

Trends of Animal Bite Cases and Comparison of Cases Reported during Pre-COVID-19 and COVID-19 Period in a Dedicated Anti-Rabies Clinic from a Tertiary Care Hospital, Hassan, Karnataka, India: A Retrospective Cohort Study

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ABSTRACT

Introduction: Rabies causes 100% case fatality in animal bite victims if left untreated, and it ranks as the 10th leading cause of death due to infectious diseases worldwide. India alone reports 20,000 human rabies deaths annually, accounting for one-third of global mortalities related to the disease. However, rabies is 100% preventable. The nationwide lockdown imposed from March 25, 2020, to curb the spread of the Coronavirus Disease-2019 (COVID-19) disrupted various essential health services, including Post-Exposure Prophylaxis (PEP) for rabies.

Aim: To describe the socio-demographic profile of animal bite cases and assess the burden of animal bites during the pre and post COVID-19 Pandemic, specifically in patients reporting to the dedicated Anti-Rabies Clinic (ARC) of a tertiary care hospital in Hassan, Karnataka, India.

Materials and Methods: A retrospective record-based study was conducted from January 2019 to November 2021 among animal bite cases reporting to the ARC at Hassan Institute of Medical Sciences, Hassan, Karnataka, India. Data on age, gender, locality, and socio-economic status were collected from the records maintained at the ARC. All subjects with complete data in the records were included in the study. All animal bite cases were managed according to the World Health Organisation

(WHO) guidelines, with necessary COVID-19 precautions taken. A total of 3,706, 3,303, and 2,144 subjects were considered for the years 2019, 2020, and 2021, respectively.

Results: There was a decreasing trend in the reported cases during the pandemic. The proportion of animal bite cases among those less than 19 years old was 1,146 (30.9%), 1,124 (34.1%), and 711 (33.1%) in the years 2019, 2020, and 2021, respectively. The majority of animal bite victims were males: 2,489 (67.2%), 2,240 (67.8%), and 1,173 (54.7%) in the years 2019, 2020, and 2021, respectively. The majority belonged to the rural population, with 2,668 (72.0%), 1,057 (32%), and 1,586 (74%) in the years 2019, 2020, and 2021, respectively. However, there was an increase in the number of victims from the urban population in the year 2020, with nearly 2,246 (68%). Most of them, 2,299 (62%), 2,114 (64%), and 1,441 (67.2%) in the years 2019, 2020, and 2021, respectively, belonged to a lower socio-economic status. Category-III bites made up the majority representation in all the years 2019, 2020, and 2021.

Conclusion: The number of animal bite cases reported during the pandemic was lower compared to the pre-pandemic phase. This highlights either missed reporting of cases or a reduction in exposure to animals, which decreased the risk of animal bites.

Keywords: Anti-rabies vaccine, Burden, Dog bite, Rabies

INTRODUCTION

Rabies is a widespread, neglected, and underreported zoonosis with an almost 100% case fatality rate in humans if left untreated. It causes a significant social and economic burden. Over 99% of human rabies cases are caused by an infected dog bite. Once symptoms of the disease develop, it is fatal. Dog-mediated human rabies causes tens of thousands of human deaths annually, despite being 100% preventable [1]. Every two seconds, a person is bitten, and the annual incidence of animal bites in India is 1.7% (or 17 per 1000 persons). The estimated incidence of rabies in India is 2.74 cases per 100,000 people annually [2]. In India, someone dies from rabies every 30 minutes. Annually, about 59,000 people die from rabies, with nearly one-third, or 20,000, of these deaths occurring in India alone [2]. In Asia, an estimated 35,172 human deaths (59.6% of global deaths) and a loss of approximately 2.2 million DALYs occur per year due to dog-mediated rabies [2]. The World Health Organisation (WHO) leads the collective "United Against Rabies" to drive progress towards "Zero human deaths from dog-mediated rabies by 2030" [3]. Although rabies is 100% fatal, it is also 100% preventable by following prompt PEP [3]. PEP consists of thorough

wound washing with soap and water, Anti-Rabies Vaccination (ARV), and timely administration of Rabies Immunoglobulin (RIG) for Category-III bites. In India, the revised and updated Thai Red Cross regimen of Intradermal vaccination (2-2-2) is adopted [4].

COVID-19 has been the most challenging pandemic of this century. During the pandemic, public health ministries necessarily shifted their focus and resources to ramp up emergency preparedness efforts to control COVID-19. Hence, essential health services were 0 across the globe, exacerbating inequalities and setting back communities that were already suffering a high burden of preventable diseases. This is especially true for neglected tropical diseases like rabies as well [5]. Restrictions imposed to control the novel coronavirus outbreak made monitoring of rabies cases more challenging. Surveillance and focused control efforts have also been scaled back due to the COVID-19 pandemic. Vital measures to control COVID-19 have had the negative trade-off of jeopardising these rabies elimination and prevention activities [6]. The aim of the study was to describe the socio-demographic profile of animal bite cases. The objective of the study was to assess the burden of animal bites during the COVID-19 pandemic.

MATERIALS AND METHODS

A record-based retrospective study was conducted using registers maintained in the ARC (Animal Bite Research Center) of a tertiary care center. The dedicated ARC was established under the Department of Community Medicine at the Government Medical College in Hassan on October 12, 2017. The ARC exclusively handles the management of animal bites, except for snake bites. The prevention measures for rabies, such as ARV (Anti-Rabies Vaccine) and RIG (Rabies Immunoglobulin), are provided free of charge to all victims, regardless of their socio-economic status. Despite the ongoing pandemic, the ARC remained operational and implemented necessary precautions when treating animal bite cases. Patient consultations allowed one attendant per patient, with precautionary measures like social distancing, face masks, and hand hygiene using provided sanitisers. Additionally, patients were advised on the importance of receiving the COVID-19 vaccine.

Inclusion criteria: The subjects who had complete data filled in the ARC register, provided consent for treatment, and received ARV were included in the study.

Exclusion criteria: Records with incomplete data in the register were excluded from the study.

The socio-demographic details of the family, parent education, and income were obtained from the registers maintained at the ARC clinic. All cases entered in the register were included in the study, while cases with incomplete details were excluded. A total of 10,569 records from January 2019 to November 2021 were reviewed, collecting detailed epidemiological information such as age, gender, area, time, type of animal, and monthly distribution of animal bite cases. Out of the 10,569 cases, 9,153 were considered for the study as they contained all the required information. Ethical clearance was obtained from the Institutional Ethical Committee (IEC) of Hassan Institute of Medical Sciences, with IEC No: (IEC/HIMS/RR21/2-11-2018).

Socio-economic classification was conducted using the Modified BG Prasad Classification [7]. The study included details of all animal bite victims, regardless of age, except for cases involving rabbit bites, rodent bites, snake bites, human bites, and those seeking pre-exposure prophylaxis or re-exposure prophylaxis, which were excluded. The recorded category of wounds was noted, and patients were categorised according to the WHO classification of contact with suspected animal bites into Category-I, II, and III [4]. Victims belonging to Category-I and II, requiring PEP (Post-Exposure Prophylaxis), were administered ARV, while Category-III victims were provided with RIG and ARV [4].

STATISTICAL ANALYSIS

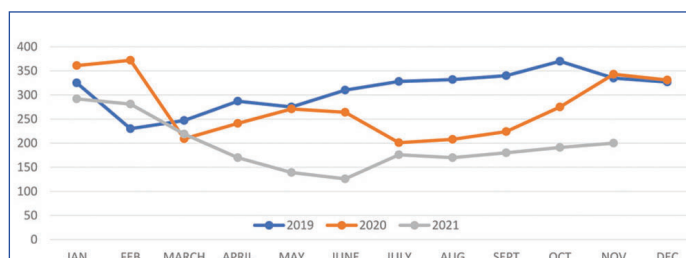
The data was entered into Microsoft Excel 2019 and analysed using the Statistical Package for the Social Sciences (SPSS) version 20.0. Descriptive statistics were employed to analyse the data, which were presented as proportions and percentages. The results were presented in the form of tables and graphs.

RESULTS

The animal bite victims who met the inclusion and exclusion criteria and attended the ARC during the study period were found to be 3,706, 3,303, and 2,144 in the years 2019, 2020, and 2021, respectively.

[Table/Fig-1] demonstrates that prior to the global COVID-19 pandemic in 2019, a higher number of cases were reported (n=3,706), with the highest number of cases recorded in October 2019 (9.9%). During the pandemic, there was a decline in the total number of cases overall, showing a decreasing trend throughout 2020 (n=3,303), with the fewest cases observed in July 2020 (6.08%). However, the number of animal bite victims reached pre-pandemic levels by the end of 2020, with the highest numbers in November (10.4%) and December (10.1%). In 2021, the total

number of cases (n=2,144) remained considerably low and followed a decreasing trend after the second wave of COVID-19, with the lowest numbers in June 2021 (5.8%).



[Table/Fig-1]: Month-wise distribution of animal bite cases during the study period 2019 (n=3706), 2020 (n=3303) and 2021 (n=2144).

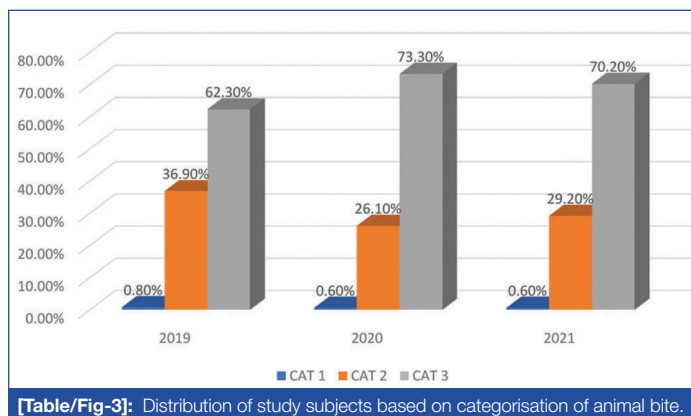
[Table/Fig-2] reveals that the majority of animal bite victims belonged to the age group of 20-50 years. In 2019, a total of 1,647 (44.5%), in 2020 a total of 1,468 (44.4%), and in 2021 a total of 972 (45.4%) fell into the 20-50 years age group. According to the BG Prasad classification, the subjects fell under Class-I (upper), Class-III (Middle 1), and Class-V (Lower Class). The proportion of animal bite cases was lower among those under 19 years old, with 1,146 (30.9%), 1,124 (34.1%), and 711 (33.1%) cases in the years 2019, 2020, and 2021, respectively. The majority of animal bite victims were males: 2,489 (67.2%), 2,240 (67.8%), and 1,173 (54.7%) in the respective years. Most victims belonged to the rural population, with 2,668 (72.0%), 1,057 (32%), and 1,586 (74%) in the years 2019, 2020, and 2021, respectively. However, there was an increase in the number of victims from the urban population in 2020, with nearly 2,246 (68%). The majority of them, 2,299 (62%), 2,114 (64%), and 1,441 (67.2%) in the years 2019, 2020, and 2021, respectively, belonged to the lower socio-economic status, followed by middle and upper classes classified according to the modified BG Prasad classification.

Characteristics	2019 (n=3706)	2020 (n=3303)	2021 (n=2144)
Age group (years)	n (%)	n (%)	n (%)
0-5	323 (8.7)	268 (8.1)	165 (7.7)
5-19	823 (22.2)	856 (26)	546 (25.4)
20-50	1647 (44.5)	1468 (44.4)	972 (45.4)
>50	913 (24.6)	711 (21.5)	461 (21.5)
Gender			
Male	2489 (67.2)	2240 (67.8)	1173 (54.7)
Female	1217 (32.8)	1063 (32.2)	971 (45.3)
Geographic distribution			
Urban	1038 (28)	2246 (68)	558 (26)
Rural	2668 (72)	1057 (32)	1586 (74)
Socio-economic status			
Class-I	333 (9)	495 (15)	232 (10.8)
Class-III	1074 (29)	694 (21)	471 (22)
Class-V	2299 (62)	2114 (64)	1441 (67.2)
Education			
Graduate and above	224 (6)	159 (4.8)	139 (6.5)
Intermediate/diploma	421 (11.3)	354 (10.8)	321 (15)
High school	806 (21.7)	928 (28)	520 (24.2)
Middle school	816 (22)	574 (17.3)	395 (18.4)
Primary school	820 (22)	740 (22.4)	412 (19.2)
Illiterate	296 (8)	280 (8.4)	192 (9)
Not available	323 (9)	268 (8.3)	165 (7.7)

[Table/Fig-2]: Socio-demographic characteristics of the animal bite victims during the study period.

[Table/Fig-3] displays the distribution of animal bite victims categorised according to the WHO classification of animal bite

exposures. Category-III bites constituted the majority in all the years 2019, 2020, and 2021.



[Table/Fig-3]: Distribution of study subjects based on categorisation of animal bite.

DISCUSSION

Humans who are bitten by animals are at risk of contracting rabies, which poses a danger to more than 3.3 billion people worldwide. These exposures occur in both urban and rural settings and have been documented for over 4,000 years. The majority of cases occur in Africa and Asia, where there is a high population of dogs and people living in close proximity. The Southeast Asia region of the WHO has the highest number of exposures globally, with almost 1.4 billion people at risk. In India, an estimated 17.4 million animal bites are reported each year, with a prevalence of 1.7% [8].

The present study involved a detailed examination of the records of animal bite patients who attended the ARC of a tertiary care hospital in Hassan. Therefore, the data provides an estimate of animal bite cases at ARC, HIMS during the last three-year period.

There were 3,706, 3,303, and 2,144 animal bite cases reported to the ARC during 2019, 2020, and 2021, respectively. A nationwide lockdown was imposed from March 25, 2020, in an effort to contain the spread of COVID-19. In 2019, before the COVID-19 pandemic, a higher number of cases were observed in the summer months of April to May, as well as during November and December. This may be due to increased exposure to animals during vacations when people spend more time outdoors and are more prone to animal bites. This finding is consistent with studies conducted by Sreenivas NS et al., and Satapathy D et al., [9,10].

Following the lockdown, there was a decline in the number of animal bite cases reported to the ARC, which can be attributed to restricted outdoor movement and a shift to indoor activities such as working from home, resulting in decreased contact between humans and street animals. This study found a decrease of 10.9% and 42.1% in animal bite cases during the COVID-19 pandemic in 2020 and 2021, respectively, compared to the pre-pandemic period in 2019. The number of cases decreased by more than 100 patients per month visiting the ARC compared to pre-pandemic times. It was also observed that the number of cases started to increase to pre-pandemic levels once the lockdown was lifted. This decline in cases could be attributed to two factors. Firstly, the strict lockdown measures may have led to missed reporting and missed Post-Exposure Prophylaxis (PEP) due to limited transportation services and people being confined to their homes. Secondly, restricted movement of people may have reduced the risk of exposure to street animals. This finding aligns with the study conducted by Satapathy D et al., [10].

The majority of animal bite victims belonged to the adult population, specifically the age group of 20 to 50 years, both during and before the COVID-19 pandemic. This may be due to the fact that a significant portion of this population consists of working individuals and students pursuing higher education, who need to go outside for their duties, resulting in increased exposure to street animals. This trend remained consistent even during the COVID-19 pandemic.

This finding is similar to studies conducted by Sreenivas NS et al., and Gowda P et al., [9,11]. Additionally, there was a slight increase in the number of animal bite victims in the pediatric age group. This can be explained by the fact that due to the lockdown, schools were closed and transitioned to online classes, causing children (5-19 years) to spend more time at home, potentially increasing their exposure to pet animals. This finding aligns with the study conducted by Dixon CA and Mistry RD, who reported a threefold increase in dog bite cases among children during the COVID-19 pandemic lockdown [12].

In this study, the majority of bite victims were males, both before the pandemic (2019) and during the pandemic (2020, 2021). This may be because men are more engaged in outdoor activities, which puts them at a higher risk of coming into contact with animals. This finding is similar to other studies conducted across the country [13-16].

Furthermore, the majority of bite victims belonged to the lower socio-economic status, both before and during the COVID-19 pandemic, which is consistent with the study conducted by Pavithra R et al., and Kulkarni P et al., [17,18]. This may be attributed to the fact that individuals from lower socio-economic backgrounds tend to spend more time sleeping and working outdoors, increasing their risk of animal exposure.

The majority of the victims (72%, 74%) were from the rural population in 2019 and 2021, which is consistent with studies conducted by Rudresh HB et al., and Pavithra R et al., [16,17]. In this study, it was observed that during the pre-pandemic period in 2019, animal bite victims were more likely to be from rural areas. However, during the pandemic and lockdown, there was a significant increase in animal bite victims from urban areas. This could be attributed to the fact that many hospitals in semi-urban and rural areas were either closed or converted into COVID Care Centers or COVID Hospitals. Additionally, the fear of complications from a dog bite may have prompted individuals to seek treatment at higher-level urban centers. Furthermore, the availability of Antirabies Vaccines (ARV) in rural areas was impacted by logistical issues during the lockdown, resulting in limited access to the vaccine. As a result, individuals sought treatment at the tertiary care hospital, which had a higher availability of rabies prevention biologicals, primarily in the urban areas. The lack of transportation during the lockdown also hindered people from rural areas from reaching the urban hospitals where the necessary vaccines were available. This situation raises concerns about the proper treatment and management of animal bites in rural areas, which need to be addressed.

In the present study, the majority of the cases belonged to Category-III (62.3%, 73.3%, 70.2%) both before and during the COVID-19 pandemic. This was because all Category-III animal bite victims were referred to tertiary care hospitals due to the lack of rabies biologicals in rural hospitals. This finding is consistent with studies conducted by Kulkarni P et al., and Manna N et al., [18,19].

Under the National Rabies Control Programme, the government should take appropriate steps to create awareness among the general public about the seriousness of the disease and the importance of immediate vaccination if Post-Exposure Prophylaxis (PEP) was missed due to the lockdown. It is crucial to treat cases presenting for rabies PEP, even months after the bite, as if the contact had recently occurred, following the rabies prevention guidelines. Moreover, educating the public on the significance of reducing exposure to animals to prevent animal bites and, consequently, rabies should be emphasised. It is essential to educate the pediatric population about the timely reporting of minor/major bites and scratches to their parents.

Limitation(s)

The present study was a retrospective study, and the data were collected from registers. However, it is important to note that there

may be some missing data in the registers, which could have resulted in the exclusion of several cases from the study.

CONCLUSION(S)

This study has demonstrated a clear decline in the number of animal bite cases reported to ARC during the pandemic, particularly during the national and state lockdowns. The incidence of animal bites can be greatly reduced by minimising contact with street animals.

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REFERENCES

- [1] World Health Organization. Rabies Fact Sheet. Geneva. World Health Organization; 2017 [Updated 2021 Feb 20; Cited 2019 July 10]. Available at: <http://www.who.int/mediacentre/factsheets/fs099/en>.
- [2] Sudarshan MK, Mahendra BJ, Madhusudana SN, Ashwoath Narayana DH, Rahman A, Rao NS, et al. An epidemiological study of animal bites in India: Results of a WHO sponsored national multi-centric rabies survey. *J Commun Dis.* 2006;38(1):32-39.
- [3] World Health Organization. Zero by 30: The global strategic plan to end human deaths from dog-mediated rabies by 2030. World Health Organization; Geneva: 2018a. [Cited 2022 Jan 20]. <https://apps.who.int/iris/bitstream/handle/10665/272756/9789241513838-eng.pdf>.
- [4] Rupprecht CE et al. In: Plotkin SA, Orenstein WA, Offit PA, editors. *Vaccines.* 7th ed. Philadelphia: Elsevier Saunders. 2017. pp. 918-42.
- [5] Nadal D, Beeching S, Cleaveland S, Cronin K, Hampson K, Steenson R, et al. Rabies and the pandemic: Lessons for one health. *Trans R Soc Trop Med Hyg.* 2022;116 (3):197-200.
- [6] Raynor B, Díaz EW, Shinnick J, Zegarra E, Monroy Y, Mena C, et al. The impact of the COVID-19 pandemic on rabies reemergence in Latin America: The case of Arequipa, Peru. *PLoS Negl Trop Dis.* 2021;15(5):e0009414.
- [7] Pentapati SSK, Debnath DJ. Updated BG Prasad's classification for the year 2022. *J Family Med Prim Care.* 2023;12(1):189-90.
- [8] Jethani S, Singh SK, Anshumali, Kamble BD, Dobhal V, Singh S, et al. Epidemiological pattern and trend analysis of animal bite cases of anti-rabies clinic of tertiary care hospital of Delhi. *J Family Med Prim Care.* 2022;11(2):728-32.
- [9] Sreenivas NS, Sakranaik S, Sobagiah RT, Kumar A. An epidemiology of animal bite cases attending tertiary care centre of Bangalore Medical College and Research Institute, Bengaluru: A retrospective study. *Int J Community Med Public Health.* 2017;4(7):2538-42.
- [10] Satapathy D, Karmee N, Reddy N, Pandit D. Seasonal trend of animal bite victims attending antirabies clinic of a tertiary care hospital, Berhampur. *APCRI J.* 2020;XXI:33-39.
- [11] Gowda P, Subhashini KJ, Metri SS, Sundar M. Study of demographic profile of animal bite cases and management practices in a dedicated anti rabies clinic of a tertiary care hospital, Hassan, Karnataka. *Int J Community Med Public Health.* 2019;6(11):4816-21.
- [12] Dixon CA, Mistry RD. Dog bites in children surge during coronavirus disease-2019: A case for enhanced prevention. *J Paediatr.* 2020;225:231-32.
- [13] Patil SP, Singh VS, Chavan SS. Study of pre-treatment practices and some of the epidemiological factors associated among dog bite cases attending outpatient department in tertiary care hospital. *Int J Health Sci Res.* 2014;4(4):34-39.
- [14] Subathra V, Kishore SG, Ranganath TS, Kumar AK. Profile of animal bite victims attending anti-rabies clinic in a tertiary care hospital, Bangalore. *RGUHS Nat J Public Health.* 2016;1(2):62-67.
- [15] Vishwanath GR, Rajderkar SS, Sangrulkar TV, Sharma SK, Gajbhiye RI. Animal bite cases in western Maharashtra, India: A retrospective study 2010-2015. *Int J Community Med Public Health.* 2018;5(4):1610-12.
- [16] Rudresh HB, Jagadeesh B, Rajgopal J. Profile of animal bite victims reporting to intradermal rabies vaccination centre at a tertiary care government hospital: 10 years experience. *Int J Community Med Public Health.* 2019;6(4):1545-48.
- [17] Pavithra R, Viveki RG, Halappanavar AB. Socio-demographic profile and management practices of animal bite cases attending anti rabies clinic in a tertiary care centre in North Karnataka. *IJAR.* 2015;5(1):371-73.
- [18] Kulkarni P, Marulappa VG, Manjunath R. Clinico-epidemiological study of human rabies cases attending epidemic disease hospital Mysore city, Karnataka, India. *Int J Community Med Public Health.* 2017;4(8):2825-29.
- [19] Manna N, Chakraborty A, Lahiri A, Bag S. Practices related to post-exposure prophylaxis of rabies in animal bite cases: A clinic-based study from a tertiary care hospital, West Bengal. *IOSR J Dent Med Sci.* 2017;16(12):26-29.

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