

Introduction

Rabies is a viral disease that is practically 100% fatal and continues to be an important public health problem worldwide, particularly in developing nations where it is enzootic and the urban populace is rapidly increasing¹. The only established intervention to prevent rabies after exposure is post-exposure prophylaxis, involving wound care and administration of the rabies vaccine² and rabies immunoglobulin in severe exposures. However, completion of the full course of vaccination against rabies poses an extremely significant challenge, particularly in cities, where primary health centres (PHCs) have been held accountable for providing accessible and effective rabies care to large, heterogeneous populations³. These centres offer critical services like vaccination, public education, and counselling in ensuring full completion of rabies vaccination after exposure³. However, the factors affecting full completion of rabies vaccination may include unavailability of the vaccines, accessibility, and knowledge of the patient as well as the capacity of clinic staff. Failure to follow the recommended vaccination schedule has caused incomplete protection, and thus, partly due to this, it contributes to increasing the risk of infection with rabies⁴.

Some researchers have demonstrated that adherence of patients to the regimens for rabies vaccination relates to a number of socio-economic factors, perceived seriousness of the illness and trust in the health care system, and logistical impediments⁵. In addition to these causes, clinic efficiency, public awareness programmes, and tracking patients may also determine a better outcome with regard to completing the cycle of vaccination. This research focussed on an urban PHC, examining completion of rabies vaccination with a view to identifying gaps in the current delivery model and strategies that will boost vaccination coverage, reduce the drop-out rates, and eventually reduce the incidence rate of rabies within the communities. In this context, this study was conducted with the objective of finding out the proportion of animal bite patients who completed the four-dose intradermal rabies vaccination given on days 0,3,7 & 28 and assessing factors affecting incomplete rabies vaccination.

Methodology

Prior approval of the Institutional Ethics Committee (No./SC-1/2025/4512) and permission from administrative medical officer of the UPHC were obtained for the study. A record-based study was done from the record section of animal bite victims who attended the outpatient unit of the urban primary health centre (UPHC), Abdullapur, Meerut, Uttar Pradesh. All the patients who started receiving vaccination and got registered there were included while those who were registered at some other place and came here only to get a second, third or fourth dose and did not have any record or prescription paper with them were excluded. Patients who missed the dose were called over the phone, and it was enquired whether they received the vaccination at some other place. Those who did not receive the call were excluded. The records of the 132 cases for the period of three months from 1st July to 30th September, 2024, were studied. Data entry and statistical analysis were done using Microsoft Excel and Epi-info software.

Results

A total of 132 animal bite patients attended the UPHC for rabies vaccination in these 3 months. 125 (95%) were bitten by dogs, 43 (32%) were children & 10 (7%) elderly, 89 (69%) were men and 83 (63%) had visited the UPHC alone, without an accomplice.

Only 55% of patients had completed the four doses of the intradermal rabies vaccination. Total of three doses were taken by 25% of the patients, 13% received two doses and 7% took only one dose of the rabies vaccine, respectively.

The compliance to the four-dose schedule was better amongst the children (76.7%), females (72.1%), those bitten by cats (80.0%) or monkeys (100.0%) and those accompanied by someone to the UPHC (77.6%). The compliance was unsatisfactory amongst the elderly (30.0%) and the young adults aged 16-30 years (38.7%). On applying the chi-square test between the completion of the rabies vaccination schedule and different factors, it was found that factors such as age, gender and accomplice were statistically significant with the completeness of rabies vaccination, while the biting animal was statistically non-significant. [Table-1]

Table 1. Table showing the factors associated with completion of the rabies vaccination schedule (N=132)

Factors	Incomplete vaccination (< 4 doses) (n=59), n (%)	Completed vaccination (4 doses) (n=73), n (%)	Total (N=132), n (%)	Chi-square value, P-value
Age (years)				
≤15	10 (23.3%)	33 (76.7%)	43 (32.6%)	14.448, 0.0001 (Significant)
16-30	19 (61.3%)	12 (38.7%)	31 (23.5%)	
31-45	17 (50%)	17 (50%)	34 (25.7%)	
46-60	6 (42.9%)	8 (57.1%)	14 (10.6%)	
>60	7 (70%)	3 (30%)	10 (7.6%)	

Factors	Incomplete vaccination (< 4 doses) (n=59), n (%)	Completed vaccination (4 doses) (n=73), n (%)	Total (N=132), n (%)	Chi-square value, P-value
Gender				
Female	12 (27.9%)	31 (72.1%)	43 (32.6%)	7.273, 0.0070 (Significant)
Male	47 (52.8%)	42 (47.2%)	89 (67.4%)	
Biting animal				
Cat	1 (20%)	4 (80%)	5 (3.8%)	2.996, 0.0835 (Not Significant)
Dog	58 (46.4%)	67 (53.6%)	125 (94.7%)	
Monkey	0 (0%)	2 (100%)	2 (1.5%)	
Accomplice				
Self	48 (57.8%)	35 (42.2%)	83 (62.9%)	15.604, 0.0001 (Significant)
Someone else*	11 (22.4%)	38 (77.6%)	49 (37.1%)	

Statistical significance was considered at p < 0.05 with a 95% confidence interval.

*Included mother (11.4%); husband (4.5%); father (18.9%); brother, friend and grandmother (0.8% each)

Discussion

The present study shows that 55% had completed the four-dose intradermal (ID) post-exposure vaccination schedule given on days 0, 3, 7 and 28. The remaining patients received only 3 doses (25%), 2 doses (13%), or just a single dose (7%), reflecting a significant drop-out in adherence as the vaccination schedule progressed, reflecting a serious public health concern. Sharma et al.⁶ in 2016 in a community-based study done at rural and urban slums of Delhi observed that 79.2% of patients received a full dose of post-exposure prophylaxis. Reasons for poor completion may be due to misconceptions that one or two doses are sufficient, distance to health facilities and lack of awareness about the full vaccine schedule. A study by Godbole M et al.⁷ in 2019 to assess knowledge and responses to dog bites among the urban and rural populations of Hubballi Taluk, Karnataka, found that 89.2% of people were aware that rabies vaccination is necessary for rabies prevention. They also highlighted that lack of follow-up and minimal communication by health personnel contributed to incomplete vaccination.

In the present study, compliance with the four-dose schedule was highest in the age group <15 years (76.7%), followed by 31-45 years (50%) and 16-30 years (38.7%), and lowest in the >60 years group (30%). The study done by Acharya R et al.⁸ in 2016 Bikaner, Rajasthan, demonstrated that maximum compliance was in the <10 years age group (25.35%) while least compliance was in the >60 years age group (4.94%). Another study done by Arora S et al.⁹ in 2019 in Delhi showed that maximum compliance (26.3%) was in the <10 years age group, while minimum compliance

(2.6%) was in the >50 years age group. Among the gender group, compliance in males was 67.4%. In a study done by Acharya R et al.⁸ mentioned that compliance in males was 76.36%, while in females it was 23.64%. The present study showed that 95% of patients were bitten by dogs. A study done by Jain M et al.¹⁰ in Rajasthan in 2015 showed that 88.85% of patients were bitten by a stray dog. The study done by Arora S et al.⁹ states that 98.1% of patients were bitten by dogs.

In the present study, factors such as age, gender and the influence of an accomplice with the bite victim showed significant association (95% CI with p-value <0.0001), which led to completion of the vaccination schedule. Also, the better compliance in younger individuals may be due to greater parental supervision and concern for children's health. Females often demonstrate better health-seeking behaviour, which can lead to improved compliance with the vaccination schedule. Being accompanied by someone else provides emotional support, guidance, and reminders, ensuring follow-up doses are not missed. In contrast, individuals who come alone may be more prone to default. People bitten by less common animals like monkeys and cats may perceive a greater threat and therefore adhere better to the vaccination schedule, whereas dog bites might be seen as more routine, leading to complacency.

Conclusion

Our study highlights that 45% of animal bite patients did not complete the four-dose intradermal rabies vaccination with significant associations noted for age, gender, and who accompanied the patient to the hospital. This

incomplete coverage underscores the urgent need for targeted awareness and intervention strategies to enhance vaccination compliance and prevent fatal rabies infections.

Recommendation

We recommend strengthening community education on rabies risks and vaccination importance, involving both healthcare workers and local leaders. Ensuring vaccine availability, better follow-up systems, and counselling of bite victims at initial contact can significantly improve vaccination completeness. Special focus should be given to vulnerable groups like children and the elderly identified in this study.

Authors' Contributions: All authors contributed equally.

Conflict of Interest: None

Source of Funding: None

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process: None

References

1. World Health Organization. Rabies vaccines: WHO position paper – April 2018. *Wkly Epidemiol Rec.* 2018;93(16):201–220. Available from: <https://www.who.int/news-room/fact-sheets/detail/rabies>
2. Centers for Disease Control and Prevention. Rabies post-exposure prophylaxis (PEP): clinical guidance. Atlanta (GA): CDC; [cited 2025 Mar 8]. Available from: <https://www.cdc.gov/rabies/hcp/clinical-care/post-exposure-prophylaxis.html>
3. Krishna NS, Thangaraj JW, Devika S, Sasi A, Egambaram S, Rani DS, Khan SA, Delli A, Srivastava AK, Mishra A, Shrinivasa B. Availability of anti-rabies vaccine and rabies immunoglobulin in Indian health facilities: a nationwide cross-sectional health facility survey. *The Lancet Regional Health-Southeast Asia.* 2025 Jul 1;38. [Google Scholar] [PubMed]
4. Manisha R, Kumar P, Govil P, Datta K. Incomplete rabies vaccination and fatal outcome: a case report. *Indian J Emerg Med.* 2024;10(4):227–229. Available from: https://rfppl.co.in/subscription/upload_pdf/manisha-mam-1739788299.pdf
5. N'Guessan RD, Heitz-Tokpa K, Amalaman DM, Tetchi SM, Kallo V, Ndjoug Ndour AP, Nicodem G, Koné I, Kreppel K, Bonfoh B. Determinants of rabies post-exposure prophylaxis drop-out in the region of San-Pedro, Côte d'Ivoire. *Frontiers in Veterinary Science.* 2022 Jul 8;9:878886. [Google Scholar] [PubMed]
6. Sharma S, Agarwal A, Khan AM, Ingle GK. Prevalence of dog bites in rural and urban slums of Delhi: A communitybased study. *Annals of medical and health sciences research.* 2016;6(2):115-9. [Google Scholar] [PubMed]
7. Godbole M, Joshi AR, Bant DD. A cross sectional study to assess the knowledge and response to dog bite among the urban and rural population of Hubballi taluk. *Int J Community Med Public Health [Internet].* 2019 Feb;6(2):539-44. [Google Scholar]
8. Acharya R, Sethia R, Sharma G, Meena R. An analysis of animal bite cases attending anti-rabies clinic attached to tertiary care centre, Bikaner, Rajasthan, India. *Int J Community Med Public Health.* 2016 Dec 28;3(7):1945-8. [Google Scholar]
9. Arora S, Ray TK, Gupta E, Joseph B, Arunraj K, Rasania SK. Myths and unhealthy wound practices regarding animal bite among subjects attending anti-rabies clinic in a South Delhi municipal corporation polyclinic in Mehrauli, Delhi. *Int J Community Med Public Health.* 2019;6(11):4794–8.
10. Jain M, Prakash R, Garg K, Jain R, Choudhary M. Epidemiology of animal bite cases attending anti-rabies clinic of a Tertiary Care Centre in Southern Rajasthan. *J Res Med Dent Sci.* 2015 Jan 1;3(1):79. [Google Scholar]