

**Title:** COST ANALYSIS OF RABIES PROPHYLAXIS AMONG PET DOGS OWNERS IN BANGALURU CITY

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**Keywords** Cost Analysis, Rabies Prophylaxis, PrEP

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## Original Article

## COST ANALYSIS OF RABIES PROPHYLAXIS AMONG PET DOG OWNERS IN BENGALURU CITY

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### ABSTRACT

**Introduction:** Pet dogs constitute a significant proportion of dog bites.

**Objectives:** To compare cost incurred between pre exposure and post exposure rabies prophylaxis among pet dog owners.

**Subjects and Methods:** All category II & III pet dog bite subjects attending anti rabies clinic of a medical college hospital for a period of three months in the second quarter of 2016 were the study subjects.

**Results:** Average cost of PEP per subject was Rs. 3280. Average cost of PrEP per subject was Rs. 720. The cost incurred by PEP is 4.5 times that of PrEP. The cost incurred for PEP in private hospital is 4.31 times more than that in Government hospitals. The cost incurred for pet dog vaccination in private clinics is twice that of government veterinary hospitals. The cost of PrEP for a family is lesser than PEP of an individual or lifetime vaccination of a pet dog.

**Conclusion:** PrEP for individual/ family is economical than PEP in subjects owning pet dogs.

**Key words :** Cost Analysis, Rabies Prophylaxis, PrEP.

### INTRODUCTION

In India, 17.4 million animal bite cases occur annually and an estimated 20,000 human rabies deaths occur annually constituting 36% of rabies deaths in the world.<sup>1</sup> It was reported that there are approximately 25 million dogs, with an estimated dog : man ratio of 1:36 in India.<sup>1</sup> In urban areas of our country, dogs are responsible for about 96% of animal bite cases.<sup>2</sup>

An estimated 10 million people worldwide receive expensive post-exposure rabies prophylaxis (PEP) annually.<sup>3,4</sup> Every year about 5 million in India receive post-exposure vaccination.<sup>5</sup>

Purified equine or human rabies immunoglobulin (ERIG or HRIG) are expensive, often in short supply or not available when and where needed the most.<sup>3,6</sup> Importantly, scarce and expensive immunoglobulin is not needed in a patient who had PrEP.<sup>7</sup> The cost of post exposure prophylaxis (PEP) is high, but if the family had taken pre exposure prophylaxis (PrEP), the cost is cheaper. The efficacy of animal vaccines is not

100% and complete vaccination of pet dogs seem to be costly. Increasing accessibility and reducing costs should therefore be prioritized.

Hence, the present study was taken up with the following objectives : To compare cost incurred between Post Exposure Prophylaxis (PEP) and Pre Exposure Prophylaxis (PrEP) among pet dog owners and to compare the estimated cost of PEP viz PrEP viz Pet dog vaccination.

### SUBJECTS & METHODS

This descriptive study was conducted in the Anti-Rabies Clinic (ARC) of a Medical College Hospital in Bengaluru city on all the Category II & III pet animal bite subjects attending ARC during the second quarter of 2016.

**Inclusion Criteria:** All pet dog bite subjects attending ARC were included and those who are not willing to reveal the required information by phone and who did not complete PEP upto day 28 were excluded. A total of 96 subjects with category II/III exposure fulfilled the inclusion and exclusion criteria. The cost for PEP, estimated cost of PrEP for

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the same subjects, projected cost for the entire family and lastly estimated cost of pet dog vaccination was analyzed and compared. The cost calculated for rabies prophylaxis was based on the existing rates prevailing as on 2016. Statistical tests used were mean, median and percentages.

### METHODOLOGY

All pet dog bite subjects with category II or III exposures were interviewed using a semi structured proforma to find out the costs incurred for the treatment (direct & indirect costs) at the ARC of a medical college hospital in Bengaluru city. They were subsequently followed up through telephonic interviews (up to day 28) to find out the costs incurred to complete PEP. If the same study subjects, would have taken PrEP, the cost incurred for PrEP was calculated, assuming a similar distribution of IM and ID vaccination. As every member of family is vulnerable to pet dog bites, the approximate cost of PrEP was scaled up to calculate for entire family. Similarly, the cost of pet dog vaccination was estimated. The regimens followed for PEP schedule were Essen regimen (IM) and Updated Thai Red Cross regimen (ID). PrEP schedule was one full vial of re-constituted vaccine administered intramuscularly (IM) or 0.1ml of 1.0 ml/diluent-containing government approved vaccine administered ID on days 0, 7 and 28. The cost calculated for rabies vaccine administration includes treatment taken in both government and private settings during the course.

### RESULTS

A total of 96 subjects were enrolled in the study, of which 31(31.22%) had category II & 69 (71.88%) had category III exposures. All the study subjects were exposed to pet dogs only. Median age of the study subjects was 24 [inter quartile range: 10-36] years, majority of them were males, from an urban locality and bitten by partially vaccinated pet dogs. 56 (58%) subjects had received ARV by IM route and 40 (42%) by ID route.

The average cost of PEP for an individual was Rs. 3,280 : Direct cost - Rs. 2,494 and Indirect cost - Rs. 786 (Table-1). The minimum cost was Rs. 320

and maximum cost was Rs. 16,710. The total cost of PEP for 96 subjects was Rs. 3,14,840 : Direct cost - Rs. 2,39,410 and Indirect cost-Rs.75,430. The cost has been calculated based on actual cost of HRIG/ERIG administration, vaccination by different routes, schedules, place of administration during the course of 28 day follow up of dog bite subjects. Majority of pet dog bite subjects took the rabies vaccine second dose onwards in a clinic/hospital near their home.

**Table 1**  
Average cost of PEP based on the interview of subjects of pet dog bites. (n= 96)

Cost	Variables	Average cost (in Rs)
Direct	Wound care (NSAIDs, Antibiotics, suturing, dressing and TT)	155
	Premedication (Pheniramine, Ranitidine and Hydrocortisone)*	8
	Rabies Vaccine**	801
	Rabies Immunoglobulin	824
	ARV, RIG- administration & injection charges	456
	Hospitalisation	250
Indirect	Travel for RIGs	120
	Travel for ARV	165
	Loss of wages	477
	Others (food)	24
<b>Total</b>		<b>3,280</b>

In case of PEP, the 56 subjects who had taken rabies vaccine by IM route, the total cost of rabies vaccine was Rs. 95,200 ( Rs.340 x 5 doses x 56 subjects ) and average cost Rs,1700. The total cost of PEP by IM route was Rs. 2,49,620 and

**Table 2**  
Estimated average cost of PrEP for the same subject(n= 96)

PrEP Cost	Variables	Average cost (in Rs)
Direct	Rabies Vaccine (3 doses)	484
	Rabies vaccine -administration and injection charges	115
Indirect	Travel for ARV	107
	Others (food)	14
	<b>Total</b>	<b>720</b>

average cost per individual was Rs. 4,457 : Direct cost was Rs. 3,490 & indirect cost was Rs. 964. Similarly, 40 subjects who had taken rabies vaccine by ID route ,the total cost of rabies vaccine was Rs. 10,880 (Rs. 340 x 4 doses x 0.2 ml x40 subjects) and

average cost Rs. 272. The total cost of PEP ID route was Rs. 65,220 and average cost per individual was Rs.1,630 : Direct cost was Rs. 1095 & indirect cost was Rs. 535. Average cost of PEP by ID/IM route=1630:4,457=1:2.7. PEP by IM route costs 2.7 times more than PEP given by ID route.

The number of vials required for PrEP compared to PEP is in the ratio of 12:32 = 1: 2.7 by ID route (n=40) and 168:280 = 1:1.7 by IM route (n=56). Cost of PrEP : PEP for subjects would have been Rs. 4,080 : Rs. 10,880 by ID route and Rs. 57,120 : Rs.95,200 by IM route. The average cost of PrEP by ID/IM route per subject was Rs. 102 : Rs.1,020 = 1:10.

A comparison of costs of PEP in various hospitals is as follows. Estimated average cost of PEP in tertiary government hospital was Rs. 1,560; corporation health centre was Rs. 1,775; private medical college hospital was Rs. 4,825 and private hospital was Rs. 6,725. The cost incurred for PEP in private hospital is 4.3 times that of Government hospitals.

The estimated average cost of PrEP for an individual was Rs. 720 : Direct - Rs. 599 and Indirect - Rs. 121 (Table-II). The minimum cost was Rs.128 and maximum cost was Rs. 1,980. The total estimated cost of PrEP for 96 subjects was Rs. 69,150 : Direct - Rs. 57,504 and Indirect- Rs. 11,646.

The average family size was 4.42. The projected average cost of PEP for a family was Rs.14,498 and PrEP for a family was Rs.3,182. The cost incurred by PEP for an individual will be 4.5 times that of PrEP.

The total estimated average cost of pet dog vaccination for lifetime in government veterinary hospital was Rs. 5,600; Direct – Rs. 2,800 (Rabies Vaccine -first year - 2 doses and annually 1 dose @ Rs. 200 per dose); Indirect – Rs. 2,100 ( Travel expenses @ Rs. 150/visit and other expenses like food @ Rs. 50/visit). On the other hand, the total estimated average cost of pet dog vaccination for lifetime (13 years) in private veterinary practitioner was Rs. 11,200 ; Direct – Rs. 4,900 (Rabies Vaccine

-1st year-2 doses and annually 1 dose @ Rs. 350 per dose, consultation @ Rs. 200 per visit; Indirect – Rs. 2,100 ( Travel expenses @ Rs. 150/visit and other expenses like food @Rs. 50/visit).

The cost of PEP for an individual was Rs. 3,280, PrEP for an individual was Rs. 720, PrEP for a family was Rs. 3,182 and vaccination of pet dog was for life was approximately Rs. 5,600. The cost of PrEP for a family was lesser than PEP for an individual or lifetime vaccination of a pet dog.

## DISCUSSION

In the present study, an attempt was made on cost analysis of PEP, PrEP and pet dog vaccination in terms of - direct costs which includes wound care, premedication, ARV, RIGs, consultation and hospitalization; Indirect cost such as travel ,loss of wages and food .The subjects had taken treatment from different places of vaccination i.e., government/private hospitals and different routes of administration(IM/ID) . Hence, cost calculated is based on the actual observation of PEP for 96 subjects. If all the subjects had taken vaccine by IM route or ID route, the average cost of PEP will be different. Similarly for PrEP the cost will vary depending on IM/ID and administration of vaccine in government or private sector.

In a resource scarce country like ours, availability of rabies vaccine at all the time is questionable. In such a scenario, PrEP is preferable for pet dog owners as estimated number of vials required for PrEP is less compared to PEP. Similarly, on re-exposure, the need for booster doses of vaccine in case of PrEP will not cause an economic burden to individual compared to re-exposure management in case of PEP. Further with PrEP, the fear of reactions to ERIG or non-availability of the human rabies immunoglobulin HRIC will not be a problem. Therefore PrEP can be considered as a cost economical intervention for prevention of rabies among pet dog owners.

Rabies vaccine needs to be administered annually for lifetime for protection against the disease in pet dogs. The cost of pet dog vaccination is a little more than PrEP, but lesser than PEP for

entire family. However vaccination is still recommended in pet dogs to prevent rabies. Comparison of pet dog vaccination between government and private hospitals showed that cost is 2 to 4 times more in private sector.

WHO also recommends PrEP to all the pet dog owners.<sup>8</sup> A comprehensive mass dog vaccination programmes is the most cost-effective way to protect everyone exposed to a dog bite. In December 2015, WHO, OIE, FAO and the Global Alliance for Rabies Control agreed a strategic framework to end human deaths globally from dog-mediated rabies by 2030.<sup>9</sup> About 17% of households reported having a pet/domesticated dog and the pet dog: man ratio was 1: 36. Pet dog care/management practices were not satisfactory with a low veterinary consultation (35.5%) and vaccination (32.9%). The situation was slightly better in urban areas. Pet dogs constituted 40% of bite cases.<sup>10</sup>

Elimination of dog rabies is less expensive than increased efforts to provide effective post-exposure treatment or initiating universal pre-exposure vaccination. Canine rabies control thus remains the only long-term cost effective means of eliminating this disease.<sup>11</sup> Pre exposure prophylaxis is a cost effective strategy which can aid in the control and elimination of rabies in endemic countries.<sup>12</sup>

PrEP may be offered to high risk groups. Only veterinary and forest staff are currently given PrEP.<sup>13</sup> There is a need for PrEP for all the family members owning pet dog. Combination of PrEP and pet dog vaccination is recommended as it is cost economical for prevention and control of rabies in India.

## CONCLUSION

PrEP for individual/ family is economical than PEP in subjects owning pet dogs.

## LIMITATION OF THE STUDY

The cost of PEP for the entire family is calculated on the assumption that every member

will have an exposure to pet dog. The cost of pet dog vaccination is based on the assumption of one dog per family. The life span of dog is assumed to be 13 years and cost of re-exposure prophylaxis is not a part of the study.

## RECOMMENDATION

In rabies endemic countries, the safety and best protection of people is through PrEP and pet dog vaccination.

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