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Original Research

Trend Analysis of Animal Bite Cases and Utilization of Rabies Biologicals at an Anti-Rabies Clinic in Bengaluru

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Abstract

Background: Rabies is a fatal zoonotic disease and remains a major public health problem in India, contributing nearly 36% of global rabies deaths. Post-exposure prophylaxis (PEP), including anti-rabies vaccine (ARV) and rabies immunoglobulin (RIG), is highly effective in preventing rabies. This study was conducted to describe the trends of animal bite cases and usage of rabies biologicals at an anti-rabies clinic in Bengaluru. **Methods:** A descriptive retro-prospective study was conducted to assess the trends of animal bite cases reported to the Anti-Rabies Clinic, KIMS Hospital and Research Centre, Bengaluru. Case record forms of animal bite cases from January 2012 to December 2016 were reviewed. Prospectively data was collected using a structured proforma of animal bite cases who reported to the study centre for PEP during the year 2017. data analysed using descriptive statistics. **Results:** A total of 8171 cases of animal bites reported during 2012 to 2017 for availing post exposure prophylaxis. The intra-annual trend showed more cases during the months of December to April. Majority of the study subjects were adults & children. The biting animal was dog in most of the cases. Majority of the exposures were abrasions, and the commonest site of bite was on lower limbs. Majority of them had category III exposures, and all the animal bite victims received appropriate PEP. **Conclusions:** The animal bite cases were more during the months of December to April, which is breeding season of animals. All the animal bite victims received PEP as per the recommendation of WHO.

Keywords: *Animal exposure, Rabies, Trends, Post-exposure prophylaxis, Anti-rabies vaccine, Rabies immunoglobulin.*

Introduction

Rabies is a neglected zoonotic disease caused by the rabies virus, belonging to the genus Lyssavirus under the family Rhabdoviridae. It remains a major public health concern, particularly in developing countries, where it primarily affects poor and vulnerable populations living in remote rural areas and urban slums.[1] Rabies is present in more than 150 countries and territories across all continents except Antarctica and continues to pose a risk to over 3.3 billion people worldwide.[2] The disease is almost invariably fatal once clinical symptoms develop; however, it is entirely preventable through timely and appropriate post-exposure prophylaxis.[3]

Globally, rabies causes substantial health and economic burden, particularly in Asia and Africa, where the majority of cases occur. It is estimated that around 12 million people in Asia receive PEP annually following suspected rabid animal exposures. In the absence of PEP, approximately 327,000 rabies deaths would occur each year in Asia and Africa.4 Rabies also contributes to significant psychological trauma and economic burden due to the high cost of treatment and preventive measures.5

India bears a substantial share of the global rabies burden. It is estimated that approximately 17.4 million animal bites occur annually in the country, with an incidence of about 1.7%.6 Dogs are responsible for about 96% of these bites, and the large population of unvaccinated stray dogs contributes to ongoing transmission. Despite the availability of effective preventive measures, rabies deaths continue to occur due to delayed or incomplete post-exposure prophylaxis.7

Post-exposure prophylaxis is the cornerstone of rabies prevention and includes immediate and thorough wound washing, administration of anti-rabies vaccines, and rabies immunoglobulin or monoclonal antibodies for category III exposures.8 Modern cell culture vaccines are safe, effective, and widely used for both pre-exposure and post-exposure prophylaxis.9 The World Health Organization has targeted rabies for global elimination by 2030, emphasizing improved access to PEP, dog vaccination, and strengthened surveillance.

The Government of India has implemented the National Rabies Control Programme to reduce rabies mortality and improve access to PEP services.10 Monitoring trends in animal bite cases and usage of rabies biologicals is essential for planning resource allocation, ensuring uninterrupted supply of vaccines and immunoglobulin, and strengthening rabies prevention strategies.

Tertiary care anti-rabies clinics play an important role in providing PEP services and serve as valuable sources of epidemiological data on animal bite cases. Trend analysis of such data provides insights into disease burden and healthcare utilization patterns.

However, limited data are available regarding long-term trends of animal bite cases and usage of rabies biologicals in tertiary care settings in Bengaluru. Therefore, the present study was conducted to describe the trends of animal bite cases and usage of rabies biologicals at an anti-rabies clinic in a tertiary care hospital.

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Materials and Methods

The study was conducted at the Anti-Rabies Clinic (ARC) of the Preventive Medicine Unit, Kempegowda Institute of Medical Sciences (KIMS) Hospital and Research Centre, Bengaluru, after obtaining approval from the Institutional Ethics Committee. The Anti-Rabies Clinic is a tertiary care facility providing comprehensive post-exposure prophylaxis (PEP) services for animal bite victims, including wound management, anti-rabies vaccination, and administration of rabies immunoglobulin. The study was carried out over a period of one and a half years, from January 2017 to June 2018, with the objective of assessing the trends of animal bite cases and utilization of rabies biologicals among victims.

A descriptive study design was adopted, incorporating both retrospective and prospective components. The retrospective component involved collection of data from case records of animal bite victims who reported to the Anti-Rabies Clinic between January 2012 and December 2016. The prospective component included all animal bite victims who reported to the clinic between January 2017 and December 2017 and who provided written informed consent to participate in the study.

Purposive sampling was used. Inclusion criteria comprised all cases with complete records during the retrospective period and animal bite victims willing to provide informed consent and available for follow-up during the prospective period. Cases with incomplete records and re-exposure cases were excluded. Data were collected using structured case record forms maintained at the clinic. The data collected included socio-demographic information such as age, gender, address, education, and occupation; relevant past and present medical history; details of the biting animal including species and ownership status; type and category of exposure; wound characteristics; wound washing practices; rabies vaccination details including dates and route of administration; and rabies immunoglobulin administration details. Information on adverse drug reactions following vaccination and immunoglobulin administration was also recorded.

All study participants underwent detailed history taking and clinical examination to identify any pre-existing illness, history of previous rabies vaccination, or drug allergies. Post-exposure prophylaxis was provided according to World Health Organization (WHO) guidelines, which included immediate wound washing with soap and water, administration of anti-rabies vaccine, and rabies immunoglobulin for category III exposures.

The data collected were entered into Microsoft Excel and analysed using Stata version 12.1 statistical software. Statistical analysis included calculation of median, interquartile range, proportions, and percentages.

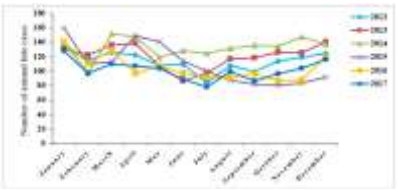
Results

A total of 8171 cases of animal bites had been reported to anti rabies clinic during the study period of 6 years, from 2012 to 2017 for availing post exposure prophylaxis. The intra-annual trend of animal bite cases reported to anti rabies clinic during this period showed that, most of the cases had reported during the months of December to April (table-1),(graph-1).

Table 1: Intra-annual trend of animal bite cases during 2012-2017

Months	2012	2013	2014	2015	2016	2017
January	132(9.7)	131(9.1)	140(8.8)	159(12.2)	140(11.2)	128(10.5)
February	115(8.5)	122(8.5)	97(6.1)	110(8.4)	111(8.8)	97(7.9)
March	126(9.3)	136(9.4)	152(9.5)	112(8.6)	129(10.3)	110(9.1)
April	122(8.9)	138(9.6)	147(9.2)	149(11.4)	97(7.7)	107(8.8)
May	108(7.9)	107(7.4)	119(7.5)	140(10.7)	107(8.5)	104(8.6)
June	109(8.1)	86(5.9)	128(8.1)	114(8.7)	97(7.7)	89(7.3)
July	84(6.2)	97(6.8)	124(7.8)	100(7.6)	92(7.3)	78(6.4)
August	108(7.9)	117(8.1)	131(8.2)	87(6.7)	91(7.2)	99(8.2)
September	99(7.3)	118(8.2)	136(8.6)	82(6.2)	96(7.7)	86(7.1)
October	114(8.4)	126(8.7)	134(8.4)	80(6.1)	86(6.9)	96(7.9)
November	119(8.7)	125(8.6)	147(9.2)	83(6.3)	88(7.1)	104(8.6)
December	124(9.1)	140(9.7)	137(8.6)	92(7.1)	120(9.6)	116(9.6)
Total	1360(100)	1443(100)	1592(100)	1308(100)	1254(100)	1214(100)

Figures in parenthesis indicate percentages



Graph 1: Intra-annual trend of animal bite cases during 2012-2017

In the study majority of the animal bite victims were adults & children. Most of the bite victims were males had studied above primary school education and were employed. As anti-rabies clinic is in the urban locality majority of them were from urban areas (table-2).

Table 2: Socio-demographic profile of animal bite victims

Socio-demographic variables		2012 (n=1360)	2013 (n=1443)	2014 (n= 1592)	2015 (n=1308)	2016 (n=1254)	2017 (n=1214)
Age (inYears)	<18	578(42.5)	618(42.8)	668(41.9)	534(40.8)	525(41.9)	450(37.1)
	18-59	675(49.6)	700(48.5)	779(48.9)	661(50.5)	618(49.3)	647(53.3)
	≥60	107(7.9)	125(8.7)	145(9.2)	113(8.7)	111(8.8)	117(9.6)
Gender	Male	998(73.4)	992(68.7)	1096(68.8	886(67.7)	848(67.6)	795(65.5)
	Female	362(26.6)	451(31.3)	496(31.2)	422(32.3)	406(32.4)	419(34.5)
Education status	Illiterate	136(10.0)	182(12.6)	209(13.1)	166(12.7)	218(17.4)	270(22.2)
	Educated	1224(90.0)	1261(87.4)	1383(86.9)	1142(87.3)	1036(82.6)	944(77.8)
Employment status	Unemployed	148(10.9)	162(11.2)	192(12.1)	157(12.0)	155(12.4)	209(17.2)
	Employed	1212(89.1)	1281(88.8)	1400(87.9)	1151(88.0)	1099(87.6)	1005(82.8)
Residence	Urban	1019(74.9)	1101(70.1)	1180(74.1)	1019(77.9)	994(75.3)	981(80.8)
	Rural	340(25.1)	432(29.9)	412(25.9)	289(22.1)	310(24.7)	233(19.2)

Figures in parenthesis indicate percentages

During the study period in majority the biting animal was dog (table-3), only 10-15% of were vaccinated, 50-55% healthy & alive and the remaining others were either non-traceable, sick, died or killed; which may be suspected rabid and pose a potential threat to the bite victim.

Table 3: Details of the biting animal

Biting animal	2012 (n= 1360)	2013 (n=1443)	2014 (n= 1592)	2015 (n=1308)	2016 (n=1254)	2017 (n=1214)
Dog	1253(92.1)	1363(94.4)	1495(93.9)	1220(93.3)	1164(92.7)	1118(92.1)
Cat	61(04.5)	52(03.6)	58(03.6)	51(03.8)	63(05.1)	62(05.1)
Monkey	23(01.7)	19(01.3)	22(01.4)	23(01.8)	15(01.1)	29(02.3)
Cow	19(01.4)	4(0.3)	9(0.6)	9(0.7)	8(0.6)	3(0.2)
Bear	1(0.1)	2(0.1)	4(0.3)	2(0.2)	0(0)	0(0)
Horse	0(0)	1(0.1)	1(0.1)	2(0.2)	3(0.2)	2(0.2)
Fox	0(0)	1(0.1)	2(0.1)	0(0)	1(0.1)	0(0)
Pig	1(0.1)	1(0.1)	0(0)	1(0.1)	0(0)	0(0)
Wild boar	2(0.1)	0(0)	0(0)	0(0)	0(0)	0(0)
Camel	0(0)	0(0)	1(0.06)	0(0)	0(0)	0(0)

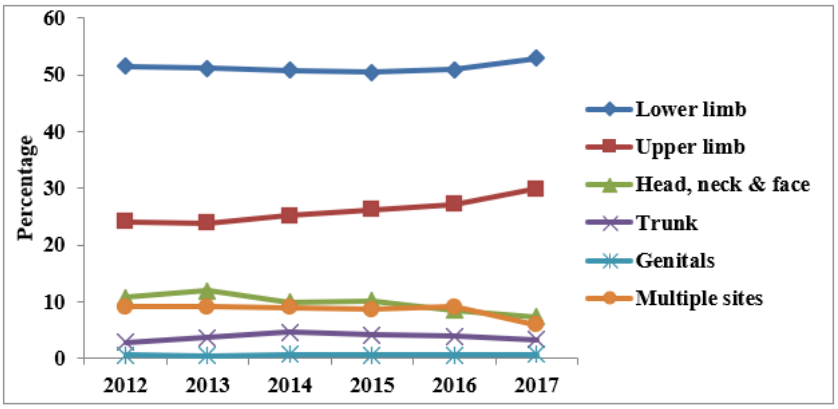
Figures in parenthesis indicate percentages

Majority of the exposures were abrasions, lacerations and punctured wounds (table-4). The commonest site of bite was on lower limb (50-52%); followed by upper limb, head, neck and face, trunk and genitals(graph-2) and most of the animal bites were unprovoked (70-75%), which may be suspected rabid animals.

Table 4: Type of animal exposure

Type of Exposure	2012 (n= 1360)	2013 (n=1443)	2014 (n= 1592)	2015 (n=1308)	2016 (n=1254)	2017 (n=1214)
Abrasion	597(43.9)	658(45.6)	788(49.5)	548(41.9)	538(42.9)	535(44.1)
Laceration	287(21.1)	228(15.8)	379(23.8)	363(27.8)	248(19.8)	263(21.6)
Punctured wound	209(15.4)	259(17.9)	173(10.9)	198(15.1)	229(18.2)	210(17.3)
Multiple wounds	241(17.7)	291(20.2)	245(15.4)	183(13.9)	226(18.1)	199(16.4)
Lick on abraded skin	5(0.4)	4(0.3)	2(0.1)	10(0.8)	9(0.7)	2(0.2)
Lick on intact skin	4(0.3)	3(0.2)	5(0.3)	6(0.5)	4(0.3)	5(0.4)

Figures in parenthesis indicate percentages



Graph 2: Trend of site of animal exposure

Most of the individuals washed their wounds with either water only (25-30%) or with soap and water (65-70%), to remove the virus which might have deposited locally at the wound site. The trend of wound washing practices has been gradually improving over the study period from 2102 to 2017, but is still inadequate; since it is the first step of post exposure prophylaxis to remove the virus present on the surface/ wound site.

Application of local antiseptics to neutralize the virus, if deposited was practiced by only few of them (1-3%). Irritants such as turmeric powder, calcium carbonate (lime), plant extract, coffee powder, jack fruit, calotropis sap were used.

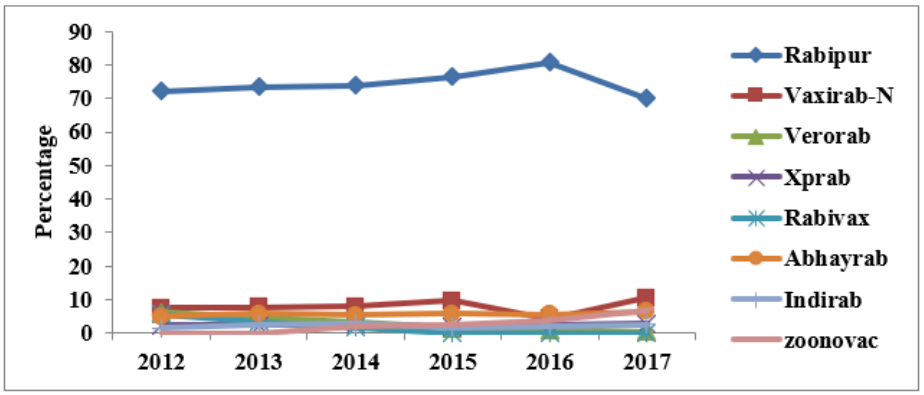
All the animal bite victims reported to anti-rabies clinic were provided complete post exposure prophylaxis as per WHO guidelines and the details are as follows (tabie-5).

Table 5: Distribution of animal bite victims according to category of exposure

Categorization of exposure	2012 (n= 1360)	2013 (n=1443)	2014 (n= 1592)	2015 (n=1308)	2016 (n=1254)	2017 (n=1214)
I	4(0.3)	3(0.2)	5(0.3)	6(0.5)	4(0.3)	5(0.4)
II	83(6.1)	79(5.5)	82(5.2)	73(5.6)	63(5.1)	58(4.8)
III	1273(93.6)	1361(94.3)	1505(94.5)	1229(93.9)	1187(94.6)	1151(94.8)

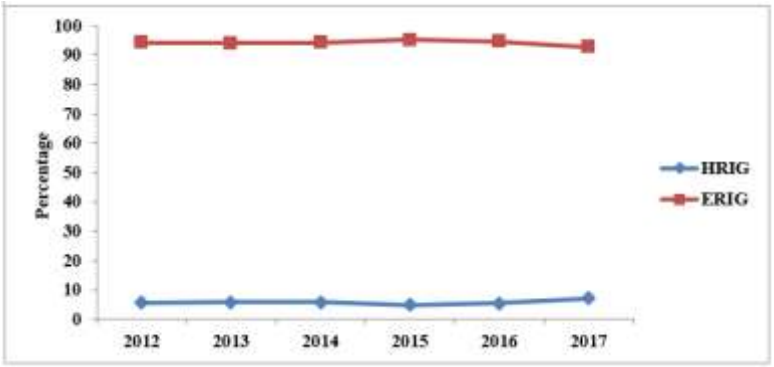
Figures in parenthesis indicate percentages

Most of the animal bite victims during the study period had received rabies vaccination through intramuscular route. The trends of the usage of different vaccines are as follows:(graph-3) The most commonly used brands of vaccines during the period of 2012 - 2017 were Rabipur, Abhayrab, Vaxirab N and Zoonovac V.



Graph 3: Trend of anti-rabies vaccines used during 2012-2017

All category III exposures were given rabies immunoglobulin as per WHO guidelines and majority of them received equine rabies immunoglobulin (ERIG) followed by human rabies immunoglobulin (graph-4). The common brands of equine rabies immunoglobulin used were Equirab and Premirab and human rabies immunoglobulin brands were Berirab P and Plasmarab.



Graph 4: Trend of types of rabies immunoglobulins used

Discussion

Rabies remains a major public health problem in India despite the availability of effective preventive measures. The present study assessed trends in animal bite cases and usage of rabies biologicals at a tertiary care anti-rabies clinic over a six-year period.

The present study reported a total of 8171 animal bite cases over a six-year period (2012-2017), with relatively consistent reporting throughout the study period. The intra-annual distribution showed that most animal bite cases were reported during the winter months from December to April. This seasonal trend may be attributed to increased aggressiveness of animals during their breeding season and increased human-animal interaction during this period.Similar findings were reported in a retrospective study conducted at M.K.C.G. Medical College, Berhampur, which observed higher reporting of animal bite cases during winter months, with peak incidence in February and lower incidence during summer and rainy seasons. This pattern was attributed to breeding behaviour of dogs and increased protective aggression, along with greater outdoor exposure of humans.11 Likewise, a retrospective study at G.C.S. Hospital, Jamnagar reported higher incidence of animal bite cases during winter months, which was attributed to breeding season, poor visibility during early morning and evening hours, and increased vulnerability of humans.12A study conducted at Dr. S.C.G. Medical College, Nanded reported increasing trends in animal bite cases over a five-year period, with peak incidence during pre-monsoon months from February to April.13 These findings suggest that seasonal variation in animal bite incidence is influenced by animal breeding patterns, climatic conditions, and human outdoor activities.

In the present study, the majority of animal bite victims were adults and children, with fewer elderly individuals affected. Males constituted the majority of victims. This finding is consistent with studies conducted at Bangalore Medical College and Research Institute, which reported that males accounted for 78% of bite victims, with most belonging to the young adult age group.14 Similarly, a study conducted at an urban health training centre in Bangalore reported that 72.4% of bite victims were males, with a significant proportion among children.15These findings indicate that males and economically productive age groups are at greater risk of animal bite exposure.

The present study also showed that most bite victims were literate and belonged to urban areas. This may be due to better healthcare access and reporting patterns, as the anti-rabies clinic was located in an urban tertiary care centre. Similar findings were reported in studies conducted in Madhya Pradesh and Karnataka, where most victims were educated and belonged to working age groups.[16,17] A study conducted in South Karnataka reported that most victims belonged to unskilled and semi-skilled occupations.18 These findings suggest that animal bite exposure is common among urban populations and economically active individuals.

In the present study, dogs were responsible for the majority (>92%) of animal bite cases. Similar findings have been reported in multiple studies conducted across India, where dogs accounted for more than 90% of animal bite cases.19,20 This confirms that dogs remain the primary reservoir and source of rabies transmission in India.Most bites were unprovoked, which is consistent with studies conducted in Madhya Pradesh and Rajasthan, where unprovoked bites constituted the majority of cases.21,22 This may be attributed to aggressive behaviour of stray dogs and increased human-animal interaction. The most common types of injury included abrasions, lacerations, and puncture wounds. The lower limb was the most frequently affected site, followed by upper limb and other body parts. Similar findings were reported in studies conducted in Surat and Lucknow where lower limbs were the most commonly affected site.23,24 This may be due to greater accessibility of lower limbs during animal attacks and the natural defensive posture of humans.

Appropriate wound washing is a critical step in rabies prevention, as it reduces viral load at the exposure site. In the present study, most victims reported washing their wounds with water or soap and water. However, only a few applied antiseptics, and some applied harmful traditional substances such as turmeric, lime, and plant extracts. Similar practices were reported in studies conducted in Haryana and Pune where victims applied substances such as turmeric powder, oil, and ash to wounds.25,26 These findings indicate gaps in awareness regarding appropriate wound care practices.

The majority of cases in the present study were Category III exposures, indicating severe exposure and high risk of rabies transmission. Similar findings were reported in studies conducted in Maharashtra and Mumbai, where Category III exposures constituted the majority of cases.27,28 This may be due to increased exposure to stray animals and delayed healthcare seeking behaviour. Most Category III exposure cases received rabies immunoglobulin as per WHO guidelines, with ERIG being the most commonly used due to its availability and affordability. Proper local infiltration of immunoglobulin was performed in most cases. Rabies vaccination was administered predominantly through the intramuscular route, although intradermal vaccination was also used.

Conclusion

The study revealed a substantial burden of animal bite cases and an increasing trend in utilization of rabies biologicals. Continuous surveillance, adequate supply of rabies vaccines and immunoglobulin, and strengthening rabies prevention programmes are essential to achieve rabies elimination goals.

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