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Research Article

# Compliance with Post-exposure Prophylaxis following Animal Bites among Rural Population attending a Rabies Clinic in Delhi

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## I N F O

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## A B S T R A C T

*Introduction:* Rabies, an acute and exceptionally lethal viral disease affecting the central nervous system, is attributed to *Lyssavirus* type 1. In the battle against rabies, vaccination stands as the cornerstone strategy, bearing significant importance in preventing and controlling the disease. However, the persistent challenge of ensuring full compliance with vaccination completion warrants immediate attention.

*Objective:* To find out compliance with post-exposure prophylaxis following animal bites among the rural population in Delhi.

*Methodology:* This cross-sectional study was conducted at an anti-rabies clinic situated in a rural area of Delhi, India. The study population comprised patients who sought medical attention for animal bites between January 1, 2023 and February 28, 2023. Participants were identified from the clinic's patient registry, and subsequent telephonic interviews were conducted to gather data on complete vaccination.

*Results:* The study enrolled 429 patients with animal bites, with males representing the majority (65.3%, n = 280). Compliance with the recommended vaccination regimen was concerning, as only 28.8% (95% CI: 24.6%-33.4%) of participants completed the full course, while 71.2% (95% CI: 66.6%-75.4%) did not comply. The category of bite was significantly associated with vaccination completion.

*Conclusion:* The prevalence of complete vaccination completion following an animal bite was alarmingly low, with a substantial majority (71.2%) of the studied population failing to adhere to the prescribed dosage regimen. This highlights the urgent need to enhance awareness and promote adherence to Post-exposure Prophylaxis (PEP) protocols. It necessitates intersectoral collaboration and the establishment of integrated reporting systems to address this critical concern.

**Keywords:** Dog Bite, Post-exposure Prophylaxis, Vaccine Compliance, Rabies

## Introduction

Rabies, commonly referred to as hydrophobia, is an acute and highly fatal viral disease that primarily affects the central nervous system. It is caused by *Lyssavirus* type 1 and is predominantly a zoonotic disease transmitted by warm-blooded animals, specifically wild animals such as dogs, wolves, and jackals. The transmission to humans occurs through bites or licks from animals infected with the rabies virus.[1]

Once clinical signs manifest, rabies is an almost invariably fatal condition. Therefore, the prevention of contact with wild animals and the administration of Post-Exposure Prophylaxis (PEP) are vital strategies for effectively mitigating the disease. By adhering to these preventive measures, the incidence of rabies can be significantly reduced.[1]

Rabies virus has the capability to infect a wide range of warm-blooded animals; however, the susceptibility to infection varies significantly among different species. Incidences of rabies have been documented in various wildlife species, including bears, hyenas, jackals, leopards, mongooses, sambar deer, wolves, and foxes. In India, a substantial number of animal bites requiring PEP, estimated at approximately 15 million cases annually, are reported. Notably, the majority of these bites are attributed to dogs. The presence of unvaccinated free-roaming dogs, particularly street dogs, within human settlements contributes significantly to the high incidence of rabies in India.[2-4]

According to a report from the World Health Organization (WHO), the global mortality burden attributed to dog-mediated rabies is estimated to result in a loss of 3.7 million disability-adjusted life years (DALYs). This staggering impact underscores the significant public health consequences associated with this disease. Additionally, the economic burden of dog-mediated rabies has been estimated at approximately US$ 8.6 billion, highlighting the substantial financial ramifications of the disease on a global scale. Within the context of the National Rabies Control Program (NRCP), data collected from various states and union territories in India revealed a total of 6,644 clinically suspected human rabies cases and deaths between the years 2012 and 2020.[5]

NRCP aims to prevent human deaths from rabies by enhancing capacity building, advocating for expanded administration of PEP in dog-mediated rabies endemic regions, and increasing community awareness of rabies prevention. With an ambitious vision, the program strives for the elimination of human rabies by 2030 and has declared rabies as a notifiable disease. However, inadequate awareness and knowledge regarding appropriate actions following a dog bite render victims more susceptible to developing rabies. Particularly in rural areas, awareness about rabies has been found to be insufficient. Misconceptions surrounding the management of animal bite wounds further exacerbate the vulnerability of patients, particularly among individuals residing in rural areas.[6,7]

The data on rabies vaccination compliance is scarce in rural settings in India. So, the present study is to determine compliance with PEP following animal bites amongst the rural population attending a rabies clinic in Delhi.

## Methodology

### Study Design

This is a record-based cross-sectional study carried out from January 1, 2023, to February 28, 2023.

### Study Setting

The study was conducted in the Anti-Rabies Clinic (ARC) of Urban Primary Health Centre (UPHC), Fatehpur Beri, Delhi. It provided initial treatment and management of animal bite cases, receiving on average up to 20 patients of animal bites daily. The services provided included initial tetanus and toxoid (TT) dosage, complete Anti-Rabies Vaccination (ARV) given to first and second-degree animal bites, and follow-up dosage for third-degree animal bites, after referring them to ARC Safdarjung Hospital for anti-rabies immunoglobulin. On arrival of the patients, the inspection of wounds was done, and wounds were categorized as per the World Health Organization's classification of animal bite wounds for PEP. In ARC, an intradermal (ID) regimen is followed, which includes four doses of vaccination. The data were registered with the sociodemographic profile data, type of animal bite, category of bite, and the dosing schedule in the register maintained at the center.

### Sample Size

Study participants included those who had a dog bite during the study period and had taken treatment from ARC, UPHC Fatehpur. We took a sample size of 430 patients, taking 41.8% as the non-compliance rate, 95% confidence interval (CI) and 10% non-response rate. The patients who didn't have a working phone number were excluded from the study. Finally, the study was conducted among 429 participants.[8]

### Study Process

Convenience sampling was used in the study. The study participants were selected from the register at ARC until the desired sample size was reached. The patients were contacted telephonically, and their vaccination history was verified using the register. Any missing data was filled in as necessary. Sociodemographic details were also collected over the phone. Cases were said to be compliant with PEP if they had completed four doses of the vaccination, while

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non-compliance with PEP was defined as cases where the individuals did not complete the four doses.

### Statistical Analysis

Data were entered in Microsoft Excel and analysis was done using STATA 18. Non-compliance with vaccination was reported as a proportion with 95% CI. To find the association, a chi-squared test or Fisher's exact test was done. A p value of 0.05 was taken as significant.

### Ethical Clearance

Ethical clearance was obtained from the Institutional Ethics Committee of Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi. Each subject enrolled in the study was explicitly explained the aim of the study by the investigator and informed consent (telephonically) was obtained, prior to inclusion.

## Results

The study was conducted among 429 animal bite patients who attended the ARC of UPHC Fatehpur Beri following animal bites between January 1, 2023, and February 28, 2023. Among the study population, approximately 65.3% (280 individuals) were male, while the remaining 34.7% (149 individuals) were female. The mean age of the participants was calculated to be 25 ± 15 years. Notably, 44.5% (191 cases) of the reported animal bite incidents originated from Bhatti Mines, a rural area within Fatehpur Beri, New Delhi, and 42.9% (184 cases) were from locations situated more than 2 kilometers away from the UPHC (Table 1).

Among the total reported animal bite cases, the majority (318, 74.1%) were attributed to dog bites, followed by monkey bites (100, 23.3%), and cat bites (11, 2.6%). Categorizing the severity of the bites, the largest proportion of cases (321, 74.8%) fell under category II bites, followed by category III bites (67, 15.6%), with category I bites accounting for the remaining cases (41, 9.6%). An analysis of the bite locations revealed that the most commonly affected site was the right lower limb (152, 35.4%), followed by the left lower limb (114, 26.6%) (Table 2).

Out of the total participants enrolled in the study, a mere 123 [28.8% (95% CI: 24.6%-33.4%] individuals completed the full vaccination, while the remaining 306 [71.2% (95% CI: 66.6%-75.4%)] participants did not complete the vaccination regimen. Notably, among the participants, a mere 19.5% (n = 84) received a single dose, 27.7% (n = 119) received two vaccine doses, and 23.8% (n = 103) received three vaccine doses (Figure 1).

The completion rate of vaccination was found to be higher among male participants compared to their female counterparts, with 31.4% of males completing the vaccination compared to only 23.5% of females. However, this difference was not statistically significant (p = 0.08). Notably, the vaccination completion rate was highest among individuals aged over 50 years (44.4%), while it was lowest among those aged between 10 and 30 years (26.3%). When considering the participants' origin, those from Bhati mines exhibited the highest vaccination completion rate, although the difference, as compared to individuals from other areas, was not statistically significant. Furthermore, there was no significant difference in the completion rates among participants who experienced dog, cat, or monkey bites (p = 0.96). Interestingly, the completion rate was highest for bites classified as third-degree compared to first and second-degree bites, with completion rates of 60.3%, 15.4%, and 23.6%, respectively (p < 0.01). The location of the bite did not have a significant effect on vaccination completion (p = 0.88); however, it is noteworthy that completion rates were highest for bites occurring on the head (Table 3).

**Table 1.Sociodemographic Profile of the Patients (N = 429)**

| Variables | Male n (%) | Female n (%) | Total N (%) |
|---|---|---|---|
| **Age category (years)** | | | |
| < 10 | 64 (22.8) | 32 (21.5) | 96 (22.4) |
| 10-30 | 129 (46.1) | 80 (53.7) | 209 (48.7) |
| 31-50 | 73 (26.1) | 32 (21.5) | 105 (24.5) |
| > 50 | 14 (5.0) | 5 (3.3) | 19 (4.4) |
| **Address** | | | |
| Bhatti mines | 118 (42.1) | 73 (48.9) | 191 (44.5) |
| Other areas > 2 km from UPHC | 127 (45.4) | 57 (38.3) | 184 (42.9) |
| Other areas of Fatehpur Beri within 2 km of the radius of UPHC | 35 (12.5) | 19 (12.8) | 54 (12.6) |
| **Total** | 280 (100.0) | 149 (100.0) | 429 (100.0) |

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**Table 2.Genderwise Distribution of Characteristics of Bite**

| Characteristics of Bite | Male n (%) | Female n (%) | Total N (%) |
|---|---|---|---|
| **Biting animal** | | | |
| Dog | 230 (82.1) | 88 (59.1) | 318 (74.1) |
| Monkey | 46 (16.5) | 54 (36.2) | 100 (23.3) |
| Cat | 4 (1.4) | 7 (4.7) | 11 (2.6) |
| **Bite category (degree)** | | | |
| 1st | 31 (11.1) | 10 (6.7) | 41 (9.6) |
| 2nd | 202 (72.1) | 119 (79.9) | 321 (74.8) |
| 3rd | 47 (16.8) | 20 (13.4) | 67 (15.6) |
| **Location of bite** | | | |
| Right upper limb | 39 (13.9) | 23 (15.4) | 62 (14.4) |
| Left upper limb | 22 (7.8) | 7 (4.7) | 29 (6.7) |
| Right lower limb | 98 (35) | 54 (36.2) | 152 (35.4) |
| Left lower limb | 82 (29.3) | 32 (21.5) | 114 (26.6) |
| Right buttock | 5 (1.8) | 8 (5.4) | 13 (3.0) |
| Left buttock | 3 (1.1) | 1 (0.7) | 4 (0.9) |
| Back | 23 (8.2) | 19 (12.7) | 42 (9.8) |
| Head | 8 (2.9) | 5 (3.4) | 13 (3.0) |
| **Total** | 280 (100.0) | 149 (100.0) | 429 (100.0) |

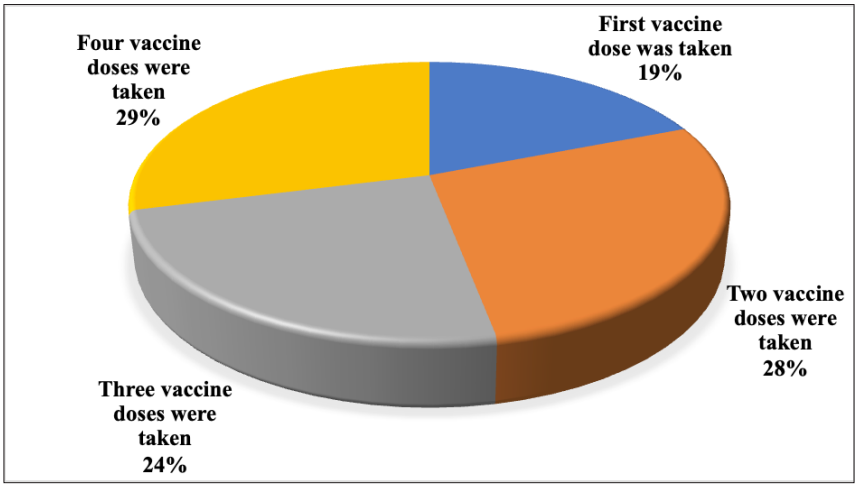


**Figure 1.Distribution of Patients based on the Number of Vaccination doses Received**

**Table 3.Association of Vaccination Completion Status with Sociodemographic and Other Bite Characteristics (N = 429)**

| Variables | Vaccination Completed (123, 28.8%) n (%) | Vaccination Not Completed (306, 71.2%) n (%) | Total (429, 100%) N (%) | p Value |
|---|---|---|---|---|
| **Gender** | | | | |
| Male | 88 (31.4) | 192 (68.6) | 280 | 0.08 |
| Female | 35 (23.5) | 114 (76.5) | 149 | |

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| | | | | |
|---|---|---|---|---|
| **Age category (years)** | | | | |
| < 10 | 29 (30.2) | 67 (69.8) | 96 | 0.27 |
| 10-30 | 55 (26.3) | 154 (73.7) | 209 | |
| 31-50 | 31 (29.3) | 75 (70.7) | 106 | |
| > 50 | 8 (44.4) | 10 (55.6) | 18 | |
| **Address** | | | | |
| Bhatti mines | 59 (30.9) | 132 (69.1) | 191 | 0.56 |
| Other areas > 2 km from UPHC | 52 (28.3) | 132 (71.7) | 184 | |
| Other areas of Fatehpur Beri within 2 km of the radius of UPHC | 12 (22.2) | 42 (77.8) | 54 | |
| **Biting animal** | | | | |
| Dog | 94 (29.2) | 228 (70.8) | 322 | 0.96 |
| Cat | 2 (20.0) | 8 (80.0) | 10 | |
| Monkey | 27 (27.8) | 70 (72.2) | 97 | |
| **Bite category (degree)** | | | | |
| 1st | 6 (15.4) | 33 (84.6) | 39 | < 0.01* |
| 2nd | 76 (23.6) | 246 (76.4) | 322 | |
| 3rd | 41 (60.3) | 27 (39.7) | 68 | |
| **Site of bite** | | | | |
| Upper limb | 24 (26.4) | 67 (73.6) | 91 | 0.88 |
| Lower limb | 79 (29.7) | 187 (70.3) | 266 | |
| Buttocks | 5 (29.4) | 12 (70.6) | 17 | |
| Back | 10 (23.8) | 32 (76.2) | 42 | |
| Head | 5 (38.5) | 8 (61.5) | 13 | |
| **Total** | 123 (28.8) | 306 (71.2) | 429 | |

*Statistically significant

## Discussion

We conducted a cross-sectional study among 429 individuals who sought medical care at an ARC located in a rural area of Delhi, India, during the period from January 1, 2023, to February 28, 2023. Our study revealed a notable predominance of animal bites among male participants, with a higher incidence observed within the age group of 10-30 years. Dog bites accounted for the majority of cases, representing approximately three-fourths of the total. Notably, the right lower limb was identified as the most commonly affected site. However, we observed a concerning low rate of vaccination completion in our study population, with only 28.8% of participants completing the recommended vaccination regimen. Importantly, the severity of the bite demonstrated a significant association with vaccination completion.

In our current study, we observed a predominance of male individuals, constituting approximately three-fourths (280, 65.3%) of the study population. These findings align with previous investigations conducted by Khokar et al., Domple et al., and Bedi et al., where male individuals accounted for 69.9%, 65.1%, and 71.6% of individuals exposed to animal bites, respectively.[9-11] This gender disparity may be attributed to increased outdoor activity and mobility, further leading to an elevated risk of exposure to animal bites. Furthermore, our study revealed a preponderance of participants below the age of 30 years, a pattern consistent with the findings reported by Kinge and Supe, Ganasva et al., and Gadekar and Dhekale.[12-14] Similarly, the majority of bites (318, 74.1%) in our study were attributed to dogs, which is in accordance with the observations reported in a study conducted by Panda and Kapoor.[15]

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In the present study, a significant proportion of cases were categorized as category II (74.8%) and category III (15.6%), accounting for a cumulative total of 90.4% of cases. These findings are consistent with the observations made by Parmar et al. and Ganasva et al., who reported similar proportions of 84.9% and 86.2% for combined category II and category III cases, respectively.[13,16] However, our findings contrast with those of Panda and Kapoor, Patil et al., and Karthik et al., whose studies indicated that a majority of study participants presented with category III wounds.[15,17,18] These discrepancies can likely be attributed to variations in the characteristics of the study populations and the specific geographical contexts in which the studies were conducted. The study conducted by Panda and Kapoor was done in a tertiary care hospital, so more category III patients might have sought care.

In our study, we identified the lower limb as the predominant site of dog bites, accounting for more than half (60%) of all reported cases. These findings are consistent with the results of investigations conducted by Panda and Kapoor, Pavithra et al., and Parmar et al., which reported comparable proportions of 66.1%, 70%, and 60.1%, respectively, for victims presenting with dog bites on the lower limb.[15,16,19] The lower limb's susceptibility to dog bites may be attributed to its increased exposure and proximity to the animals during encounters.

The overall rate of compliance with PEP in our study was determined to be 28.8%. This finding highlights the suboptimal adherence to PEP among the study population. Interestingly, a study conducted by Gadapani et al. in a rural setting reported even lower rates of PEP compliance, underscoring the challenges faced in ensuring adequate PEP coverage in rural areas.[20] Conversely, Sahu et al. observed a more favorable scenario, with nearly 50% of the population completing the recommended PEP regimen.[21] Notably, studies conducted by Panda and Kapoor, and Patil et al. in urban areas demonstrated higher levels of PEP compliance.[15,17] These contrasting findings may be indicative of varying levels of awareness and access to healthcare services across different geographical settings. A study conducted by Singh et al. further emphasized the poor awareness regarding the necessity of rabies vaccination in animals and PEP following an animal bite in rural areas.[22]

## Limitations

Given the retrospective nature of our study, it is important to acknowledge certain limitations pertaining to the availability of comprehensive data. Specifically, the information regarding the vaccination status of the animals involved in the bites, as well as the reasons behind the discontinuation of subsequent vaccination doses, was not adequately captured in our records. Furthermore, it is crucial to recognize that our study was conducted solely within the confines of a single rural ARC center, which limits the generalizability of our results to the broader population.

## Conclusion

This community-based study represents a significant contribution to the limited body of literature examining compliance with PEP in rural areas of Delhi following animal bites. Among the 429 study participants, a mere 28.8% demonstrated adherence to the complete course of anti-rabies vaccination. These findings shed light on the persistent lack of awareness surrounding the importance of PEP in rural communities, despite the advancements in technology and healthcare. The critical implication of this study underscores the urgent necessity to enhance compliance with full ARV regimens among individuals affected by animal bites. Additionally, fostering intersectoral collaboration among relevant departments can bolster primary care services and mitigate the burden of rabies in rural areas. Strategies such as telephonic reminders and integrated reporting systems for all rabid bite cases and PEP compliance should be implemented. By increasing awareness regarding rabies prevention, a completely preventable disease, significant benefits can be realized in the foreseeable future.

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**Conflict of Interest:** None

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