Original Research

EPIDEMIOLOGY, MANAGEMENT, AND ADMINISTRATIVE CHALLENGES OF DOG BITE CASES IN AN EMERGENCY OF A TERTIARY CARE HOSPITAL: A RETROSPECTIVE STUDY (2021–2023)

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ABSTRACT

Background: Dog bite injuries remain a public health concern in India and contribute significantly to trauma, infection, and rabies risk. This study assessed the epidemiological profile, clinical management, and administrative challenges of dog bite injuries reported at a tertiary care hospital.

Methods: A retrospective observational study was conducted in the Emergency Department of Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar. Medical records of **96 dog bite** cases reported between January 2021 and December 2023 were reviewed. Data on demographics, incident characteristics, bite category, clinical management, and hospital stay were analysed descriptively.

Results: Males comprised 67% of the sample. Children aged 0–5 years (36.5%) and adults over 60 years (16.7%) were the most affected groups. Stray dogs were responsible for 77% of bites. The face and head–neck region was the most commonly affected site (55.9%). All cases were **Category III bites**. Debridement and suturing were performed in 31% of cases, while 26% required grafting or flap procedures. General anaesthesia was required in 49% of cases. Delayed reporting (>24 hours) occurred in 17% of patients. Hospital stay of 1–2 days was recorded for 52% of cases.

Conclusion: Dog bite injuries impose substantial clinical and administrative challenges, particularly in high-burden settings. The high proportion of severe bites, facial injuries, and surgical workload highlights the need for standardized triage pathways, improved public education, and coordinated animal control strategies.

Keywords: Dog Bite Injuries, Epidemiology, Rabies Prophylaxis, Emergency Care, Public Health, India.

INTRODUCTION

Dog bite injuries represent a significant yet under-recognized public health problem globally. They contribute to physical trauma, psychological distress, functional impairment, and, importantly, the risk of rabies—a disease that remains almost universally fatal once clinical symptoms appear. According to the World Health Organization (WHO), tens of millions of dog bite incidents occur each year, with children, the elderly, and immunocompromised individuals being the most vulnerable groups due to limited ability to defend themselves and closer proximity to animals.[1]

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Rabies continues to be a major concern in low- and middle-income countries, including India, where approximately 20,000 human deaths occur annually, largely attributed to dog bites.[2] Despite improvements in vaccine availability, challenges such as inconsistent access to rabies immunoglobulin, delays in seeking care, and inadequate public awareness hinder effective prevention. The large population of free-roaming stray dogs, insufficient sterilization programs, and weak enforcement of animal control policies further contribute to the burden.[3]

Effective management of dog bite cases requires prompt wound care, appropriate administration of post-exposure prophylaxis (PEP), and timely surgical intervention. Evidence consistently highlights that early wound cleansing, proper debridement, and timely initiation of PEP significantly reduce complications and mortality.[4] However, emergency departments in high-burden regions often face operational challenges, including

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overcrowding, limited resources, and lack of standardized treatment pathways.

Sher-i-Kashmir Institute of Medical Sciences (SKIMS) in Srinagar is the largest tertiary care referral centre in Jammu & Kashmir, receiving a high volume of trauma and animal bite cases from multiple districts. The institute's emergency department plays a central role in the management of moderate-to-severe dog bite injuries, including complex facial wounds in children, exposure requiring reconstructive surgery, and cases requiring intensive rabies prophylaxis. Despite the large caseload, limited data from this region exist on the epidemiological patterns, clinical burden, and administrative challenges associated with dog bite injuries.

This study aims to fill this gap by analysing dog bite cases reported at SKIMS from 2021 to 2023. It examines demographic trends, bite characteristics, clinical management approaches, surgical needs, and patterns of healthcare utilization. Additionally, the study identifies administrative and operational challenges related to delayed reporting, resource constraints, and referral pathways. By generating region-specific evidence, this work seeks to support strengthened public health strategies, improved hospital preparedness, and more coordinated dog bite management policies in high-burden areas.

METHODS

Study Design and Setting- This retrospective observational study was conducted in the Emergency Department of Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Srinagar, a tertiary care referral centre catering to multiple districts in Jammu & Kashmir. The study analysed hospital records of dog bite cases reported between **January 2021 and December 2023**.

Sampling Method- A **consecutive sampling method** was employed, wherein all eligible dog bite cases presenting to the Emergency Department during the study period were included. This ensured complete case capture and minimized selection bias.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- All patients presenting with a documented history of dog bite during the study period, irrespective of age, sex, or severity.

Exclusion Criteria:

- Cases with incomplete medical records.
- Bite injuries caused by animals other than dogs.

Data Collection

Data were extracted from:

- Emergency department case sheets
- Surgical and nursing notes
- Digital medical record system (D-MRS)
- Referral registers

The following variables were collected and coded into a structured data sheet:

1. Demographic Variables

- Age
- Gender
- Place of residence (district)

2. Incident Characteristics

- Circumstances of bite (e.g., crossing near a dog, playing)
- Time of incidence (morning, afternoon, evening, night)
- Type of dog (stray or pet)
- Reporting time interval (<6 hours, 6–24 hours, >24 hours)

3. Clinical Characteristics

- Site of bite (face/head–neck, upper limb, lower limb, chest)
- WHO exposure category
- Number and depth of wounds
- Associated injuries

4. Treatment and Management

- Type of wound care (debridement, suturing, grafting, flap reconstruction)
- Anaesthesia used (local, general)
- Rabies vaccine administration and immunoglobulin use
- Duration of hospital stay

5. Administrative and Operational Factors

- Referral patterns
- Overcrowding and resource constraints
- Availability of vaccines and surgical slots
- Documentation challenges

Data Analysis

Data were entered into Microsoft Excel and analysed using **IBM SPSS Statistics Version 26**.

- Descriptive statistics (frequency, percentage, mean, and range) were used to summarize demographic, clinical, and management variables.
- Cross-tabulation was performed to explore distributions across age, gender, and clinical exposure categories.
- Owing to the modest sample size and the observational nature of the data, **inferential statistical tests were not applied**, and results are presented as descriptive trends.
- Figures and charts were generated to illustrate distributions of key variables.

Ethical Considerations- Ethical approval for this study was obtained from the **Institutional Ethics Committee (IEC), SKIMS**. As the study involved retrospective record review, the requirement for individual informed consent was waived. Patient confidentiality was strictly maintained by anonymizing all identifiers and securely storing extracted data.

RESULTS OF DOG BITE CASES AT SKIMS (2021-2023)

1. Demographic Profile of Cases- A total of 96 dog bite cases were reported in the Emergency Department of SKIMS from 2021 to 2023. The majority of cases involved males (67%), while females constituted (33%) (Ref Fig 1)

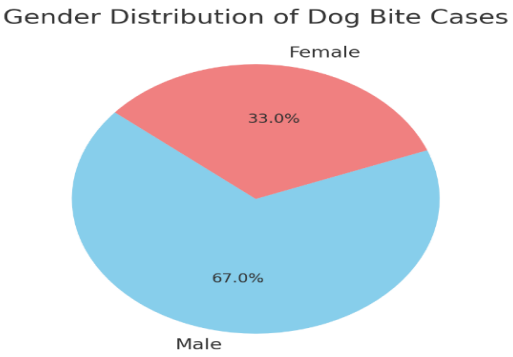

Fig 1: Gender Distribution of Dog Bite Cases

Age Distribution:

- The most affected age group was 0–5 years (36.5%) cases, followed by (16.7%) cases belonging to age group of > 60 years and 13.5% cases of 40–50 years age group. Other age groups had lower incidences, indicating a bimodal age distribution with peaks in young children and older adults. (Ref Fig 2)

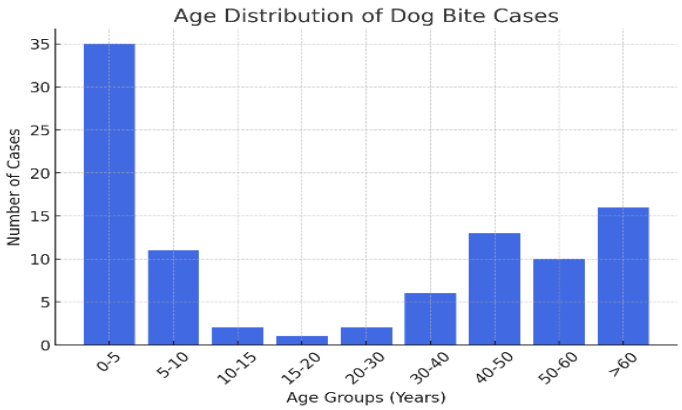

Fig 2: Age Distribution of Dog Bite Cases

2. Geographic and Referral Patterns- Cases originated from multiple districts, with the highest incidence in Baramulla (15 cases), Ganderbal (14 cases), and Srinagar (9 cases). Referral data was available for 54 cases, with most being referred from SMHS Hospital (15 cases). (Ref Fig 3)

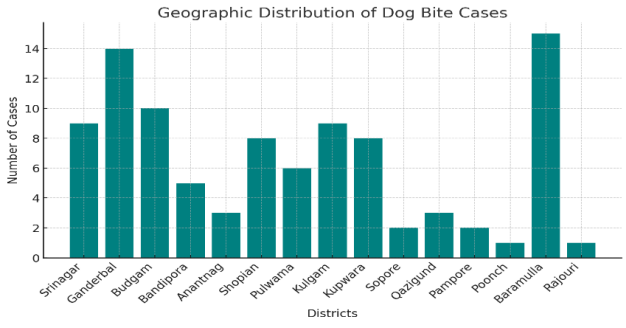

Fig 3: Case Distribution by District

3. Incident Characteristics

- **Most Common Reasons for Dog Bites:**
  - Crossing near a dog (51 cases, 53%)
  - Playing near a dog (29 cases, 30%)

- **Time of Incidence:** The highest number of cases occurred in the afternoon (42%), followed by the evening (29%). (Ref Fig 4)
- **Reporting Time:** 36% of cases reported within 6 hours, while 17% had delayed reporting of more than a day.

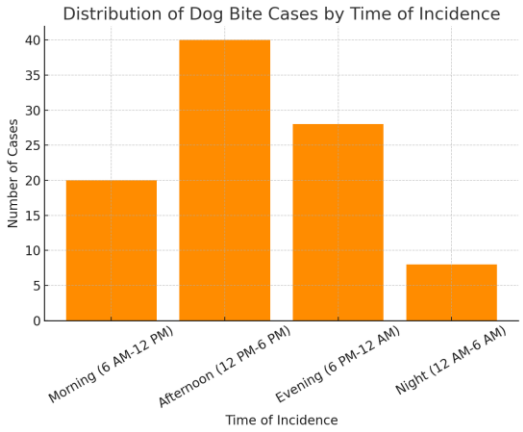

Fig 4: Distribution of Cases by Time of Incidence

4. Clinical Exposure Details

- Stray dogs were responsible for 77% of cases.
- Site of bite: (Ref Fig 5)
  - Face/Head & Neck (55.9% of cases) was the most common site.
  - Upper limb (33.9% cases), Lower limb (9.3% cases), and Chest (0.8 % cases) were also affected.
- All cases were classified as Class III exposures.

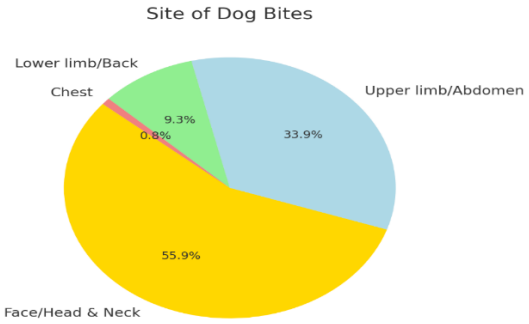

Fig 5: Site of Dog Bites

5. Treatment & Management (Ref Fig 6)

- **Surgical interventions:**
  - Debridement & suturing (30 cases, 31%)
  - Wound debridement with STSG/FTG/Flap (25 cases, 26%)
  - Flap reconstruction (6 cases, 6.25%)
- **Anaesthesia use:**
  - General anaesthesia (49%) was the most common, followed by local anaesthesia (28%).
- All 96 patients received the rabies vaccine on the same day of reporting.

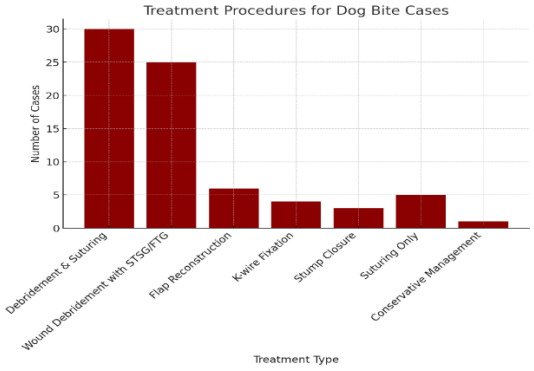

Fig 6: Treatment Procedures for Dog Bite Cases

6. Length of Stay (LOS) (Ref Fig 7)

- 52% of cases had a hospital stay of 1-2 days.
- Only 11% required hospitalization beyond one week.
- Rest of the cases had a stay between 3-7 days

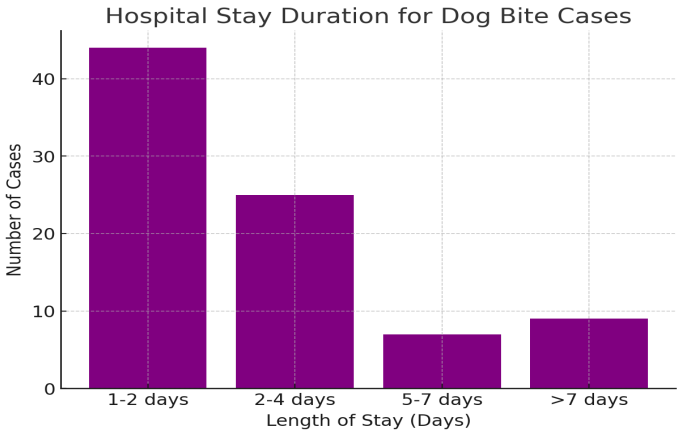

Fig 7: Hospital Stay of Dog Bite Cases

Table 1. Summary of Key Demographic and Clinical Variables

Variable Category	Findings
Total Cases	96
Male : Female	67% : 33%
Most Affected Age Groups	0–5 years (36.5%), >60 years (16.7%)
Most Affected Districts	Baramulla (15), Ganderbal (14), Srinagar (9)
Type of Dog	Stray (77%), Pet (23%)
Common Bite Sites	Face/Head/Neck (55.9%), Upper Limb (33.9%), Lower Limb (9.3%)
Exposure Category	100% Category III
Common Procedures	Debridement & suturing (31%), Grafting/Flap (26%)
Anaesthesia Use	GA (49%), LA (28%)
Hospital Stay	1–2 days (52%), >7 days (11%)
Delayed Reporting	17% reporting after 24 hours

Administrative Challenges arising out of dog bite cases & Solutions thereof

1. Delayed Reporting & Treatment Initiation (Ref Fig 8)

- **Challenge:** Only 36% of cases reported within 6 hours, while 17% had delays of more than a day, increasing the risk of infection and complications.

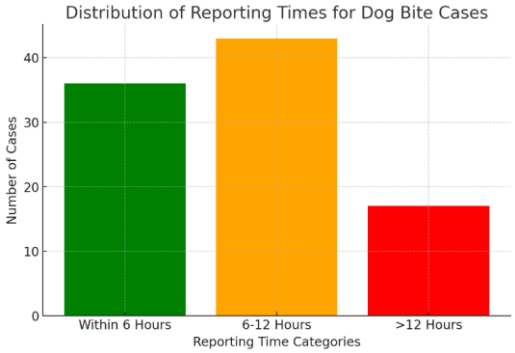

Fig 8: Distribution of reporting times for Dog Bite Cases

- **Solution to Combat the Challenge**
  - Set up emergency awareness programs in high-incidence districts.
  - Deploy telemedicine consultation to guide first-aid and encourage prompt reporting.

- Implement fast-track protocols for suspected rabies cases.

2. High Burden on Emergency Department (Ref Fig 9_

Challenge: All cases were handled in the Emergency Department, leading to overcrowding and strain on resources

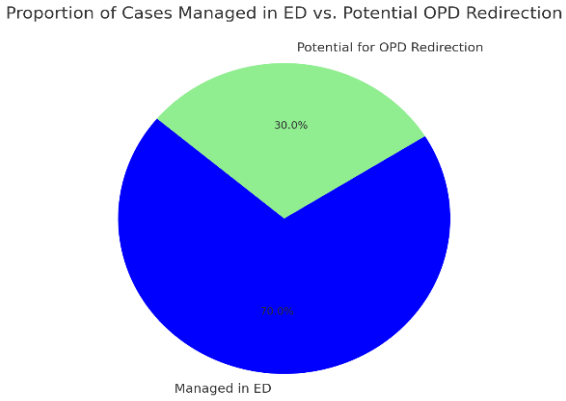

Fig 9: Pie Chart Showing Proportion of Cases Managed in ED Vs Potential for OPD Redirection

Solution to Combat the Challenge

- Establish a separate dog bite unit within the emergency or infectious disease department.
- Introduce a triage system for dog bite severity (minor cases managed at OPD, severe cases in ED).
- Designate trained nursing staff for wound care and rabies prophylaxis.

3. Lack of Community Awareness & Stray Dog Control

- **Challenge:** 77% of bites were caused by stray dogs, yet preventive measures like public awareness and sterilization are lacking.
- Solution to combat the challenge
  - Initiate community awareness campaigns through social media, local health centre's, and schools.
  - Coordinate with municipal authorities for dog sterilization programs and designated animal control teams.
  - Set up public reporting helpline for aggressive stray dogs.

4. Inconsistent Referral & Inter-Hospital Coordination

- **Challenge:** Out of 54 referred cases, 15 came from SMHS, indicating a lack of streamlined referral guidelines between hospitals. (Ref Fig 10)

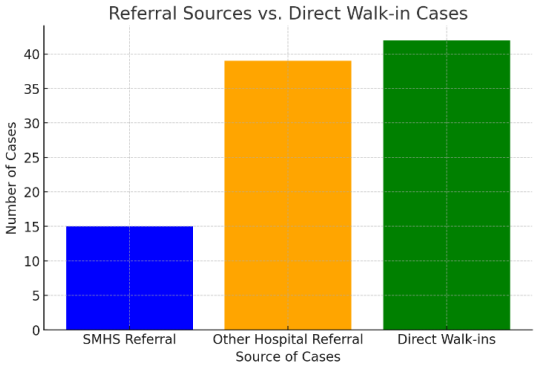

Fig 10: Bar Chart Showing Referral Sources Vs Direct Walk-in Cases

- **Solution to Combat Challenge**
  - Develop standardized referral protocols for dog bite cases.
  - Set up inter-hospital networking for seamless transfer of severe cases.
  - Introduce electronic referral tracking to monitor patient flow.

5. Limited Surgical & Anaesthesia Resource Allocation (Ref Fig 11)

- **Challenge:** 49% of cases required **general anaesthesia**, straining anaesthesia teams, especially for minor procedures.

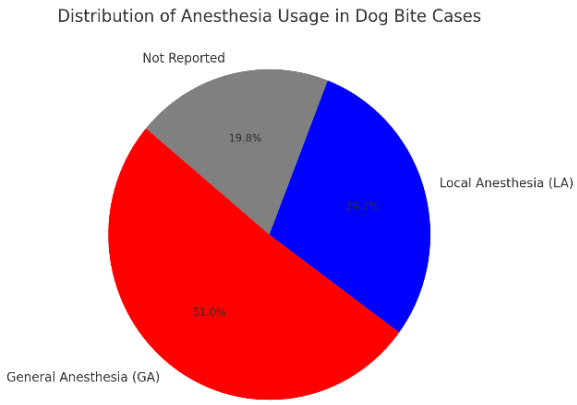

Fig 11: Pie Chart Showing Types of Anaesthesia Used (GA Vs LA)

- **Solution to Combat Challenge**
  - Expand use of regional anaesthesia where feasible.
  - Assign dedicated surgical slots for bite wound management.
  - Train emergency physicians in minor constructive procedures.

Discussion

The present study provides a comprehensive overview of dog bite cases managed at a tertiary care emergency department in Kashmir over a three-year period. By examining demographic patterns, clinical characteristics, treatment approaches, and administrative challenges, the findings contribute valuable regional data to the existing national and international evidence base.

Our study observed a **bimodal age distribution**, with the highest incidence in children aged 0–5 years and elderly individuals above 60 years. This differs from several Indian studies, such as those from Mumbai[9] and Himachal Pradesh[11], where young adults (21–40 years) formed the majority, likely due to occupational exposure. However, the prominence of children in our study aligns with global data, including U.S. findings showing the highest incidence among children aged 5–9 years.[8]

The male predominance (67%) observed here is consistent with national findings from Mumbai (81.6%) and New Delhi (73.9%)[9],[10], and may reflect greater outdoor activity among males.

Stray dogs accounted for **77%** of bites in our study, aligning closely with data from Mumbai (78.5%), New Delhi (82.8%), and Himachal Pradesh (81.2%).[9–11] This underscores the widespread challenge of free-roaming dog populations across Indian cities.

Unlike many Indian studies where the **lower limbs** are most frequently injured, our findings showed a predominance of **face and head–neck injuries (55.9%)**, largely among children. This is likely because children's height places their face within biting range, a trend supported by paediatric trauma literature. However, the interpretation is presented cautiously without over-speculation, focusing on anatomical vulnerability rather than behavioural assumptions.

All cases in this study were classified as **Category III bites**, reflecting the severity of injuries presenting to a tertiary care centre. This proportion is higher than reported in other Indian studies (approximately 75%–80%).[9–11] The higher severity may relate to the referral nature of SKIMS, where complex wounds—including deep lacerations, avulsions, and facial injuries—are commonly sent for advanced care.

Surgical intervention was required in a significant proportion of cases, with **31%** undergoing debridement and suturing and **26%** requiring grafting or flap procedures. The high rate of general anaesthesia use (49%) reflects the predominance of facial wounds and paediatric cases requiring sedation for safe wound exploration and closure.

The majority of bites occurred during the **afternoon and evening hours**, consistent with daily human–dog interaction patterns documented in other regions. Seasonal variations observed in other studies—notably the Mumbai study reporting peaks between February and April[9]—have been attributed to increased aggression during the **mating season of stray dogs**. This behavioral pattern is well documented in veterinary epidemiology, where unneutered male dogs exhibit heightened territoriality and pack behavior during estrus cycles.[12]

While our dataset did not directly analyze seasonal trends, this contextual evidence helps explain variations reported across different studies.

These studies highlight the need for improved awareness, timely medical intervention, and better control measures for stray dog populations to reduce the incidence and severity of dog bite injuries.

Comparative Analysis of Dog Bite Case Studies: SKIMS vs. Other Studies

Parameter	SKIMS (2021–23)	Mumbai (2024, Dinesh Asokan)	SKIMS (2021–23)	Mumbai (2024, Dinesh Asokan)	SKIMS (2021–23)
Total Cases	96	3347	360	1512	~344,000 annually
Male: Female Ratio	67% : 33%	81.6% : 19.4%	73.9% : 26.1%	58% : 42%	Higher in males, especially in children
Most Affected Age Group	0–5 years (35 cases) & >60 years (16 cases) (Bimodal distribution)	21–40 years (40.3%)	Mean age: 29.3 years	21–30 years (22.6%)	5–9 years most affected
Common Biting Animal	Stray Dogs (77%)	Stray Dogs (78.5%)	Stray Dogs (82.8%)	Stray Dogs (81.2%)	Pet Dogs (majority), only some stray cases
Common Bite Site	Face/Head & Neck (66 cases)	Not specified	Lower Limb (66.1%)	Lower Limb (69.9%)	Lower Limb most common
Category III Bites	100%	78.18%	80.8%	74.6%	Not Specified
Provoked vs. Unprovoked	Not specified	83.08% Unprovoked	68.3% Unprovoked	Not specified	Not specified
Common Time of Incidence	Afternoon (42%)	Feb-April (40.2%)	Not specified	Not specified	Higher in poorer neighbourhods
Treatment & Management	Debridement & Suturing (31%), Skin Grafts (26%), Flap Reconstruction (6%)	Not specified	Not specified	Not specified	27,000 required reconstructive surgery (2018)
Hospital Stay (LOS)	52% (1–2 days)	Not specified	Not specified	Not specified	Not specified
Socioeconomic Influence	Higher in rural areas, lower awareness	More cases in urban slums	Higher cases in low-income areas	Higher in tribal/rural settings	Higher in lower-income, low-education areas

CONCLUSION

Dog bite injuries continue to pose a significant clinical and public health challenge, particularly in regions with large stray dog populations. This study from a tertiary care centre in Kashmir highlights the high burden of **Category III bites**, the predominance of injuries among **young children and elderly adults**, and the considerable proportion of cases requiring **surgical intervention and general anaesthesia**. The findings also reveal important operational issues, including delayed reporting, inconsistent referral pathways, and strain on emergency and surgical services.

Strengthening dog bite management requires a combination of **clinical preparedness**, including standardized triage and treatment pathways, and **public health measures**, such as community awareness, improved access to timely care, and effective stray dog control strategies. Future research should explore multicentre data, long-term functional outcomes, and the impact of preventive interventions.

By addressing both clinical patterns and administrative challenges, this study contributes evidence to guide policy, enhance emergency department functioning, and support more coordinated regional strategies for reducing the burden of dog bite injuries.

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Conflicts of Interest: None declared.

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