

Compliance to post-exposure prophylaxis among animal bite patients – A hospital-based epidemiological study

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ABSTRACT

Background and Objectives: Although rabies is a 100% fatal disease, it is preventable with appropriate and timely post-exposure prophylaxis (PEP). A hospital-based study was conducted among 360 animal bite patients in the Anti-Rabies Clinic (ARC) of Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi (VMMC and SJH). **Materials and Methods:** A predesigned, pretested, structured questionnaire was administered by the interview technique to assess the compliance to PEP among the animal bite patients attending the ARC, which comprised assessment of wound washing practices adopted by the animal bite patients, administration of rabies immunoglobulin (RIG), and compliance to full course of anti-rabies vaccination (ARV). **Results:** Out of 360 study participants, 131 (54.4%) had washed the wound using soap and water and 216 (89.6%) had washed the wound for less than 5 min. The compliance to the full course of ARV was seen among 172 (47.8%) study participants, whereas 164 (45.5%) were found to be non-compliant and 24 (6.7%) were found to be delayed compliant. **Conclusions:** It was observed that a considerable segment of the study population did not practice the correct wound washing practices, and only about half of the total study participants (172; 47.8%) were found to be compliant to the full course of ARV. As rabies is a 100% preventable disease, increasing awareness pertaining to appropriate PEP may prove to be beneficial in improving the compliance to PEP and reducing the burden of mortality.

Keywords: Animal Bite, anti-rabies vaccination, compliance, post-exposure prophylaxis, rabies, wound washing practices

Introduction

Rabies is an acute viral zoonotic disease of the central nervous system (CNS) that affects all warm-blooded animals including mammals and occurs in more than 150 countries and territories.^[1] The etiological agents of rabies encephalitis belong to the Mononegavirales order, the Rhabdoviridae family, and the *Lyssavirus* genus.^[2-4]

Globally, 59,000 human deaths have been reported due to dog-mediated rabies annually, with an associated loss of 3.7 million Disability Adjusted Life Years (DALYs). Of these deaths, Asia

accounts for the major fraction, that is, 59.6% (35,172 human deaths) deaths, which translates into a loss of 2.2 million DALYs. Also, 59.9% of the deaths in Asia and 35% of human rabies annual deaths in the world are accounted for by India alone.^[2]

As rabies is practically 100% fatal, bites by cats and dogs should be considered as a “medical emergency” and the “life-saving” post-exposure prophylaxis (PEP) should be immediately provided.^[5] Extensive experience from across the globe indicates that appropriate administration of a combination of (a) local wound treatment, (b) passive immunization, and (c) vaccination has been effective in preventing the occurrence of the disease. All the three elements of treatment are equally essential since rabies has been found to occur when one of the elements has been omitted.^[6]

Prompt post-exposure use of anti-rabies vaccines (ARVs) together with appropriate wound management and concurrent

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administration of rabies immunoglobulin (RIG) at the time of severe exposures is near to 100% effective in the prevention of this disease. However, improper wound care, direct nerve inoculation, lack of patient compliance to vaccination schedules, unnoticed wounds, and delay in seeking treatment among other factors (e.g., vaccine and cold chain quality) may contribute to failure of treatment and subsequent death. It has been seen that lack of awareness on PEP against rabies and poor or noncompliance to the prescribed vaccination schedule significantly impacts the mortality rates following animal bite.^[7,8] In order to accomplish the target of zero death due to rabies by 2030, 100% compliance to PEP remains the key strategy. It becomes quite necessary to focus on consistent community awareness campaigns and efforts to make the people well informed about the seriousness of the problem. Since dog bite is a problem which prevails in both urban and rural areas, the treating physicians at the primary as well as tertiary care level have a critical role to play to sensitize the animal bite victims to complete the full course of anti-rabies vaccination along with administration of RIG and wound management practices, which have a major role in prevention of the disease. Accordingly, the study envisaged to determine the compliance to PEP among animal bite patients. Along with this, the study aimed to identify the various reasons associated with dropout rates among patients and reasons for noncompliance to full course of ARV.

Materials and Methods

Study design

This was a hospital-based study conducted at the Anti-Rabies Clinic (ARC) of Vardhman Mahavir Medical College and Safdarjung Hospital (VMMC and SJH), New Delhi.

The study participants were the animal bite victims attending the ARC of VMMC and SJH, New Delhi.

Study duration

The study was carried out from February 2019 to July 2020.

Sample size calculation

The primary aim of the study was to assess the compliance to full course of ARV among the animal bite patients. Therefore, taking the compliance to full course of ARV as 55.2% as per the study conducted by Nishant *et al.*^[9] at the anti-rabies vaccination OPD in a tertiary care hospital in Mumbai, the sample size was calculated using the formula

$$n = \frac{4pq}{d^2}$$

The sample size was calculated to be 321. After adding 10% as loss to follow-up, the sample size was computed to be 360.

Inclusion criteria

Patients with category II and category III animal bite wounds who came to the ARC for Day 0 dose of the ARV were

included in the study. Wound categorization was done as per the classification of animal bite wounds for PEP based on the World Health Organization (WHO) recommendations.^[2,5]

Data Collection

In order to attain the required sample size, non-probability convenient sampling method was used. The importance and purpose of the study was explained to the animal bite victims or to the accompanying guardians/relatives of those who were less than 18 years. Those willing to participate were included in the study and written informed consent/assent was obtained for their participation in the study. Information regarding their sociodemographic profile, history of animal bite exposure, and various domiciliary practices followed after animal bite exposure were collected using a predesigned, pretested, structured questionnaire that was administered through the interview technique. For each study participant, the follow-up was done over telephonic conversation and from the database of the ARC.

For the purpose of the present study, the following definitions were used:

Compliant- The study subjects who received the full course of ARV, that is, the scheduled doses of ARV on the recommended dates (as per the records of VMMC and SJH).

Delayed compliant- A subject who completed the scheduled doses of ARV within 60 days, but deviated from the scheduled regimen.

Dropout/noncompliant- If the study subject had taken at least one dose of ARV after animal bite, but not completed all the scheduled doses (as per the records).

Data analysis and statistical methods

All the data were coded and entered into a master sheet on MS Office Excel and later transferred to Statistical Package for the Social Sciences (SPSS; IBM SPSS Statistics 21.0) for analysis. For the data entered into the worksheet of MS Excel, data validation checks were carried out at regular intervals. The results obtained were represented as percentages and proportions and depicted as graphs and tables.

Ethical consideration

The Institute Ethics Committee of VMMC and SJH, New Delhi, provided the ethical clearance.

Results

The study was conducted among 360 animal bite patients who attended the ARC of VMMC and SJH following animal bite incident. The sociodemographic profile of the study participants is presented in Table 1.

The age of the participants ranged from 2 to 65 years, and the mean age was 29.3 ± 15.2 years. The study participants' median age (interquartile range) was 26 (18–40) years.

Around three-fourths (266; 73.9%) of the study participants were males and one fourth (94; 26.1%) were females. Majority (298; 82.8%) of the study participants were literate. While 212 (58.9%) participants were employed, slightly greater than one fourth (27.5%) were students [Table 1].

Most (118; 32.8%) of the study participants were from Class II socioeconomic status followed by Class III (91; 25.3%), based on the Modified BG Prasad Socioeconomic Classification, Update-2019.^[10]

Majority (317; 88.1%) of the bites were caused due to dogs. Almost four-fifths (298; 82.8%) of the animal bite patients were bitten by stray animals and 53 (14.7%) were bitten by pet dogs.

Majority (291; 80.8%) of the study participants had category III wounds based on WHO recommendations for classification of animal bite wounds for PEP. While majority (217; 60.3%) of the study participants presented with single wounds, the most common type (227; 63.1%) was observed to be abrasion wounds [Table 2].

Compliance to PEP

A. Wound washing practices

Out of the 360 study participants, 241 (66.9%) reported to have washed their wounds before coming to the hospital and among those who washed their wounds, majority (182; 75.5%) reported to have washed the wounds within 30 min of the incident, 131 (54.4%) had washed the wound using soap and water, and 216 (89.6%) had washed the wound for less than 5 min [Table 3].

There was no significant association between the sociodemographic parameters of the study participants and the wound washing practices ($P > 0.05$).

B. Rabies immunoglobulin

Among the 291 category III bite cases, 256 (88%) were administered RIG. The reasons for non-administration of RIG were that some of the study participants did not give consent for local wound infiltration due to fear of pain and infection. Further, all the 360 study participants were administered tetanus toxoid (TT) injection.

C. Compliance to ARV

Of the 360 study participants, 172 (47.8%) were found to be compliant to the full course of ARV, 164 (45.5%) were found to be noncompliant, and 24 (6.7%) cases were of delayed compliance [Figure 1].

Out of the 360 study participants who were administered Day 0 dose of ARV, 67 (18.7%), 122 (33.9%), and 164 (45.6%) participants dropped out on the 3rd, 7th, and 28th day of ARV administration, respectively [Table 4].

Among the 24 study participants who were delayed compliant, the minimum and maximum number of days of delay were 1

Table 1: Sociodemographic profile of animal bite patients (N=360)

Variable	Number (n)	Percentage (%)
Age (years)		
0-20	112	31.1
21-59	237	65.8
≥60	11	3.1
Gender		
Male	266	73.9
Female	94	26.1
Occupation		
Employed/working	212	58.9
Student	99	27.5
Housewife	33	9.2
Unemployed	9	2.5
Retired	7	1.9
Literacy status		
Literate	298	82.8
Illiterate	62	17.2

Table 2: Distribution of the study participants according to the characteristics of animal bite exposure (N=360)

Variable	Number (n)	Percentage (%)
Type of Animal		
Dog	317	88.1
Cat	22	6.1
Monkey	16	4.4
Rat	5	1.4
Category of wound*		
Category II	69	19.2
Category III	291	80.8
Number of wounds		
Single	217	60.3
Multiple	143	39.7

WHO=World Health Organization. *According to WHO recommendation^[26]

Table 3: Distribution of study participants according to the wound washing practices following animal bite

Variable	Number (n)	Percentage (%)
Wound washing practice (N=360)		
Wound washing done	241	66.9
Wound washing not done	119	33.1
Method of wound washing (n=241)		
Wound washing using soap and water	131	54.4
Wound washing using water only	110	45.6
Duration of wound washing (n=241)		
0-5 min	216	89.6
6-10 min	23	9.6
11-15 min	02	0.8

and 10 days, respectively, and the maximum cases of delay were reported for the 28th day dose.

The most common reasons for delay were found to be residential distance from the ARC (17; 70.8%), followed by forgetfulness about the scheduled dates (11; 45.8%) and fear of loss of wages (7; 29.2%).

Table 4: Distribution of study participants according to the delayed and dropout rates to the full course of ARV (N=360)

Dose of ARV	Number of compliant cases (%) [*]	No. of delayed compliant cases (%)	No. of dropout cases w.r.t. Day 0 dose of ARV (%)
Day 0	360 (100%)	NA	NA
Day 0, 3	287 (79.7%)	6 (1.6%)	67 (18.7%)
Day 0, 3, 7	224 (62.2%)	14 (3.9%)	122 (33.9%)
Day 0, 3, 7, 28	172 (47.8%)	24 (6.6%)	164 (45.6%)

ARC=Anti-Rabies Clinic, ARV=anti-rabies vaccine, NA=not applicable. ^{*}As per the ARC records

Table 5: Distribution of study participants according to the reasons for noncompliance to ARV (n=86)

Reasons for noncompliance	Number [*]	Percentage (%)
Place of residence far away from the ARC	43	50.0
Fear of loss of wages	33	38.4
Forgetfulness	24	27.9
Ill advice from relatives, friends, etc.	18	20.9
Biting animal was observable	15	17.4
Household responsibilities	7	8.1

ARC=Anti-Rabies Clinic, ARV=anti-rabies vaccine. ^{*}Multiple responses possible

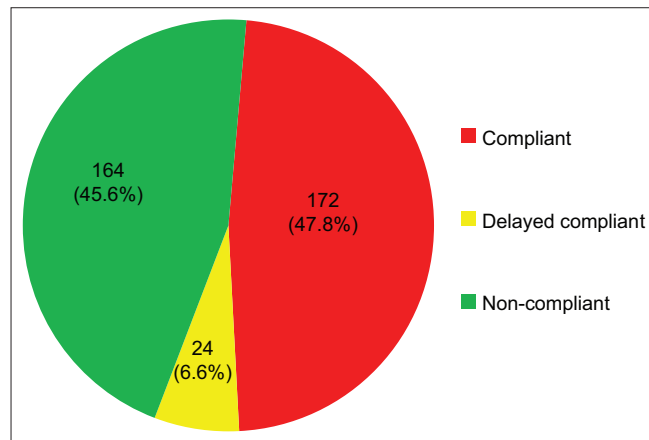


Figure 1: Distribution of the study participants according to compliance to the full course of ARV (N= 360). ARV = anti-rabies vaccine

Non-compliance to ARV

Of the 360 study participants, 164 (45.6%) were found to be noncompliant, among which the noncompliance was maximum for Day 3 dose of ARV.

On telephonic interview, 46 study participants reported to have taken the full course of ARV at other health facilities (govt./private); 32 study participants could not be contacted telephonically even after three attempts, and accordingly, were classified as loss to follow-up cases. The remaining 86 study participants gave the following reasons for noncompliance to ARV administration.

The most common reasons for non-compliance to ARV administration were found to be place of residence being far away from the ARC (43; 50.0%) and fear of loss of wages (33; 38.4%) [Table 5].

Discussion

In the present study, age of the study participants ranged from 2 to 65 years and the mean age of participants was found to be 29.3 ± 15.2 years. Most (317; 88.1%) of the animal bites were caused due to dogs, followed by cats (22; 6.1%).

Out of the 360 study participants, 241 (66.9%) reported to have washed their wounds before coming to the health facility, and among the 241 study participants who had washed their wounds, only 131 (54.4%) had washed the wound with water and soap.

Similar findings were reported by Shankaraiah *et al.*^[11] in their study that following animal bite, wound washing was done in only 68.2% of intra-dermal rabies vaccination (IDRV) group subjects and 66.0% of intra-muscular rabies vaccination (IMRV) group subjects. Venkatesan *et al.*^[12] and Lilage *et al.*^[13] reported in their studies that 64% and 72.2% of animal bite victims had washed the wound site, respectively. However, the findings of the present study were different from those reported by Jain *et al.*^[14] and Salve *et al.*^[15] who reported only 18.7% and 24.1% patients, respectively, had washed their wounds with running water or water with soap before attending the ARV clinic.

In the current study, of the 360 study participants, 172 (47.8%) were compliant to the full course of ARV. These findings were comparable to the findings of Sahu *et al.*,^[16] Vinay *et al.*,^[17] and Malkar *et al.*,^[18] who reported 52.3%, 53.2%, and 42.81% of the study subjects being compliant to the complete ARV schedule in their studies, respectively. Higher compliance was reported in the study by Dhaduk *et al.*,^[19] where 68% of the victims had completed the full course of ARV schedule within 28 days from the day of bite. Similar findings were also reported by Domple *et al.* and Shankaraiah *et al.*, where 76.5% and 77% of the animal bite victims were compliant to the full course of ARV, respectively.^[11,20] However, Patil *et al.*^[21] reported in their study that only 34.3% of the cases completed the full course of vaccination, which was low compared to the present study.

The most common reasons for noncompliance to ARV administration were found to be residence being far away from the ARC and fear of loss of wages. According to the study conducted by Anandaraj *et al.*,^[22] lack of time and health status of the animal were the common reasons cited for noncompliance. Ganasva *et al.*^[23] reported personal work, due date of vaccination being a

holiday, minor wound, forgetfulness, or economic problems as the reasons for noncompliance. However, Shankaraiah *et al.*^[11] reported in their study the main constraints for noncompliance to be forgotten dates, distance from the hospital, cost incurred, loss of wages, and interference with school timings/working hours.

The present study highlights that there is a need to improve the compliance to full course of vaccination against rabies, and hence, educating the general population and raising their awareness about the same becomes extremely relevant. In this regard, the primary health-care providers and family physicians, being the first point of contact for the animal bite victims in rural and urban areas, have an important role to play. They can counsel their patients about the importance of PEP in the prevention of this fatal disease. They can explain their patients about the importance of compliance to the full course of ARV schedule and the importance of wound management following animal bite. The misconceptions of the community regarding this fatal disease and administration of ARV can be addressed to a large extent by the health-care providers and physicians, which can contribute a lot toward improving the PEP of patients following animal bite.

Conclusion/Recommendation

This study is one of the very few hospital-based studies that has been carried out in the National Capital Region (NCR) of Delhi for assessing the compliance to PEP following animal bite. In the current study, it was observed that out of the 360 study participants, only 172 (47.8%) were compliant to the full course of ARV. Further, the study found no significant association between the different sociodemographic parameters of the study participants and their compliance to complete the ARV schedule and the wound washing practices followed. This suggests that in the advanced era of technology, different sections of the society are still unaware of the importance of PEP. The key take-home message is an urgent need to improve the compliance to full course of ARV among the animal bite patients by carrying out proper counseling and emphasizing the importance of completing the full course regimen by the health-care workers at the ARC, in order to save the patients from this fatal disease. Additionally, printed information education communication (IEC) materials (containing relevant information about the disease, its prevention and cure, importance of vaccination, etc.) can also be provided to such animal bite victims to improve their knowledge and awareness. A mobile application may be developed, which may be utilized to enhance the compliance to full course of ARV by giving timely reminders to the animal bite patients on or before the scheduled doses of ARV. The most common reasons for noncompliance to ARV administration among the 86 study participants were found to be place of residence being far away from the ARC and fear of loss of wages. This finding suggests the need to strengthen the health system and ensure vaccine availability at most of the health facilities in order to improve accessibility of the general public to vaccines, so as to prevent dropouts and noncompliance to vaccination

due to fear of loss of wages and residence being far away from the ARC centers.

Key message

A considerable segment of the study population who approached the health-care facility for vaccination following animal bite had not resorted to correct/proper wound washing practices, and almost half of them did not complete the full course of ARV. Several literature studies show this practice to be quite common in both rural and urban settings. Primary care physicians can play a significant role in promoting health education activities and community awareness regarding the importance of PEP following animal bite and in explaining the significance of completing the entire schedule of ARV, which is available free of cost at the government health-care centers. This can create a positive impact on the general public, which will eventually lead to the prevention of deaths occurring due to rabies and will also be an essential step toward elimination of this fatal disease. As rabies is 100% preventable, increasing awareness regarding its prevention can certainly prove to be beneficial in the near future.

Declaration of patient consent

All appropriate patient consent forms have been obtained and patients' consent were taken for use of their images and other clinical information to be reported in the journal.

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Conflicts of interest

There are no conflicts of interest.

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