

Clinical Audit of Anti-Rabies Post-Exposure Prophylaxis Practices at Mufti Mehmood Memorial Hospital, Kuchlak, Quetta: A Retrospective Record-Based Quality Improvement Study

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Abstract

Background: Rabies remains a significant zoonotic public health threat, particularly in low- and middle-income countries such as Pakistan. Effective prevention of human rabies depends on timely administration and completion of post-exposure prophylaxis (PEP). However, poor adherence to vaccination schedules and inadequate documentation remain major challenges in resource-limited healthcare settings.

Objective: This clinical audit aimed to evaluate anti-rabies vaccine (ARV) prescribing practices, record-keeping standards, and vaccination completion trends at Mufti Mehmood Memorial Hospital (MMMh), Kuchlak, Quetta.

Methodology: A retrospective clinical audit was conducted using hospital ARV prescription records from July 2021 to June 2022. Records were assessed against World Health Organization (WHO) recommendations for rabies PEP documentation and management. Prescriptions missing two or more critical data elements (patient name, age, gender, vaccine dose, and administration date) were considered incomplete. Data were analyzed using Microsoft Excel 2016.

Results: Among patients with documented gender information (n=436), males constituted 368 (84.4%) and females 68 (15.6%). Children aged 1–10 years and individuals aged 11–20 years represented the highest proportion of reported cases, collectively accounting for approximately 40% of patients. Among 291 patients who initiated ARV, only 54 (18.6%) completed the recommended five-dose vaccination schedule, indicating substantial loss to follow-up.

Conclusion: This audit identified important gaps in anti-rabies vaccination services, particularly incomplete documentation and poor adherence to the recommended vaccination schedule. Strengthening record-keeping systems, improving patient counselling, implementing follow-up mechanisms, and introducing electronic surveillance systems may enhance rabies prevention and control efforts.

How to cite this article: Qadir MA, Hussain SMY, Wahid S, Larik EA, Khan AS, Sadiq YS, Jalil S. Clinical audit of anti-rabies post-exposure prophylaxis practices at Mufti Mehmood Memorial Hospital, Kuchlak, Quetta: a retrospective record-based quality improvement study. Int J Drug Deliv Technol. 2026;16(75s): 114-122. DOI: 10.25258/ijddt.16.75s.13

Introduction

Zoonosis has emerged as one of the biggest threats to public health throughout human history [1]. Zoonotic diseases represent a major global public health challenge, contributing substantially to morbidity and mortality worldwide. It is no

coincidence that the COVID-19 pandemic emerged amid widespread habitat disruption and resource depletion driven by the demands of a rapidly growing global population [1].

In awareness of the ongoing menace of rabies, World Rabies Day (WRD) was launched on

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September 28, 2007, by the Global Alliance for Rabies Control (GARC) [2]. The day is used to create awareness and enhance strategies towards eliminating dog-mediated human rabies. In 2024, WRD celebrated its 18th anniversary with the theme "Breaking Rabies Boundaries," consolidating the world vision to eradicate dog-mediated human rabies by 2030. The pursuit is made possible with a concerted action of the Quadripartite partners the Food and Agriculture Organization (FAO), the World Organisation for Animal Health (WOAH), the United Nations Environment Programme (UNEP), and the World Health Organization (WHO) [2, 3].

An estimated 59,000 individuals die each year from rabies, with over 95% of deaths happening in Asia and Africa [4]. The highest number reporting in Asia accounts for 60% of global rabies mortality [5]. Incidence rates are particularly high in countries like India, China, Bangladesh, and Pakistan due to high populations of stray dogs, low vaccination levels, and poor access to PEP [6]. In South Asia alone, 20,000–30,000 individuals lose their lives to rabies annually [7].

In Pakistan, the disease is endemic and a significant public health concern, especially in disadvantaged urban and rural areas [8]. Up to 1,500 to 2,000 deaths from rabies are estimated to happen every year. The problem is compounded by the high number of unvaccinated stray dogs, which account for most unprovoked biting cases. Alarming, 40% of dog bite victims are children under 15 years of age. Because of their youthful age and ignorance, children do not report minor bites or scratches, thus putting them at risk of contracting diseases in the event the biting animal is rabid [4, 9].

Historical experiences of rabies elimination are instructive. During the early 1900s, the United Kingdom eliminated rabies by imposing firm public health regulations such as muzzling and licensing of dogs and destruction of stray dogs [10]. Currently, numerous high-income nations have been able to eradicate rabies using large-scale dog vaccination campaigns, rigorous animal control, and education programs [11]. Even though there have been advancements in the prevention of rabies around the world, poor health infrastructure, scarce health care, and lack of surveillance systems pose a hindrance to the control of rabies in LMICs. Availability of proper PEP is difficult to attain in many situations owing to lack of money, poor access to health care, logistical problems, and insufficient awareness among the people. Moreover, there is lack of surveillance systems for rabies that leads to the under-reporting of the disease [12].

In Pakistan, rabies is still considered a significant public health issue with the National Institute of Health estimating roughly 2,000–5,000 people dying each year because of rabies-related deaths. Nevertheless, there is an underestimation of the

magnitude of this problem as a result of the lack of proper reporting and surveillance mechanisms. Since health care institutions providing rabies PEP serve an integral part in the prevention of the disease, it is important to evaluate the process of vaccination, documentation, and patient follow-up. This clinical audit was performed in Mufti Mehmood Memorial Hospital (MMMh), Kuchlak and its objectives were as follows:

- I. To establish the frequency and demographics of patients visiting Mufti Mehmood Memorial Hospital (MMMh) Kuchlak for the anti-rabies vaccination.
- II. To evaluate the practice of anti-rabies vaccines prescription and administration according to recommendations.
- III. To determine the quality and completeness of record keeping for patients who received rabies PEP.
- IV. To evaluate the adherence to recommended anti-rabies vaccination schedule and its completion.

2. Research Methodology

Study Design and Setting

A retrospective clinical audit was conducted at Mufti Mehmood Memorial Hospital (MMMh), Kuchlak, Quetta, Balochistan, to assess anti-rabies vaccination practices, compliance with recommended post-exposure prophylaxis (PEP) protocols, and the quality of clinical documentation. The audit was conducted in accordance with the standards outlined in the World Health Organization (WHO) Guide for Rabies Pre- and Post-Exposure Prophylaxis in Humans.

Study Population and Data Collection

The audit included all patients who received anti-rabies vaccine (ARV) prescriptions at MMMh during the study period from July 2021 to June 2022. To ensure assessment of complete vaccination schedules, records of patients who received follow-up doses during July 2021 were traced back to June 2021, where available.

Hospital prescription records and available vaccination documentation were reviewed retrospectively. Data extracted from the records included demographic characteristics (age and gender), prescription details, vaccine dose number, date of vaccine administration, and available follow-up information regarding completion of the vaccination schedule.

Audit Criteria and Standards

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The audit standards were developed based on recommendations from the World Health Organization (WHO) Guide for Rabies Pre- and Post-Exposure Prophylaxis in Humans. The audit assessed the appropriateness of anti-rabies post-exposure prophylaxis (PEP) documentation and follow-up practices against predefined quality indicators.

recommended vaccine schedule based on available follow-up records.

The audit findings were used to identify gaps in clinical practice, documentation systems, and patient follow-up mechanisms, with the aim of developing recommendations for quality improvement in rabies PEP services.

The following audit criteria were evaluated:

Audit Parameter	WHO-Based Standard
Patient identification details	Complete recording of patient name and relevant identifiers should be maintained for every case
Demographic information	Age and gender should be documented for all patients receiving rabies PEP
Exposure history	Details of Dog bite victims, including bite/scratch history and exposure category, should be documented
Wound assessment	Site and severity of exposure should be recorded to guide PEP decisions
Vaccine administration	Correct vaccine dose, route, and date of administration should be documented
Vaccination schedule	Patients should receive vaccine doses according to the recommended WHO PEP schedule
Follow-up monitoring	Subsequent vaccine doses and completion of the recommended schedule should be documented
Patient counselling	Documentation of advice regarding wound care, vaccine completion, and prevention measures should be maintained

Audit Process

All available anti-rabies vaccination records during the study period were reviewed and compared against the predefined audit standards. Each record was assessed for the presence or absence of required documentation elements. Compliance was measured as the proportion of records fulfilling each audit criterion.

Records were categorized as:

1. **Complete documentation:** Records containing all required audit parameters.
2. **Incomplete documentation:** Records with one or more missing essential parameters.
3. **Vaccination completion status:** Patients were assessed for adherence to the

Data Management and Statistical Analysis

Data were compiled and analyzed using Microsoft Excel 2016. Descriptive statistical methods were applied to summarize patient demographics, vaccination patterns, documentation completeness, and adherence to the recommended anti-rabies vaccination schedule. Results were presented using frequencies and percentages.

Ethical Approval

Ethical approval was obtained from the relevant institutional authority prior to conducting the audit. As this study involved retrospective review of hospital records, no direct patient intervention was performed. Patient confidentiality and anonymity were maintained throughout data collection and analysis.

3. Results

A total of 962 anti-rabies vaccination records were reviewed as part of the clinical audit conducted at Mufti Mehmood Memorial Hospital (MMMH), Kuchlak. The findings are presented according to documentation completeness, demographic characteristics of patients, and anti-rabies vaccine dose completion patterns.

a) Review of Anti-Rabies Vaccination Records

A total of 962 anti-rabies vaccine (ARV) prescriptions issued at Mufti Mehmood Memorial Hospital (MMMH), Kuchlak, between July 2021 and June 2022 were reviewed as part of the clinical audit. The records were assessed for completeness according to predefined audit criteria. Among the reviewed prescriptions, 733 (76.2%) contained the required demographic and vaccination-related information, including patient name, age, gender, vaccine dose details, and administration date. The remaining 229 (23.8%) records were incomplete due to missing essential documentation parameters.

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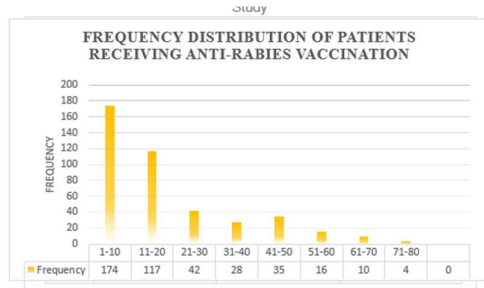


Fig. 1 Assessment of Documentation Completeness Among Anti-Rabies Vaccination Records at Mufti Mehmood Memorial Hospital, Kuchlak

2. Age-wise Distribution of Rabies Exposure Patients

Age distribution analysis demonstrated that children and young individuals represented the majority of patients presenting for anti-rabies vaccination. The highest number of cases was observed among children aged 1–10 years, followed by individuals aged 11–20 years. A total of 291 patients were below 20 years of age, indicating a higher vulnerability of younger age groups to Dog bite victims. The lowest number of cases was recorded among elderly patients aged 71–80 years, with four reported cases.

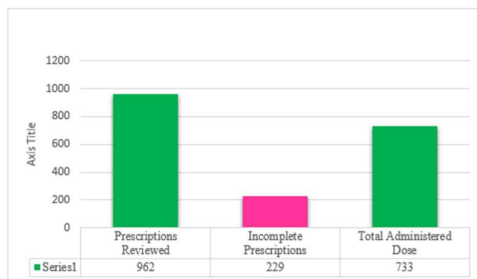


Figure 3: Gender-wise Distribution of Patients Receiving Anti-Rabies Vaccination

Figure 2: Age-wise Frequency distribution of Patients Receiving Anti-Rabies Vaccination

3. Gender-wise Distribution of Rabies Exposure Patients

Gender analysis showed a higher proportion of male patients compared with females among individuals receiving anti-rabies vaccination. Among the reviewed records, 368 patients were male, whereas 68 patients were female. The observed gender distribution indicates a higher presentation rate among males; however, differences in exposure patterns, healthcare-seeking behavior, and possible under-reporting among females require further evaluation.

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4. Anti-Rabies Vaccine Dose Completion Pattern

Assessment of vaccine dose completion demonstrated a progressive decline in patient follow-up after initiation of anti-rabies vaccination. A total of 291 patients received the first dose of ARV; however, only 54 patients completed the recommended five-dose vaccination schedule. The completion rate among patients who initiated vaccination was 18.6%, indicating substantial loss to follow-up during the vaccination course.

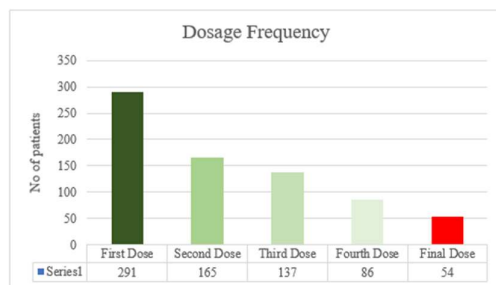


Figure 4: Anti-Rabies Vaccine Dose Completion Pattern

5. Trend of Anti-Rabies Vaccination Dose Completion

A progressive decline was observed in patient numbers across subsequent anti-rabies vaccine doses. Among 291 patients who initiated vaccination, 165 received the second dose, 137 received the third dose, 86 received the fourth dose, and only 54 completed the fifth dose.

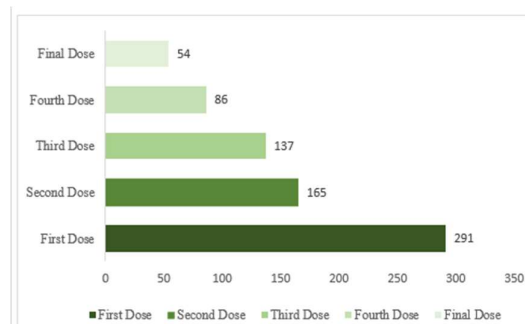


Figure 5: Trend of Anti-Rabies Vaccine Dose Completion Among Patients

4. Discussion

Clinical audit is an established quality improvement approach that evaluates healthcare practices against predefined standards and identifies areas requiring improvement. This audit assessed anti-rabies PEP services at MMMH Kuchlak, focusing on documentation quality, vaccination practices, and

adherence to the recommended vaccination schedule.

The results obtained in this audit give valuable insight regarding the current state of rabies prevention practices in semi-urban health care setting of Balochistan. The detection of 962 cases of anti-rabies vaccinations over the course of one year suggests that there is still a considerable burden of animal bite exposures and rabies PEP in the community. Out of 962 cases identified during this audit, 733 (76.2%) included all necessary information and could be analyzed in more detail, while 229 (23.8%) records were lacking essential data and could not be properly evaluated. Inadequate documentation may impede proper monitoring, delivery of patient care, evaluation of vaccination outcomes, and planning of effective rabies prevention measures.

The analysis based on age indicates that the highest risk age group is children between 1 to 10 years, closely followed by youths between 11 to 20 years. These two groups together contributed to almost 40% of total cases previous studies also reported nearly the same results [14]. This is compatible with international and local studies, which indicate that children are disproportionately at risk due to their diminutive size, inquisitive nature, and frequently unreported or delayed minor injuries [15]. This highlights the need to conduct rabies prevention education programs in schools and communities, particularly in high-risk communities such as Kuchlak, where stray dog populations are sure to be unmonitored and unvaccinated. Genderally, the statistics clearly indicate a dominance of males as victims (368) over females (68) similar trend has been seen in previous studies as well [16-18]. This dominance could be attributed to cultural and social behavioral trends in the area, where males particularly boys are likely to be exposed to outdoor play, interaction with street dogs, and activities which leave them open to dog bites [19]. However, underreporting among women, perhaps due to social stigma or poor access to healthcare, cannot be eliminated and needs further investigation [4]. The most alarming trend is possibly that of vaccination follow-through of 291 patients who were given the initial dose of anti-rabies vaccine, a mere 54 had completed the entire five-dose course similar trend was also observed globally and other countries[20-23]. This is worrying because partial post-exposure prophylaxis (PEP) seriously compromises the efficacy of the treatment, exposing patients to the deadly effects of the virus [24]. The drop-off is high and reflects critical barriers in awareness, accessibility, affordability, or logistics issues in follow-up visits. With the preventable nature of rabies through timely and complete vaccination, these gaps are a dire threat to life [25]. There may be a number of reasons for this non-compliance.

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These may range from unawareness regarding the benefits of having the full course of vaccinations, financial limitations, lack of adequate transport, and potential vaccine stock outs [26]. Furthermore, the lack of an organized follow-up or reminder system for the hospital might also be a causative factor. This trend of reducing dosages also reveals systemic problems within the delivery structure of healthcare and calls for the implementation of patient education and active follow-up measures [27]. Additionally, the absence of electronic or organized record-keeping reflected in the 229 incomplete prescriptions also reveals a major administrative deficiency. The deficiency is not just limited to patient safety and monitoring of treatment, but also to public health surveillance, as defective data can mask the actual incidence and treatment outcomes of exposure to rabies. The report is consistent with broader trends within Pakistan, where rabies is an underreported and poorly controlled condition, particularly in rural and peri-urban settings. National Institute of Health estimates as high as 2,000 to 5,000 deaths per year, which is probably conservative given systemic underreporting and absence of surveillance. This MMMH Kuchlak audit is a microcosm of these national-level issues. The WHO-endorsed vision of eliminating dog-mediated human rabies by 2030 appears remote without making substantial efforts to overcome these systemic impediments [28]. Hospital-based data collection systems, ensuring sufficiency in vaccine supplies, and raising community awareness of the disease, along with incorporating rabies education as part of school curricula, are crucial steps in the right direction. More critically, ensuring a coordinated effort by animal control authorities to mitigate the stray dog population is the key to minimizing exposure risks.

This clinical audit highlights relevant gaps in local rabies prevention strategies, notably in prescription documentation, patient compliance with vaccine regimens, and pediatric susceptibility. These results call for policy focus and the use of multi-sectoral interventions to ensure public health protection and achievement of the global

Strengths of the Clinical Audit

The following are some of the strengths of this clinical audit:

- a. First, this clinical audit presents real-life information about anti-rabies PEP services provided at a health care facility in Balochistan since there is not much information available in literature about these services in the region.

- b. Second, this clinical audit involved a large sample size (n=962) of anti-rabies vaccination cases over a one year period.
- c. Third, various parameters like demographic profile of patients, record keeping, and completion of vaccines doses have been considered while assessing gaps in the service.
- d. Fourth, World Health Organization (WHO) guidelines have been used to assess these gaps in the services.

Limitations of the Study

There are several limitations of this study.

- a. First, the study was conducted only at one healthcare facility; thus, the results cannot be generalized to all hospitals or community populations in Balochistan and elsewhere in Pakistan.
- b. Second, being a retrospective study, the use of available hospital records led to incomplete data on several important clinical parameters like exposure category, wound details, use of rabies immunoglobulin, animal conditions, and the reasons why the vaccination was stopped in certain cases.
- c. Third, the follow-up of patients was based solely on the availability of the records; thus, some patients labeled as non-completers might have taken additional vaccinations elsewhere.
- d. Fourth, the audit was performed only with regard to the documentation and vaccination pattern without assessing the healthcare professionals' knowledge, patients' awareness, socioeconomic factors, and the reasons for non-adherence.
- e. Finally, since this is the first audit cycle, no evaluation of the effect of intervention measures can be done; further re-audit will be needed to identify the effect of those changes.

Conclusion

This clinical audit identified significant gaps in anti-rabies post-exposure prophylaxis (PEP) services at Mufti Mehmood Memorial Hospital (MMMh), Kuchlak, particularly in documentation practices, patient follow-up, and completion of the recommended vaccination schedule. The review of 962 anti-rabies vaccination records demonstrated deficiencies in clinical record maintenance, limiting effective surveillance and evaluation of treatment outcomes. Children and young individuals represented a substantial proportion of patients presenting for rabies vaccination, highlighting the need for targeted awareness and preventive interventions among vulnerable populations. Furthermore, the marked decline in vaccine

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completion from the first dose to the final recommended dose indicates poor adherence to the vaccination schedule and emphasizes the need for structured follow-up mechanisms, patient counselling, and reminder systems. Improving rabies prevention requires a multifaceted approach involving standardized documentation systems, continuous training of healthcare providers, community education, and strengthened surveillance mechanisms. Establishing electronic or structured rabies vaccination registers and improving coordination between healthcare, veterinary, and public health authorities may contribute significantly toward reducing the burden of dog-mediated human rabies and supporting progress toward the global goal of rabies elimination.

Recommendations

Based on the findings of this clinical audit, the following recommendations are proposed to improve anti-rabies post-exposure prophylaxis (PEP) services:

- 1. Standardized documentation system:**
A structured anti-rabies vaccination record system should be implemented to ensure complete documentation of patient demographics, exposure history, vaccination details, and follow-up information.
- 2. Improvement in prescription practices:**
Healthcare providers should follow standardized prescription guidelines for anti-rabies vaccination, including accurate documentation of vaccine dose, schedule, administration date, and relevant clinical information.
- 3. Documentation of exposure assessment:**
Healthcare professionals providing rabies PEP should record essential exposure-related information, including animal type, bite category, site and severity of exposure, wound management, and requirement of rabies immunoglobulin (where indicated).
- 4. Strengthening follow-up and adherence monitoring:**
A systematic follow-up mechanism, including patient registers, reminder systems, and scheduled tracking of subsequent vaccine doses, should be established to improve completion of the recommended vaccination schedule.
- 5. Patient counselling and health education:**
Patients and caregivers should receive appropriate counselling regarding wound care, the importance of completing the vaccination schedule, and the risks associated with incomplete post-exposure prophylaxis.
- 6. Implementation of electronic surveillance and record management:**
Electronic or centralized data management systems should be developed to improve availability, accuracy, and utilization of rabies vaccination data for clinical monitoring and public health planning.
- 7. Capacity building of healthcare providers:**
Regular training sessions and refresher courses should be conducted for healthcare workers regarding WHO-recommended rabies PEP protocols, documentation standards, and patient counselling practices.
- 8. Community-based rabies prevention strategies:**
A One Health approach involving healthcare authorities, veterinary services, municipal administration, and local government should be adopted to improve stray dog management, promote animal vaccination, and enhance community awareness.
- 9. Assessment of healthcare provider knowledge:**
Periodic knowledge, attitude, and practice (KAP) surveys among healthcare providers should be conducted to identify training needs and improve the quality of rabies prevention services.
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