ORIGINAL RESEARCH ARTICLE

Out of pocket expenditure for availing rabies post exposure prophylaxis

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INTRODUCTION

The out of pocket expenditure for rabies post exposure prophylaxis is substantial and is borne by those who can least afford it. This depends on route of vaccine administration and the type of rabies immunoglobulin used; in addition, there are indirect expenses such as travel, loss of wages, food and others.

OBJECTIVES

1. To describe the type of exposures and the post exposure prophylaxis received.
2. To estimate the out of pocket expenditure for availing post exposure prophylaxis.

METHODOLOGY

The study was conducted at the anti-rabies clinic, KIMS Hospital and Research Centre, Bangalore from Jan - Dec 2018. The details regarding out of pocket expenditure for PEP i. e, direct cost which includes amount spent on drugs & hospital charges and indirect cost like loss of wages, travel of patient and their attenders were collected. The data was analyzed using descriptive statistics.

RESULTS

A total of 858 Category III animal bite victims had availed post exposure prophylaxis; among whom, 724 had taken vaccination through intramuscular route & 134 through intradermal route. The cost incurred for PEP by intramuscular rabies vaccination was Rs. 4943 (IQR Rs. 4530 – 5440), with direct cost of Rs. 3580 (IQR Rs. 3290 - 3815) and indirect cost of Rs. 1350 (IQR Rs. 1050 – 1750). The cost incurred for intradermal rabies vaccination was Rs. 2663 (IQR Rs. 2353 – 3065), with direct cost of Rs. 1741 (IQR Rs. 1580 - 2058) and indirect cost of Rs. 910 (IQR Rs. 590 - 1180).

CONCLUSION

The economic burden for receiving the post exposure prophylaxis is substantial.

INTRODUCTION

Animal bites are a major public health problem in most of the developing countries. In World Health Organization (WHO)'s South East Asia Region, there are more animal exposures than in any other part of the World; by virtue of large human and dog populations living in congested habitable areas. [1] More than 1.4 billion people in this region are at risk of rabies infection. Therefore, it continues to be a major public health and economic problem throughout the region, in most of the countries. [2,3]

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Timely and complete post exposure prophylaxis (PEP) for exposed individuals is necessary to prevent rabies; but, the financial expenditure for PEP in any country is substantial; which has to be borne by those who can least afford it. Poor people are at a higher risk and the average cost of rabies PEP after contact with a suspected rabid animal is about US$ 45 in Asia, where the average daily income is about US$ 1–2 per person. [4] In developing countries, an estimated 3.8% of the GNP and 31 days wages of an average Asian is spent for full course of PEP. [3] The type of anti-rabies vaccine (ARV) and route of administration as well as the type of rabies immunoglobulin (RIG) used, all significantly influences the cost of treatment. In addition to the expense of rabies biological, expenditures for the physician, hospital, loss of income and the emotional & psychological impact of PEP. Post exposure prophylaxis is provided both in government and private health care facilities. Even though PEP is provided free of cost in most of the government hospitals, the animal bite victims will incur expenditure in the form of hospital user fees, purchase of syringes & drugs, loss of wages and travelling cost. [4,5,6]

OBJECTIVES

1. To describe the type of exposures and the post exposure prophylaxis received
2. To estimate the out of pocket expenditure for availing post exposure prophylaxis

MATERIALS AND METHODS

(a) **Study Place:** Anti rabies clinic, KIMS Hospital & research center, Bangalore.

(b) **Study subjects:** Animal bite victims.

(c) **Study Period:** 1 year.

(d) **Study design:** Descriptive study.

(e) **Sampling design:** Purposive sampling.

(f) **Sample Size:** 858

(g) **Inclusion Criteria:**

- Animal bite victims willing to give informed consent.
- All category III animal exposures.
- Subjects available for follow-up.

(h) **Exclusion Criteria:**

- Category II & category III animal exposures.
- Re-exposure cases visiting for post exposure prophylaxis.

METHODOLOGY

The study was conducted at the anti-rabies clinic, KIMS Hospital and Research Centre, Bangalore from January to December, 2018 after obtaining the clearance from institutional ethics committee. All animal bite victims willing to give consent were included in the study. All study subjects were provided with PEP according to WHO recommendations in the anti rabies clinic. The details regarding socio-demographic characteristics, characteristic of biting animal, details of animal exposure and out of pocket expenditure for PEP i. e, direct cost which includes amount spent on drugs & hospital charges and indirect cost like loss of wages, travel of patient and attenders were collected. The data was entered using MS-Excel and analyzed using descriptive statistics.

RESULTS

The study included 858 Category III animal bite victims; among them 724 (84.4%) had received PEP through IM route and 134 (15.6%) through ID route. Majority of animal bite victims were <18 years of age (48.9%) followed by 48.4% of age group 18-59 years and 2.7% of age > 60 years. 64.8% of animal bite victims were males and 35.2%

were females. Most of them had completed schooling (54.0%), 23.5% were illiterates and 22.5% were graduate/post graduate. 36.5% of animal bite victims were students.

Table 1: Characteristics of biting animal.

Characteristics of biting animal		IMRV (n=724)	IDRV (n=134)	TOTAL (n=858)
Biting Animal	Dog	663(91.6)	129(96.3)	**792(92.3)**
	Cat	37(5.1)	3(2.2)	40(4.7)
	Monkey	21(2.9)	1(0.7)	22(2.6)
	Cow	3(0.4)	1(0.7)	4(0.5)
Vaccination Status of animal	Vaccinated	85(11.7)	10(7.5)	**95(11.1)**
	Unvaccinated	260(35.9)	20(14.9)	280(32.6)
	Don't know	379(52.3)	70(52.2)	449(52.3)
Fate of biting animal	Healthy	401(55.4)	64(47.8)	**465(54.2)**
	Sick	68(9.4)	12(9.0)	80(9.3)
	Died	14(1.9)	16(11.9)	30(3.5)
	Killed	37(5.1)	16(11.9)	53(6.2)
	Not traceable/ Unknown	204(28.2)	26(19.4)	230(26.8)

In 92.3% of cases the biting animal was dog, followed by cat, monkey and cow. But only 11.1% of biting animal were vaccinated against rabies, 32.6% were unvaccinated and in 52.3% the vaccination status of biting animal was not known. Among biting animals 54.2% were healthy, 26.8% were not traceable, 9.3% were sick, 6.2% were killed, and 3.5% died.

Table 2: Characteristics of Exposure.

Characteristics of exposure		IMRV (n=724)	IDRV (n=134)	TOTAL (n=858)
Place of bite	Home	118(16.3)	25(18.7)	227(26.5)
	Outside of home	606(83.7)	109(81.3)	**631(73.5)**
Type of Exposure	Abrasion	350(48.3)	59(44.0)	**409(47.7)**
	Laceration	151(20.9)	25(18.7)	176(20.5)
	Puncture wound	115(15.9)	19(14.2)	134(15.6)
	Multiple wounds	108(14.9)	31(23.1)	139(16.2)
Site of Exposure	Lower limb	382(52.8)	59(44.0)	**441(51.4)**
	Upper limb	207(28.6)	47(35.1)	254(29.6)
	Head, neck & face	57(7.9)	18(13.4)	75(8.7)
	Trunk/Genitals	36(5.0)	4(3.0)	40(4.7)
	Multiple sites	42(5.8)	6(4.5)	48(5.6)
Circumstance of bite	Provoked	198(27.3)	35(26.1)	233(27.2)
	Unprovoked	526(72.7)	99(73.9)	**625(72.8)**

Most of the animal exposure happened while victims were outside the home (73.5%) and majority of them were unprovoked bites (72.8%). Abrasion (47.7%) were the most common type of wound followed by lacerations

(20.5%), punctured wounds (15.6%) and multiple wounds (16.2%). Among the study subjects Lower limbs (51.4%) were affected the most followed by upper limbs (29.6%), head neck and face (8.7%), trunk/genitals (4.7%) and multiple sites(5.6%).

All animal bite victims were provided with post exposure prophylaxis which included thorough wound wash, anti-rabies vaccine administration and rabies immunoglobulin infiltration at the study centre as recommended by WHO. [6]

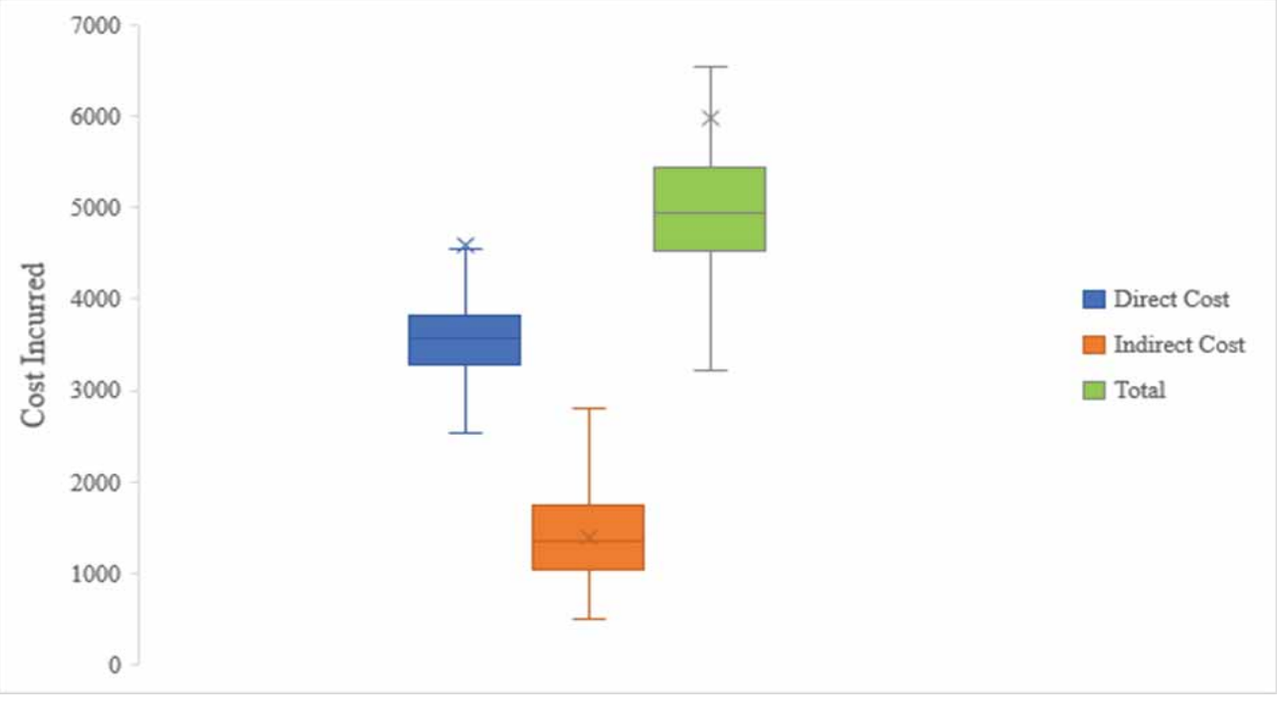
The cost incurred for availing post exposure prophylaxis who had taken intramuscular anti-rabies vaccination in the anti-rabies clinic was assessed among 724 animal bite victims

Table 3: Cost incurred for post exposure prophylaxis by intramuscular route (n=724)

Direct cost	Day 0 Median (Q1-Q3)	Day3 Median (Q1-Q3)	Day7 Median (Q1-Q3)	Day14 Median (Q1-Q3)	Day28 Median (Q1-Q3)	Total Median (Q1-Q3)
Cost of ARV	350 (325-350)	350 (325-350)	350 (325-350)	350 (325-350)	350 (325-350)	1750 (1625-1750)
Cost of RIG	930 (470-950)	0	0	0	0	930 (470-950)
Administration charges	370	0	0	0	0	370
Cost of pre-medication	60 (0-60)	0	0	0	0	60 (0-60)
Cost of TT vaccination	50	0	0	0	0	50
Cost of antibiotics/ anti- inflammatory	290 (250-350)	0	0	0	0	290 (250-350)
Cost of Disposables	38 (35-45)	0	0	0	0	38 (35-45)
Hospital Charges	50 (25-100)	50 (20-60)	50 (20-60)	50 (20-60)	50 (20-60)	225 (140-350)
Direct Cost Median (Q1-Q3)	2060 (1681-2190)	385 (370-425)	385 (370-425)	385 (370-425)	385 (370-425)	3580 (3290-3815)
Indirect Cost						
Travel Expenses	300 (200-400)	150 (100-200)	150 (100-200)	150 (100-200)	150 (100-200)	900 (750-1100)
Loss of Wages	400 (0-750)	0	0	0	0	400 (0-750)
Other Expenses (Food)	80 (0-150)	0	0	0	0	80 (0-150)
Indirect Cost Median (Q1-Q3)	750 (400-1150)	150 (100-200)	150 (100-200)	150 (100-200)	150 (100-200)	1350 (1050-1750)
Total Cost Median (Q1-Q3)	**2710 (2385-3207)**	**550 (500-600)**	**550 (500-600)**	**550 (500-600)**	**550 (500-600)**	**4943 (4530-5440)**

The present study showed that, the total median cost incurred to the animal bite victims for availing post exposure prophylaxis with intramuscular rabies vaccination was Rs. 4943 with inter-quartile range of Rs. 4530 - 5440. The direct cost incurred was Rs. 3580 with inter-quartile range of Rs. 3290 - 3815, which included cost of purchasing

anti rabies vaccine, rabies immunoglobulin, hospital administration charges, and cost of tetanus toxoid injection, cost of pre-medication, cost of disposables and cost of antibiotics, anti-inflammatory & antiseptics. The indirect cost incurred was Rs. 1350 with inter-quartile range of Rs. 1050 - 1750, which included travel expenses, loss of wages, food expenses and others for the animal bite victim and the accompaniments if any for the entire course of vaccination.



Graph 1: Cost incurred to the patients for PEP by intramuscular route.

Majority of the cost incurred for availing post exposure prophylaxis by intramuscular route was for direct expenses in the form of purchasing rabies biologicals and antibiotics, anti-inflammatory and anti-septics.

Similarly, the cost incurred for availing post exposure prophylaxis in the anti-rabies clinic was assessed among 134 study subjects who have taken intradermal anti-rabies vaccination.

Table 4: Cost incurred for post exposure prophylaxis by intradermal route (n=134)

Direct cost	Day 0 Median (Q1-Q3)	Day3 Median (Q1-Q3)	Day7 Median (Q1-Q3)	Day28 Median (Q1-Q3)	Total Median (Q1-Q3)
Cost of ARV	100 (100-150)	100 (100-140)	100 (100-140)	100 (100-140)	450 (400-520)

Cost of RIG	475 (465-950)	0	0	0	475 (465-950)
Administration charges	370	0	0	0	370
Cost of pre-medication	60 (0-60)	0	0	0	60 (0-60)
Cost of TT vaccination	20 (20-50)	0	0	0	20 (20-50)
Cost of antibiotics/ anti-inflammatory	130 (95-162)	0	0	0	130 (95-162)
Cost of Disposables	35 (25-36)	0	0	0	35 (25-36)
Hospital Charges	20	10 (10-20)	20 (10-20)	20 (10-30)	70 (50-80)
Direct Cost Median (Q1-Q3)	1300 (1176-1670)	120 (110-160)	120 (110-160)	120 (110-160)	1741 (1580-2058)
Indirect Cost					
Travel Expenses	200 (120-300)	85 (75-100)	85 (75-100)	85 (75-100)	480 (415-610)
Loss of Wages	400 (0-500)	0	0	0	400 (0-500)
Other Expenses (Food)	90 (0-100)	0	0	0	90 (0-100)
Indirect Cost Median (Q1-Q3)	650 (300-890)	85 (75-100)	85 (75-100)	85 (75-100)	910 (590-1180)
Total Cost Median (Q1-Q3)	**1958 (1691-2395)**	**220 (200-250)**	**220 (200-260)**	**215 (195-260)**	**2663 (2353-3065)**

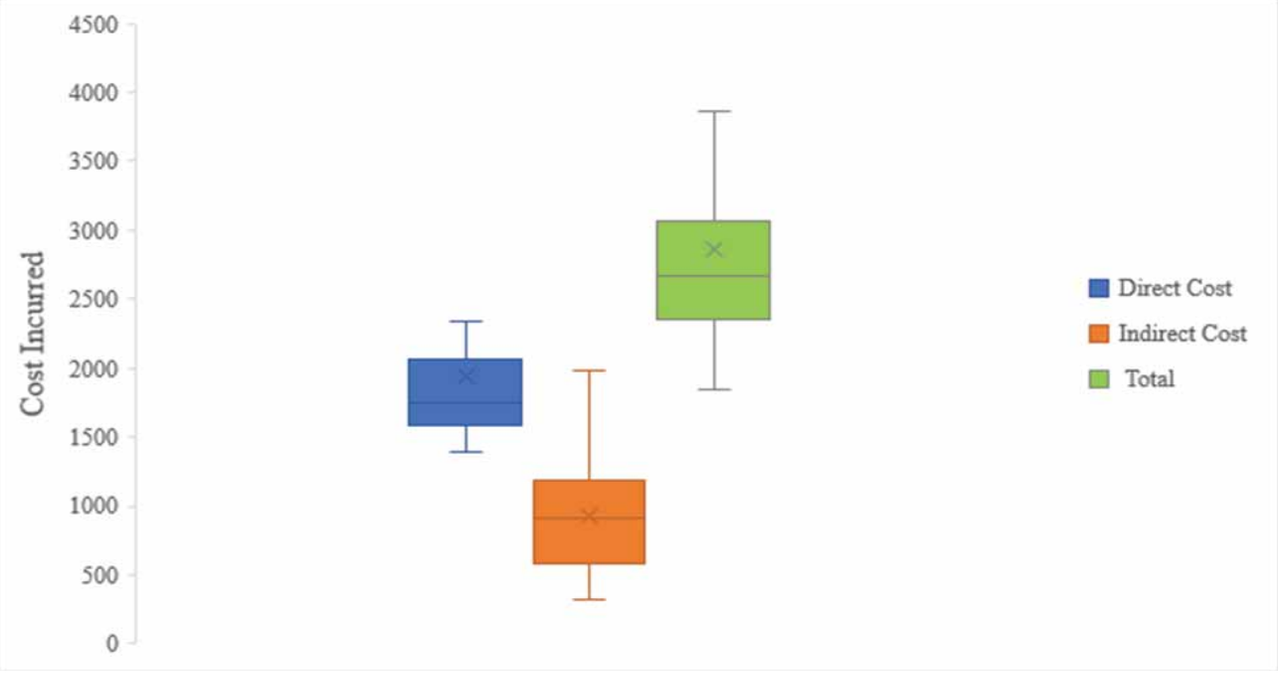
The total median cost incurred to the animal bite victims for availing post exposure prophylaxis with intradermal rabies vaccination was Rs. 2663 with inter-quartile range of Rs. 2353 - 3065.

The direct cost incurred was Rs. 1741 with inter-quartile range of Rs. 1580 - 2058, which included cost of purchasing anti rabies vaccine, rabies immunoglobulin, hospital administration charges, cost of tetanus toxoid injection, cost of pre-medication, cost of disposables and cost of antibiotics, anti-inflammatory & antiseptics. The indirect cost incurred was Rs. 910 with inter-quartile range of Rs. 590 - 1180, which included travel expenses, loss of wages, food expenses and others for the animal bite victim and the accompaniments if any for the entire course of vaccination.

Graph 2: Cost incurred to the patients for PEP by intradermal route

Majority of the cost incurred for availing post exposure prophylaxis by intradermal route was for direct expenses in the form of purchasing rabies biologicals and antibiotics, anti-inflammatory and anti-septics.

DISCUSSION



Rabies is a neglected zoonotic disease caused by the rabies virus; occurs in over 100 countries and poses a potential threat to >3.3 billion people worldwide. The neglected disease indicates that, it is insufficiently addressed by Governments and the International community, as they are best defined by people and communities they affect the most i. e. , poor people living in the remote rural areas and urban slums of the developing World. It is however, the disease most amenable to control, as the tools for prevention i. e. , PEP are available worldwide. [7] Therefore, it is the first zoonosis on the list of neglected diseases targeted for regional and eventually global elimination.

More than 15 million people worldwide receive PEP and are estimated to prevent hundreds of thousands of rabies deaths annually. The estimated global expenditure for prevention and control of rabies exceeds US$ 1.6 billion. . [8, 9]

Post exposure prophylaxis should be availed as early as possible after exposure in these endemic areas. Proper wound management and simultaneous administration of rabies immunoglobulin (RIG) combined with anti-rabies vaccine (ARV) is almost invariably effective in preventing rabies, even after high-risk exposure. [10] But, the cost of rabies PEP is a major limiting factor, since the rabies immunobiologicals are highly expensive and increases the burden to the bite victims. Hence compliance to vaccination is also affected. [11,12,13]

The present study showed that, the total median cost incurred to the animal bite victims for availing post exposure prophylaxis with intramuscular rabies vaccination was Rs. 4943 (IQR-Rs. 4530 – 5440); with direct cost of Rs. 3580 (IQR-Rs. 3290 – 3815) and the indirect expenses of Rs. 1350 (IQR-Rs. 1050 – 1750). Similarly, the total median cost incurred to the animal bite victims for availing post exposure prophylaxis with intradermal rabies vaccination was Rs. 2663 (IQR-Rs. 2353 – 3065); with direct expenses of Rs. 1741 (IQR-Rs. 1580 – 2058) and indirect expenses of Rs. 910 (IQR-Rs. 590 – 1180). The cost incurred for availing post exposure prophylaxis with intramuscular rabies vaccination is 1.8 times more than that of intradermal rabies vaccination.

Similarly, a descriptive study on economic costs of rabies post exposure prophylaxis done at both Government Hospital (where PEP is provided free of cost by ID route) & Private Medical College hospital (where PEP is provided for a cost by IM route), in Bangalore showed that, the total median cost incurred by the bite victims in Government hospitals was INR. 585 with IQR of INR. 444-725; which included direct cost of INR. 300 and indirect cost of INR. 285; and the cost spent by the government for providing PEP free of cost was INR. 1031; whereas,

the total cost incurred in private hospital was Rs. 5200 with IQR of Rs. 4900-5701 which included direct cost of Rs. 3865 with IQR Rs. 3662-4120, in which most of the cost incurred was for purchasing ARV & RIG. The study concluded that the economic burden to the bite victims as well as for the government in the developing world was more; expected to rise in future due to increased population and ineffective dog population control. [14]

Likewise, another study on cost evaluation of intradermal vaccination at the anti rabies clinic in tertiary care hospital Mumbai, Maharashtra for an year, showed that the vaccine cost for IDRV was Rs. 2,80,600 and the vaccine cost for the intramuscular (IM) assuming 84% compliance was estimated as Rs. 15,64,000. The study concluded that Intradermal regime was cost effective and reduced the cost of vaccination by about 82% (assuming 84% compliance) thus an appropriate option for middle and low income countries like ours. [15]

Therefore, PEP by intradermal rabies vaccination is a cost effective strategy, as there is economic advantages i. e, only 0.8 ml of vaccine is needed for each patient resulting in use of less than 1 vial/ patient as opposed to 5 vials/ patient to receive PEP using IM route and also only four visits are needed to complete vaccination as compared to IM regimen. So by this, we are able to reduce the indirect cost involved in terms of man hour cost, travel time and expenses for that visit. Thus by reducing the cost of vaccination, intra dermal rabies vaccination clearly makes an attractive option for resource-starved countries like ours. [16]Considering the large number of animal bite cases in the country and subsequent increase in the demand for modern rabies vaccines, universal switch over from intramuscular to intradermal route of rabies vaccination may be recommended which reduces both the cost and number of doses needed for PEP. [17] It reduces the volume of vaccine and direct cost required for PEP by 60% when compared with standard intramuscular vaccination and therefore, largely benefits the poor & needy. Therefore, it is rationale to introduce intra dermal rabies vaccination in rabies endemic country like India. [18]

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