Section: Emergency Medicine

Original Research Article

INCIDENCE OF DOG BITE INJURIES AND CLINICAL RABIES IN A TERTIARY CARE CENTRE- AN OBSERVATIONAL STUDY

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ABSTRACT

Background: In India, dog bites are a major cause of injury and the primary source of rabies transmission, a disease that is invariably fatal once symptoms develop. This study aimed to assess the incidence, characteristics, and outcomes of dog bites and patient adherence to post-exposure prophylaxis (PEP) at a tertiary care hospital. **Materials and Methods:** A retrospective observational study was conducted on 3022 patients with dog bite injuries at the Government Medical College Hospital, South Tamil Nadu, between January and December 2022. All victims received wound care and tetanus prophylaxis and were categorised according to the WHO exposure criteria. PEP included intradermal rabies vaccination (0.1 mL/site, 2-2-2-0-2 schedule), and rabies immunoglobulin was administered for Category III cases. **Result:** The incidence of dog bites was 4.7%, with a mean age of 22.5±9.5 years; 61.9% were aged 15–30 years, and 62% were males. Street dogs accounted for 88% of bites, all of which were unprovoked bites. Category II bites constituted 90% of cases, while Category III accounted for 10%. PEP was initiated in all victims; however, only 302 patients (10%) completed the four-dose vaccination schedule. Six patients (0.2%) developed clinical rabies and died, resulting in a case fatality rate of 100%. **Conclusion:** Dog bites remain a significant public health problem, predominantly affecting young males. Despite the initiation of PEP in all cases, poor adherence to the full vaccination course highlights the urgent need for community awareness, improved vaccine access, and measures to ensure treatment completion to prevent rabies-related mortality.

INTRODUCTION

Rabies is an invariably lethal viral disease caused by the Lyssavirus genus of the Rhabdoviridae family. Transmission to humans primarily occurs through bites from infected animals, most commonly, dogs. Although rabies is entirely preventable with timely and appropriate post-exposure prophylaxis (PEP), the onset of clinical symptoms almost always results in death. Worldwide, the disease claims nearly 59,000 lives annually, with more than 95% of these fatalities occurring in Asia and Africa.[1] India alone contributes to approximately 36% of global rabies deaths, reflecting its substantial disease burden.[2]

Dog bites are the leading cause of rabies transmission in humans. In India, the dog population exceeds 30 million, and a large proportion comprises unowned stray dogs that frequently interact with humans in both urban and rural areas. Studies have indicated that approximately 1.7% of the population is bitten by dogs each year, although the actual incidence is likely higher due to underreporting and gaps in timely medical intervention.[3] Incomplete or delayed administration of PEP significantly contributes to continued mortality from rabies.

Dog-bite incidents affect individuals of all ages, but the highest prevalence is seen among children and young adults.[4] Young males are particularly vulnerable, possibly due to increased outdoor activity and risk-taking behaviour. Seasonal trends have also been observed, with a rise in dog bite cases during winter months and mating periods, likely associated with changes in canine aggression and movement patterns.[5]

The World Health Organization categorises dog bite exposures into three risk levels: Category I involves

contact without skin breach; Category II includes superficial scratches or abrasions without bleeding; and Category III encompasses transdermal bites, contamination of mucous membranes, or contact with broken skin. The latter carries the highest risk of rabies transmission and warrants immediate vaccination and rabies immunoglobulin administration, along with thorough wound care.

Despite clear national protocols and the availability of anti-rabies vaccines, completing the full PEP course remains a major public health challenge. This is often due to limited awareness, inadequate follow-up, accessibility barriers, and common misconceptions about the need for vaccination after minor exposures.[6] This observational study was designed to explore the incidence and characteristics of dog bite injuries in a tertiary care setting, focusing on victim demographics, injury severity, adherence to PEP, and outcomes, including clinical rabies.

Aim

This study aimed to assess the adherence of patients with dog bites to PEP, evaluate the outcomes of dog bite cases, and determine the incidence and characteristics of patients with dog bites attending a tertiary care hospital.

MATERIALS AND METHODS

This retrospective observational study was conducted on 3022 dog bite injuries and rabies cases at the Emergency Department of the Government Medical College Hospital in South Tamil Nadu from January 2022 to December 2022.

Inclusion Criteria

All patients of any age and sex presenting with a history of dog bite injury and/or clinical rabies to the Emergency Medicine Department of Government Medical College Hospital, South Tamil Nadu, between January and December 2022 were included.

Exclusion Criteria

Patients with incomplete clinical records, such as missing demographic details, bite characteristics, or PEP status, and those who left against medical advice before receiving wound care or initiating PEP were excluded.

Methods

From January to December 2022, approximately 64,213 patients attended the Emergency Medicine Department, of which 3022 presented with dog bite injuries. All victims received wound care and prophylaxis against tetanus following dog bites. Relevant data, such as age, gender of the victims, wound care, use of post-exposure immunisation in the victims, and the month of the bite, were extracted from the records available in the tertiary care hospital.

The confirmation of dog bites and rabies was made clinically based on the patient's history. All patients subsequently received appropriate wound care after bite. Dog bite injuries were categorised according to the World Health Organization classification. Category I was defined as touching or feeding animals, licking intact skin, or contact of intact skin with secretions or excretions of a rabid animal or person. Category II was defined as nibbling of uncovered skin or minor scratches and abrasions without bleeding. Category III was defined as single or multiple transdermal bites or scratches, licks on broken skin, contamination of mucous membranes with saliva from licks, or any exposure to a bat.

PEP with rabies vaccine was administered via the intradermal route, with a dose volume of 0.1 mL per site. Purified Verocell rabies vaccine (Verorab™) and purified chick embryo cell vaccine (Rabipur™) were used, both of which have been proven to be safe and effective when administered intradermally. Each injection was required to raise a visible and palpable bleb in the skin, and if a dose was inadvertently administered subcutaneously or intramuscularly, it was repeated intradermally. The two-site intradermal method (2-2-2-0-2) was followed, in which 0.1 mL was administered intradermally at two different lymphatic drainage sites, usually in the deltoid region of both upper arms and the suprascapular area on days 0, 3, 7, and 28.

Rabies immunoglobulin was administered at a dose of 20 IU/kg for human RIG (HRIG) or 40 IU/kg for equine RIG (ERIG), without exceeding the total recommended dose. If immunoglobulin was not available on the first visit, its administration was permitted within seven days of the date of the first vaccine dose. When the calculated dose was insufficient to infiltrate all wounds, sterile saline was used to dilute the preparation two- to three-fold to allow adequate infiltration of all wounds.

Data were entered into a Microsoft Excel spreadsheet and analysed using SPSS (v24.0). Quantitative data were expressed as mean and standard deviation. Qualitative data were expressed as frequencies and percentages. Data were presented graphically for better visualisation using bar diagrams.

The study was approved by the Institutional Ethics Committee, and written informed consent was obtained from the patients before enrolment.

RESULTS

The incidence of dog bites was 4.7%, and the mean age of the victims was 22.5±9.53 years. The majority (61.9%) were in the age group of 15-30 years. They were predominantly male, and among children, male children were affected more than female children. The incidence was highest in the winter season. Of the total victims, 9% had a previous history of dog bites and were immunised. Among the patients, 12% were bitten by their pet dogs and 88% were bitten by street dogs. None of the cases involved provoked bites. The majority of dog bite cases (90%) were classified as Category II, while the remaining 10% were categorised as Category III. PEP was initiated for all 3022 victims; 65% received the first dose, but the uptake declined to 12% for the second dose, and

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only 10% completed all four doses of the vaccine. Of the total victims, six patients died, with a mortality rate of 0.2%. The case fatality rate was 100% (Table 1).

Table 1: Profile of dog bite cases and associated outcomes

		Frequency (%)
Age groups (years)	≤ 14	79 (2.7%)
	15-30	1872 (61.9%)
	≥ 30	1071 (35.4%)
Gender	Male child	50 (1.7%)
	Female child	29 (0.9%)
	Male	1877 (62%)
	Female	1066 (35.3%)
Month of dog bite	January	181 (6%)
	February	144 (5%)
	March	238 (8%)
	April	221 (7%)
	May	263 (9%)
	June	285 (9%)
	July	280 (9%)
	August	279 (9%)
	September	251 (8%)
	October	267 (9%)
	November	267 (9%)
	December	346 (12%)
Severity of injury	Category II	2720 (90%)
	Category III	302 (10%)
Completed dosage of rabies vaccine	1st dose	1964 (65%)
	2nd dose	363 (12%)
	3rd dose	393 (13%)
	4th dose	302 (10%)
Outcome	Cured	3016 (99.8%)
	Death	6 (0.2%)

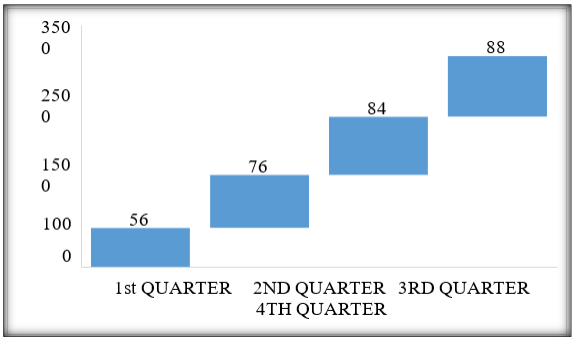

Figure 1: Distribution of dog bite cases by quarter of the year

DISCUSSION

The incidence of dog bites in our study was 4.7%, which is slightly higher than the national average reported in the WHO-sponsored multicentric rabies survey by Sudarshan et al., where the annual bite incidence was estimated at 1.7% across India.[3] Studies from other countries report bite incidence expressed per 100,000 population rather than as a percentage. For example, a systematic review/meta-analysis of Iranian studies estimated a pooled incidence of ~1,200 per 100,000 (≈1.2%), and hospital-based surveys in Bhutan reported area-specific bite rates up to ~1,000 per 100,000 (≈1.0%) in some catchments, both substantially lower than the 4.7% we observed.[7,8]

In our study, the most notable demographic trend observed was the high incidence among individuals aged 15–30 years, who comprised 61.9% of all cases. The average age of the victims was 22.5 years. This differs from the multicentric Indian study by Ichhpujani et al., which reported that 47.5% of victims were children aged 2-18 years and that 72.4% of victims were male, illustrating regional and setting-specific age patterns.[6] In contrast, in our study, children aged below 14 years constituted only 2.7% of the sample, which may be attributed to better supervision or possible underreporting of minor incidents in this age group.

In the present study, a strong male predominance was observed, with males accounting for 62% of all cases. Male children were also more frequently affected than their female counterparts. This is consistent with other Indian hospital series but somewhat lower than the 77.1% male proportion reported by Gogtay et al. in a Mumbai tertiary centre, where dogs accounted for 89.1% of bites and 78.3% of cases were Category III, contrasting with our study in which 90% were Category II.[4] This gender disparity has been well-documented in prior Indian studies and is typically linked to greater male presence in public spaces, occupational exposures, and behavioural tendencies that increase interaction with stray dogs.[9-11]

A seasonal pattern was evident, with the highest number of cases occurring during winter. This aligns with the observations made by Sudarshan et al., who noted heightened dog aggression during colder months and mating seasons.[5] These temporal patterns could inform the strategic planning of awareness and control campaigns.

Stray dogs were responsible for the majority (88%) of bites in our study, underscoring the ongoing challenge of managing stray dog populations in urban Indian settings. These figures closely resemble those

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reported in earlier Indian literature.[6,12,13] The WHO multicentric survey and Ichhpujani et al. reported lower proportions of bites by stray dogs (approximately 63% and 64.7%, respectively), suggesting higher stray dog exposure.[3,6] In our study, bites from pet dogs comprised only 12%, and no provoked bites were recorded, indicating that most incidents involved unprovoked contact with free-roaming dogs during routine human activity.

In our study, initial wound care and tetanus immunisation were administered to all patients, and anti-rabies prophylaxis was initiated in every case, demonstrating satisfactory implementation of early management protocols. However, only 10% of the victims completed the full four-dose vaccine regimen. This relatively low completion rate corresponds with findings from Panda et al., who documented dropout rates of up to 47.8% in various urban settings across India.[14] Another study reported compliance of ~60% for intramuscular schedules and ~77% for intradermal schedules,[12] indicating that our completion rate is substantially lower than many published series and underscoring a major programmatic gap in the immunisation coverage. Failure to complete the full vaccination schedule remains a major risk factor for developing clinical rabies.

A particularly alarming aspect of this study is the six deaths (0.2%) attributed to clinical rabies. All deceased patients received some form of initial care and PEP, suggesting that fatalities may have resulted from delayed presentation, inadequate wound management, or absence of rabies immunoglobulin in Category III cases. Dog-mediated rabies is estimated to cause approximately 60000 human deaths annually worldwide, with India contributing roughly one third of that global burden, highlighting the continued public health importance of improving PEP completion and RIG access.[15]

These findings have significant implications for public health. The high incidence calls for intensified control of stray dog populations through robust implementation of the Animal Birth Control (ABC) program and mass canine vaccination. Public awareness regarding prompt wound washing, immediate initiation of PEP, and adherence to the full vaccination schedule must be improved. Health education should target adolescents and young males, who represent the most vulnerable demographic. It is also imperative that healthcare facilities, including primary care centres, are consistently stocked with anti-rabies vaccines and immunoglobulins and that systems are in place to ensure proper patient follow-up and compliance. Coordination between the veterinary and medical sectors under a unified "One Health" framework is essential to effectively monitor and control zoonotic transmission.

Limitations

One of the primary limitations of this study was the potential underreporting of dog bites, as not all affected individuals may seek medical attention or present to the healthcare facility, thereby possibly underestimating the true incidence. The lack of complete and reliable data regarding the previous vaccination status of the patients restricts the ability to assess the actual risk of rabies transmission and the appropriateness of PEP. No data were available regarding subsequent dose administration at another healthcare centre after receiving the initial vaccination (1st dose).

CONCLUSION

Dog bites remain a significant public health concern, predominantly affecting young males, with street dogs being the major source. Although PEP was initiated in all cases, adherence to the complete vaccination schedule was poor, highlighting a critical gap in rabies prevention efforts. Strengthening community awareness, ensuring the accessibility of vaccines and immunoglobulins, and promoting the timely completion of prophylaxis are essential to reducing morbidity and preventing rabies-related mortality.

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