of 110) scoring above the mean and 46.7% (51 out of 110) scoring below. Veterinary doctors again had the lowest level of knowledge, with only 13.3% (7 out of 55) scoring at or above the mean, which points to a gap in knowledge in this area as well.

Table 1: Socio-demographic Profile of Study Subjects (n = 275)

Variable	Number (Percent)
Age of the Subjects (in years)	
20–25	154 (56%)
26–30	37 (13.3%)
31–35	29 (10.7%)
>35	55 (20%)
Gender	
Male	187 (68%)
Female	88 (32%)
Designation	
Interns	110 (40%)
Veterinary Doctors	55 (20%)
Medical Officers	55 (20%)
P.G. Students	55 (20%)

Table 2: Overall, Knowledge of Study Subjects (n = 275)
Mean Score = 14.75

Knowledge Score	Number (Percent)
≥ Mean	136 (49.3%)
< Mean	139 (50.7%)

Table 3: Overall Knowledge of Study Subjects – Category Wise

Designation	Number ≥ Mean (Percent)
P.G. Students (n = 55)	44 (80%)
Medical Officers (n = 55)	37 (66.7%)
Veterinary Doctors (n = 55)	7 (13.3%)
Interns (n = 110)	48 (43.3%)

Table 4: Knowledge Regarding Epidemiological Determinants (7 questions)
Mean Score = 4.48

Designation	Number ≥ Mean (Percent)	Number < Mean (Percent)
Interns (n = 110)	37 (33.3%)	73 (66.7%)
Veterinary Doctors (n = 55)	33 (60%)	22 (40%)
Medical Officers (n = 55)	44 (80%)	11 (20%)
P.G. Students (n = 55)	22 (40%)	33 (60%)

Table 5: Knowledge Regarding Pre-Exposure Prophylaxis (2 questions)
Mean Score = 1.37

Designation	Number ≥ Mean (Percent)	Number < Mean (Percent)
Interns (n = 110)	51 (46.7%)	59 (53.3%)
Veterinary Doctors (n = 55)	7 (13.3%)	48 (86.7%)
Medical Officers (n = 55)	29 (53.3%)	26 (46.7%)
P.G. Students (n = 55)	33 (60%)	22 (40%)

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Table 6: Knowledge Regarding Post-Exposure Prophylaxis (15 questions)
Mean Score = 8.89

Designation	Number ≥ Mean (Percent)	Number < Mean (Percent)
Interns (n = 110)	59 (53.3%)	51 (46.7%)
Veterinary Doctors (n = 55)	7 (13.3%)	48 (86.7%)
Medical Officers (n = 55)	33 (60%)	22 (40%)
P.G. Students (n = 55)	44 (80%)	11 (20%)

DISCUSSION

The findings from this study highlight critical gaps in knowledge and awareness regarding rabies management among different categories of healthcare providers, including interns, postgraduate students, medical officers, and veterinary doctors. As rabies remains a significant public health issue in India, understanding the preparedness of healthcare professionals is vital for effective disease prevention and control.

Table 1 shows the socio-demographic profile of the study participants, with a majority being younger individuals (20–25 years) and predominantly male. The fact that 40% of participants were interns reflects the inclusion of future front-line medical practitioners, while the presence of medical officers, PG students, and veterinarians introduces diversity in experience and training. The age and designation distribution are consistent with similar studies conducted in Udaipur and Bijapur, where young medical interns formed a significant portion of participants and exhibited variable awareness of rabies protocols [11,12].

The overall knowledge score analysis (Table 2) revealed that nearly half the participants scored below the mean, indicating a significant knowledge gap. While the average knowledge level appears moderate, the even distribution between above-average and below-average scorers underscores the need for targeted educational efforts. These findings align with those of Mishra et al. and Chowdhury et al., who found substantial deficiencies in interns' understanding of rabies epidemiology and management, especially in central and eastern India [13,14].

When knowledge was categorized by professional designation (Table 3), postgraduate students had the highest proportion of participants scoring above the mean (80%), followed by medical officers (66.7%). These results suggest that clinical experience and academic progression are positively correlated with better knowledge. This observation is supported by similar findings in studies from Kolkata and Udaipur, where more advanced students and experienced physicians outperformed their junior counterparts [13,14]. In contrast, veterinary doctors scored the lowest (13.3%), which is concerning considering their role in rabies prevention through animal vaccination and public guidance. Similar gaps among veterinarians have been observed internationally, including in studies from Turkey and Tanzania, where interdisciplinary training was recommended to improve collaboration in rabies control [15,16].

In assessing knowledge of epidemiological determinants (Table 4), medical officers performed best, with 80% scoring above the mean, indicating their stronger grasp of disease patterns and risk factors. On the other hand, interns had the weakest performance in this domain. This trend again mirrors previous studies where interns struggled with core concepts related to rabies transmission, risk populations, and seasonality of cases [12,13]. Understanding epidemiological determinants is crucial for timely diagnosis and risk assessment, and thus, improved training during internship is essential.

Regarding pre-exposure prophylaxis (PrEP) knowledge (Table 5), postgraduate students and medical officers led again, with more than half scoring above the mean. This is consistent with their clinical exposure and continued education. Interns showed a moderate understanding, while veterinary doctors performed poorly. This lack of awareness about PrEP among veterinarians may result from their focus on animal vaccination rather than human prophylaxis. However, given that veterinarians often interact with high-risk populations (e.g., animal handlers, farmers), they should be well-informed about PrEP to educate others effectively. Salahuddin et al. and Jeanpetit et al. similarly emphasized the role of veterinarians and general practitioners in rabies prevention and called for better interdisciplinary knowledge sharing [17,18].

The most promising results were seen in knowledge about post-exposure prophylaxis (PEP), as shown in Table 6. Here, 80% of PG students and 60% of medical officers scored above the mean, indicating strong understanding of PEP protocols. Interns had a nearly balanced distribution, while veterinary doctors again scored the lowest. Given that PEP is a critical intervention in rabies prevention following animal bites, the high scores among PG students and medical officers are encouraging. However, the deficiencies among interns and veterinarians raise concerns. These findings align with several other studies conducted in India and abroad. For instance, Shah et al. and Nayak et al. reported that general practitioners in both urban and rural settings often lacked accurate knowledge of PEP regimens, including wound washing, immunoglobulin administration, and follow-up vaccination schedules [19,20].

Additionally, international experiences further emphasize the global nature of this issue. A case in Italy of imported human rabies from India highlighted the dire consequences of inadequate PEP, reinforcing the critical need for awareness even in regions where

DOI: 10.69605/ijlbpr_14.4.2025.117

rabies is less prevalent [21]. Similarly, Song et al.'s epidemiological study in China revealed that underutilization of PEP was a key contributor to continued rabies mortality despite vaccine availability [22,23].

Recognition of rabies prognosis based on symptom appearance was understood by 66.3% of respondents, which is slightly lower than the 76% reported in other similar studies, suggesting a modest knowledge gap regarding the clinical course and severity of rabies once symptoms manifest [14]. Knowledge about the intramuscular regimen of PEP was also insufficient, with only 49.3% of participants responding correctly, in stark contrast to 82.7% in comparative studies [24]. Furthermore, awareness about wound washing—a critical component of first aid—was found to be particularly poor, with only 29.33% knowing the minimum recommended duration for washing with water, indicating a severe shortfall in basic rabies management education.

The concept of intradermal PEP was known to just 48%, showing a need to improve understanding of alternative PEP regimens, especially in resource-limited settings. Knowledge regarding the correct dosage of equine rabies immunoglobulin (ERIG) and human rabies immunoglobulin (HRIG) was found in 58.7% of respondents, which, while relatively better, still reflects room for improvement. Finally, only 36% were aware that PEP could still be considered even 6 months after exposure in asymptomatic individuals, a figure comparable to the 39.8% reported in other literature, again pointing to consistent gaps in long-term management awareness [25].

The overall findings of this study indicate that while more experienced healthcare workers, such as PG students and medical officers, demonstrate better knowledge of rabies management, interns and veterinary doctors show significant gaps. This disparity may stem from differences in curriculum focus, exposure to clinical cases, and opportunities for continuing medical education. These patterns reflect the conclusions of studies from both India and other countries, where the need for structured rabies training modules and frequent awareness campaigns has been consistently recommended [23-26].

CONCLUSIONS

The results of the study reveal that there are significant gaps in the knowledge regarding the management of animal bite injuries. Inadequate knowledge of healthcare personnel will on one hand endanger the life of patients exposed to rabies and on the other, increase the healthcare burden due to unnecessary vaccines and immunoglobulin. A sustainable elimination strategy is only possible when there is capacity building of clinical fraternities on WHO-recommended rabies prophylaxis guidelines. This can be achieved through regular continuing medical education, workshops and hands-on training.

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