ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Dropout rate of anti-rabies vaccination among rural and urban communities in Tamil Nadu: A comparative cross-sectional study

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Submission: 27-08-2022 Revision: 29-11-2022 Publication: 01-01-2023

ABSTRACT

Background: Rabies is a vaccine preventable deadly disease. There is a lack of organized surveillance system on animal bite victims to ensure completion of full course of post-exposure prophylaxis. **Aims and Objectives:** The aim of the study was to estimate the dropout rate of anti-rabies vaccine (ARV) post-exposure regimen among rural and urban communities of Chengalpattu district, Tamil Nadu. To interpret the association between category of bite and vaccination outcome among rural and urban communities of Chengalpattu district, Tamil Nadu. **Materials and Methods:** A retrospective hospital record based study (ARV REGISTER) was done in urban primary health center (PHC) Haridosspuram and rural PHC, Kelambakkam during January 2021. Collected data were entered into MS Excel and analyzed using SPSS version 22.0. Total dropout rates of ARV regimen among rural and urban communities were compared by Chi-square test. **Results:** A total of 5262 animal bite victims were vaccinated during the past 2 years. The majority (37.4%) of victims belonged to 21–40 years of age. The total dropout rate observed among both rural and urban communities was 51.2% with the higher proportion (72.8%) of dropouts seen among victims of category I bite. Wound washing practice was observed among the victims. Higher dropout rate (61.3%) of ARV regimen was observed among urban communities compared to rural communities (50.2%). Significant association was found between the category of animal bite and the vaccination outcome in both rural and urban communities. **Conclusion:** The animal bite victims should be educated and counseled about the importance of complete vaccination. The health workers should ensure proper follow-up of the victims to complete the vaccination schedule and thus prevent drop outs.

Key words: Anti-rabies vaccine; Dropout rate; Retrospective study

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v14i1.47839

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

Rabies is a vaccine-preventable viral disease which occurs in more than 150 countries and territories. Dogs are the main source of human rabies deaths, contributing up to 99% of all rabies transmissions to humans. Infection causes tens of thousands of deaths every year, mainly in Asia and Africa. The WHO leads the collective "United against Rabies" to drive progress toward "Zero human deaths from dog-mediated rabies by 2030." Still, it is an endemic lethal disease, even after 100 years of the invention of its vaccine by Louis Pasteur and Emile Roux in 1885.[1] Without PEP, the average probability of developing rabies following a bite by a rabid animal to the head is 55%, upper extremity 22%, the trunk 9%, and a lower limb 12%.[2] A systematic review of vaccine potency has shown that current vaccines (>2.5 IU/IM dose), when administered by the ID route for either PEP or PrEP, have efficacy equivalent to or higher than that of the same vaccine administered by the IM route.[3]

A National level community survey was done in 2003 revealed that the majority of human rabies victims were adult men (71.1%) and were from poor sections of the

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community. As over two thirds of the population of India lives in rural areas, nearly 76% of the rabies cases were reported from the rural population. In the Association for Prevention and Control of Rabies in India (APCRI) (1992–2001) decadal survey from isolation hospital data, the majority of human rabies deaths occurred in adults (64.7%), males (71.1%) belonged to poor/low-income group (87.6%), and mainly was due to dog bite (96.2%).[4] However, due to various economic and political factors, multiple cultural, religious and social practices, multiples myths associated with rabies, and lack of accurate data, even though economic and effective control measures are available; the disease has not been brought under control.[5,6] Although effective preventive and control measures such as Animal Birth Control, prophylactic vaccination of Animals, pre-exposure prophylaxis, and post-exposure prophylaxis of human are available in rural and urban communities of Tamil Nadu lack of epidemiological data poses threat to its effective implementation. The success of any preventive and control measure require a strong epidemiological surveillance mechanism. There were no published data on comparison of the dropout rate of anti-rabies vaccine (ARV) post-exposure regimen among rural and urban communities in Tamil Nadu. With this background the present study was conducted to estimate the dropout rate of ARV post exposure regimen among rural and urban communities of Chengalpattu district, Tamil Nadu.

Aims and objectives

The objectives are as follows:

1. To estimate the dropout rate of ARV post exposure regimen among rural and urban communities of Chengalpattu district, Tamil Nadu
2. To interpret the association between category of bite and vaccination outcome among rural and urban communities of Chengalpattu district, Tamil Nadu.

MATERIALS AND METHODS

A retrospective hospital record based study was done in government urban primary health center (PHC) Haridosspuram and government rural PHC, Kelambakkam during January 2021. After obtaining, the Institutional Ethics Committee approval data were collected from ARV registers of urban PHC Haridosspuram and rural PHC, Kelambakkam comprised details of animal bite victims during the period of 2019 and 2020.

The two site regimen 0.1 ml Intradermal ARV on days 0, 3, 7, and 28 were given to animal bite victims at PHCs of Tamil Nadu. The information regarding the socio-demographic and clinical profile of animal bite victims such as age and sex of the victim, type of the animal (dog, cat, monkey, and rat), and practice of wound washing before reporting to the PHC, category of bite, schedule of ARV, and their adherence to schedule of ARV were collected. Those who had taken at least one dose of ARV after animal bite but not completed all four doses of ARV regimen were considered as dropouts (partially vaccinated). Those who completed all four doses of ARV regimen were considered as fully vaccinated.[1]

Statistical analysis

Collected data were entered into MS Excel and analyzed using SPSS version 22.0. Total dropout rates of ARV regimen among rural and urban communities were compared by using Chi-square test.

RESULTS

In the present study, a total of 5262 animal victims were vaccinated during 2019 and 2020 in both urban and rural PHC. Majority of cases were from rural areas 4786 (91%) and only 476 (9%) cases were from urban areas (Figure 1).

The most common age groups of animal bite victims in urban area were 0–20 years (38.9%) and 21–40 years (35.7%), followed by 41–60 years (21.6%), and 61–80 years (3.8%). In rural areas, the most common age groups were 21–40 years (37.5%) and 0–20 years (32.4%), followed by 41–60 years (24.5%) and 61–80 years (5.5%) (Figure 2).

In urban area, 59.2% were male and 40.8% were female where as in rural area 62.2% were male and 37.8% were female.

The main biting animal in the urban area was dog (84.9%), cat (11.4%), rat (3.4%), and monkey (0.6%) similarly in rural area dog (86.5%), cat (6%), rat (5.7%), and monkey

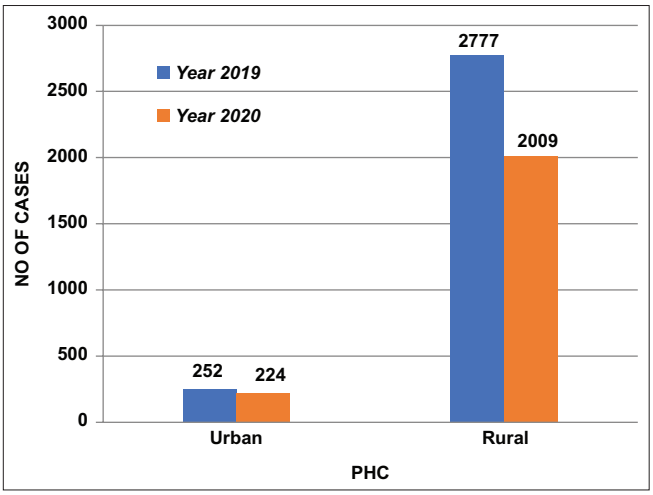


Figure 1: Distribution of animal bite cases reported to urban and rural primary health centers

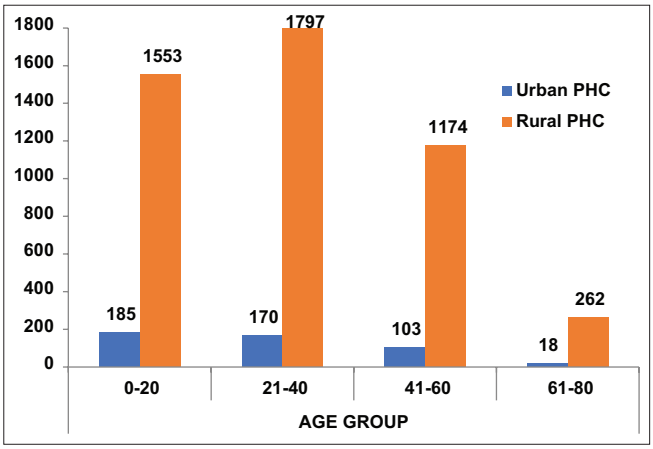


Figure 2: Age group of animal victims reported to urban and rural primary health centers

(1.8%) were main biting animal (Table 1). The dropout rate among the victims of dog bite in both urban and rural areas was lower (50.1%) compared to the victims of rat bite (52.4%), cat bite (59.3%), and monkey bite (70.1%). There was statistically significant difference observed in dropout rate among victims belonging to different category of animal (Table 2).

As per the WHO classification of animal bite wound, 80.9% of the victims in urban area had Category I bite wound, 17.6% had category II bite wound, and 1.5% had Category III bite wound were as in rural area 56.6% had Category I bite wound, 40.9% had category II bite wound, and 2.5% had Category III bite wound (Figure 3).

Dropout rate among victims of urban communities was 61.3% in comparison to 50.2% in rural communities (Figure 4). The overall complete coverage to full course of ARV combining urban and rural area was found to be as low as 48.8%. The dropout rate for the category I bite victims in both urban and rural areas was higher (72.8%) compared to the category II bite victims (20.6%) and the category III bite victims (17.3%).

(Table 3) There was statistically significant difference observed in dropout rate among victims belonging to different category of bite wound in urban ($P<0.001$ at $df=2$ and $\chi^2=96.355$) and rural area ($P<0.001$ at $df=2$ and $\chi^2=1287.027$) (Tables 4 and 5).

DISCUSSION

In rabies-endemic countries, completing the full course of ARV is essential to prevent the disease. The present study was conducted to assess the dropout rate among urban and rural communities in Tamil Nadu.

Table 1: Distribution of type of animal bites

PHC	Dog (%)	Cat (%)	Monkey (%)	Rat (%)
Urban	404 (84.9)	53 (11.1)	3 (0.6)	16 (3.4)
Rural	4142 (86.5)	286 (6.0)	84 (1.8)	274 (5.7)

Table 2: Comparison of dropout rate among different animal categories (n=5262)

Animal category	Fully vaccinated (%)	Dropout (%)	Chi-square test
Dog	2267 (49.9)	2279 (50.1)	$X^2=23.587$
Cat	138 (40.7)	201 (59.3)	df=3
Monkey	26 (29.9)	61 (70.1)	P<0.001
Rat	138 (47.6)	152 (52.4)	

Table 3: Comparison of dropout rate among victims belonging to different category of bite wound in both urban and rural primary health centers (n=5262)

Bite category	Fully vaccinated (%)	Dropout (%)	Chi-square test
Category I	843 (27.20)	2251 (72.80)	$\chi^2=1399.557$
Category II	1621 (79.40)	420 (20.60)	df=2
Category III	105 (82.70)	22 (17.30)	P<0.001

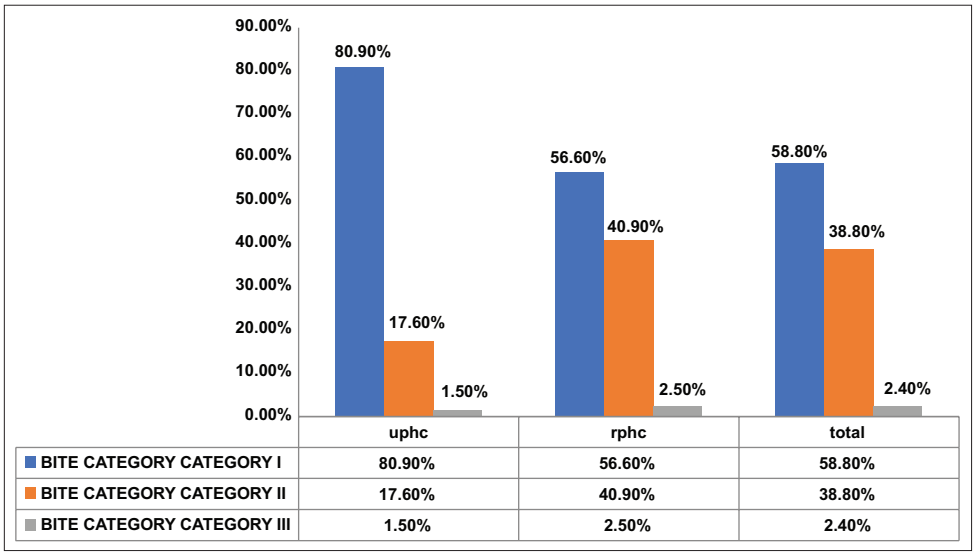
Table 4: Comparison of dropout rate among victims belonging to different category of bite wound in urban primary health center (n=476)

PHC	Bite category	Fully vaccinated (%)	Dropout (%)	Chi-square test
Urban	Category I	108 (22.6)	277 (58.1)	$\chi^2=96.355$
	Category II	69 (14.4)	15 (3.15)	df=2
	Category III	7 (1.4)	0	P<0.001

Table 5: Comparison of dropout rate among victims belonging to different category of bite wound in rural primary health center (n=4786)

PHC	Bite category	Fully vaccinated (%)	Dropout (%)	Chi-square test
Rural	Category I	735 (15.3)	1974 (41.2)	$\chi^2=1287.027$
	Category II	1552 (32.4)	405 (8.4)	df=2
	Category III	98 (2.04)	22 (0.45)	P<0.001

In the present study, majority (61.9%) victims were males among them, 33% were children 0–20 year group, and 37.4% were youth 21–40 year group. Similarly, the WHO national multi-centric rabies survey 2003, assessing burden of rabies in India by APCRI reported that majority of victims (76%) were adult men[4] and a multicentric study in India by Bhattacharya et al., also reported similarly that 72.4% were male among them children 47.5%.[7] Likewise Shankaraiah et al., in Bengaluru found that 66.7% were



	uphc	rphc	total
BITE CATEGORY CATEGORY I	80.90%	56.60%	58.80%
BITE CATEGORY CATEGORY II	17.60%	40.90%	38.80%
BITE CATEGORY CATEGORY III	1.50%	2.50%	2.40%

Figure 3: Category of animal bite among urban and rural primary health centers

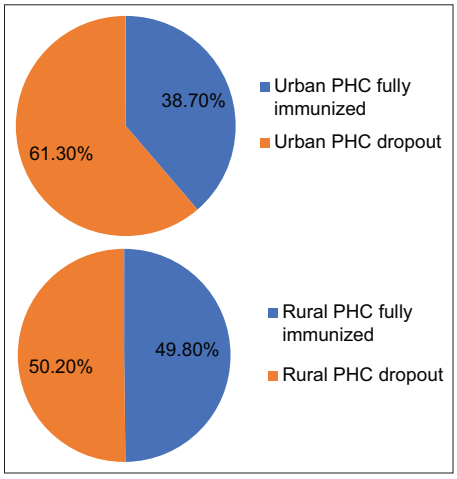


Figure 4: Anti rabies vaccine coverage among urban and rural primary health centers

males among them 21.7% were children <15 years.[8] This could be explained by the involvement of males in outdoor works which increases the chances of animal bite in comparison to females.

In the present study, main biting animal in the urban area was dog (84.9%), cat (11.4%), rat (3.4%), and monkey (0.6%) and similar to that in rural area dog (86.5%), cat (6%), rat (5.7%), and monkey (1.8%). The WHO survey observed that 91.5 % of all animal bites were due to dogs.[4] Bhattacharya et al., found that majority (96.9%) of the animal bites were by dogs.[7] Similarly Marathe et al., in Madhya Pradesh revealed that 95.8% of victims bitten by dogs.[9] Mohankumar et al., in Chennai observed that most of bites were due to stray dogs (92.8%).[10] To achieve optimum level of antibody titers (0.5 IU/ml of serum) full coverage (four doses) of post-exposure vaccination is needed.[3,11] In the present study, overall coverage of full course of vaccination in both urban and rural communities was low (48.8%) and this was similar to findings of Shankaraiah et al., Sahu et al., and Abhay et al., in their study on compliance to ARV.[8,12,13]

In the present study, majority of the victim had Category I bite (58.8%) while in the studies conducted by Sahu et al., in Lucknow, Uttar Pradesh (88.2%)[8] and Umarigar et al., in Surat, Gujarat (73.6%)[14] were majority of victims had category II bite. This can be explained by the high health seeking behavior of animal bite victims in the present study area. In the present study, the dropout rate for the category I bite victims in both urban and rural areas (72.8%) was higher compared to the category II bite victims (20.6%) and the category III bite victims (17.3%) and it is statistically significant (P<0.001) similar results were reported in the study by Biswas et al., in Cuttack where dropout rate among victims having wound Category I (37%), and Category II (8.8%) than among victims having wound Category III (5.1%).[15] The reason may be careless attitude of victims toward less severe bites.

All these studies showed that the compliance to complete course of vaccination is inadequate for a fatal disease, and this needs to be addressed on a priority basis to work toward the goal of eliminating dog mediated human rabies by 2030.[16]

Limitations of the study

Since the present study was based on hospital records, the study subjects were not interviewed personally. Hence, the barriers to full course of ARV vaccination could not be elicited.

Recommendation

We can develop a system of telephonic/SMS remainders to all animal bite victims regarding their next dose of vaccination, to complete the full course of ARV to prevent

rabies and to eliminate the disease as a public health problem.

CONCLUSION

The majority of animal bite cases were from rural areas than urban areas. The dogs were the main biting animal, affecting mostly the adult in rural area and children in urban area. Wound washing practice was high among bite victims of rural area than that of urban area. Full course completion of ARV regimen among animal bite victims was low in urban area than rural area. Category I exposure was most common both in urban and rural communities with significant association between category of bite and vaccination outcome. The results of this study reveal lack of surveillance on victims till completion of the full course of vaccination both in urban and rural communities.

ACKNOWLEDGMENT

The Authors acknowledge Block Medical Officer Kelambakkam PHC and Medical Officer Haridosspuram UPHC, for the support in carrying out this research.

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Authors Contribution:
VS- Concept and design of the study, prepared first draft of manuscript; **KRC -** Interpreted the results; reviewed the literature and manuscript preparation; **VA-** Concept, coordination, and interpretation, preparation of manuscript and revision of the manuscript; **EM-** Statistical analysis.

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Source of Funding: Nil, **Conflicts of Interest:** None declared.