

Rabies And Treatment Following Dog Bites: Knowledge Among Adults Residing In A Semi-Urban Medical Officer Of Health Area In Sri Lanka

Sinha De Silva¹, Vindya Kumarapeli²

¹Postgraduate Institute of Medicine, University of Colombo, Sri Lanka

²Directorate of Non-Communicable Diseases, Ministry of Health, Sri Lanka



Abstract

Introduction: Rabies is a zoonotic disease that is endemic in Sri Lanka and the main vector of human rabies is the dog. The country invests a huge portion of its annual health budget to prevent this deadly disease. The treatment following dog bite has an important place in the prevention of human rabies, which consists of the provision of first aid and Post Exposure Therapy (PET). The objective of the study was to describe knowledge on human rabies and treatment following dog bites (TFDB) and their associated factors among persons aged 20-59 years in a semiurban Medical Officer of Health area in Sri Lanka

Method- A community-based cross-sectional study was carried out among a random sample of 340 participants, aged 20-59 years in a semi-urban Medical Officer of Health area, Sri Lanka by using probability proportionate to the population size cluster sampling technique. Data were collected by using a pre-tested interviewer-administered questionnaire by two trained pre intern doctors and analyzed using SPSS 22 software.

Results- Response rate was 94.7% (322/340). The mean age was 38.1 years (SD=11.2 years). Of the participants, 94% were Sinhalese (n=303); 87% Buddhists (n=280); 74.2% married (n=239); 64.6% employed (n=208); 82% lived in own house (n=264) with a median income of Rs. 38,000.00 (IQR=Rs. 38,000/=). Only 11.5% (n=37) were dog owners.

Overall knowledge on rabies was good in 64.9%, (n=209): 70.8% (n=228) knew the route of entry of virus but < 45% knew cat & bat are also reservoirs. The factors associated with good knowledge on rabies were Sinhala (OR=3.4, 95% CI- 1.3 -8.9,p=0.01); having higher level of education (OR=18.7, 95% CI- 9.7 -35.8 ,p<0.001), being employed (OR=2.3, 95% CI- 1.4 -3.6 p<0.001), having a higher income level (OR=4.8, 95% CI- 2.9 -7.9, p<0.001);owning dog (OR=2.7, 95% CI- 1.6 -4.4, p<0.001).

Overall knowledge on treatment following dog bite was good in 61.2 %, (n=197):89.6%, (n=288) on first aid but < 30% knew the importance of noticing offending dog's health, observability, and what to do if a dog is suspected to have rabies. The factors associated with knowledge on the treatment following dog bite were: ever-married (OR=1.7, 95% CI- 1.1 -3.2, p=0.02); having a higher level of education (OR=13.3, 95% CI- 7.5-23.5, p<0.001); having a higher level of monthly income (OR=3.0, 95% CI-1.9 -4.8, p<0.001); being employed (OR=2.2, 95% CI- 1.4 -3.5, p<0.001); owning a dog (OR=27.7, 95% CI-3.7 -205.0, p<0.001).

Conclusions and Recommendations: The majority of the study participants had good overall knowledge of rabies and treatment following a dog bite. In general, knowledge on non-canine reservoirs of rabies and treatment following dog bites on specific events were deficient. There is a need to give holistic knowledge with regard to rabies as well as treatment following a dog bite to the general public.

Keywords—rabies, treatment following dog bites, semi-urban, Medical Officer of Health area, Sri Lanka.

I. INTRODUCTION

Rabies is a zoonotic disease i.e., a disease that is transmitted to humans from animals (1). Rabies is acute encephalitis or meningoencephalitis caused by a lyssavirus infection. The etiological agent of human rabies, the Rabies virus (RABV), belongs to the mononegavirales order, the Rhabdoviridae family, and the Lyssavirus genus. At present 12 Lyssavirus species have been

recognized by the International Committee on the Taxonomy. Out of these 12 species, the rabies virus is responsible for most of the human rabies cases in the world and both human and veterinary vaccines are prepared based on RABV (2). Rabies infection exists in two major epidemiological settings i.e., urban rabies and wild/sylvan rabies. The reservoirs in urban settings are dogs and cats, while the reservoir in the wild setting is foxes, mongooses, jackals, bats, etc. (3). But in ninety-nine percent of the time, dogs act as the source of infection around the globe for human infections. Rabid dogs are usually appeasers unhealthy, and some are furious. The diagnosis of rabies in dogs can be confirmed by postmortem studying of the brain of the suspected dog (2). The rabies virus enters the human body through wounds or mucus membranes. But it cannot cross the intact skin. There are reported instances of the acquisition of rabies by consuming the milk of rabid animals (2). The rabies virus is replicated at the site of inoculation (e.g., at the bitten muscle). Then it enters the motor endplate of the neuromuscular junction and traverses through the nerves and ultimately gives rise to the clinical features. The incubation period varies from five days to several years. In humans, two major types of rabies are recognized i.e., furious rabies and dumb rabies. Furious rabies is the classic variety and in these patients' agitation, anxiety, hallucination, bizarre behavior occurs and about 50% of them have hydrophobia. The path-gnomonic feature of them is aerophobia. Dumb rabies/ paralytic rabies occurs with symmetrical ascending paralysis. The diagnosis of rabies is mainly clinical, and management is the provision of palliative care (1).

The burden is assessed globally based on the disability-adjusted life years (DALYs) due to rabies and its management and the economic burden i.e., direct as well as indirect. Out of the countries where canine rabies is endemic, in Latin American and the Caribbean countries, the public health burden probably exceeds 15000 DALYs, and the annual budget requirements for control activities are nearly US\$ 20 million (4). When Africa and Asia's region are considered, the estimated deaths due to canine rabies is about 55,000 (95%CI 24000-93000) per year. This has resulted in a loss of 1.74 million DALYs (95% CI 0.73-2.93). Around US\$ 583.5 million is estimated to be spent on rabies in this region per year. When compared to the other parts of the world, most rabies-related deaths occur in Asia. In 2003, estimated rabies deaths exceed 30,000 (5).

A multi-center study carried out in India has revealed 20,565 human deaths occur in India (6). In Sri Lanka, although there is a steady decline in deaths due to human Rabies from the mid-1970s, Rabies is still endemic (7). The number of deaths due to Rabies had been declined over the past few years with nearly 20-30 death annually in 2018. The annual Sri Lankan government expenditure on post-exposure therapy vaccines alone is about one-tenth of countries' annual expenditure on drugs and vaccines (8). The rabies control activities are carried out in both countries of which it is endemic as well as it is free. The countries free of canine rabies provide oral rabies vaccines for wild animals to prevent cross infections and also provide pre & post-exposure prophylaxis for those who are traveling to and from the endemic countries (2). It is estimated USA where free of canine rabies has spent US\$ 300 million per annum for rabies control activities (9). Countries, where canine rabies is endemic, are using different strategies in order to control rabies by conducting mass dog immunization campaigns, promotion of responsible dog ownership, and control of dog population. This also addresses the increasing awareness among the community on first aid following dog bite i.e., flushing of the wound with soap and water and provision of post-exposure therapy for dog bite victims(2). Despite the fact that the Southeast Asia region is recognized as an endemic region for rabies, centrally coordinated rabies control activities are carried out only in four countries namely Bhutan, Indonesia, Sri Lanka, and Thailand.

In Sri Lanka, the Veterinary Public Health Veterinary Service (PHVS) unit is operational under the Ministry of Health to carry out rabies control activities throughout the country (10). The adoption of legislation such as The Rabies Ordinance of 1893 and the Dog Registration Ordinance of 1904 in Sri Lanka is clear evidence of the existence of this disease and measures taken by colonial rulers to control it. The Rabies control program was established in 1953 in order to provide well-organized rabies control activities across the country (11). According to the PHVS "the dog is the main reservoir as well as the transmitter in Sri Lanka". Therefore, the national program is mainly targeting the prevention and transmission of canine rabies. The main strategies of the national program are to improve awareness on responsible dog ownership among the general public, birth control and vaccination of dogs, habitat control, and continuous monitoring and evaluation of the activities (11). A dog bite is considered a medical emergency and the victim should seek medical care immediately. This consists of mainly first aid, wound care, and measures for the prevention of rabies (2). The measures taken to prevent Rabies following a dog bite are the most important aspect of patient management following a dog bite. This is known as post-exposure prophylaxis therapy (PET). This was introduced four decades ago has evolved since then. Following the screening of the offending animal and the dog bite victim through history and examination, the modality of the PET is decided by the clinician. Sri Lanka has also adopted these guidelines and the latest PET guideline had been issued as a circular in order to ensure uniformity of the quality of care throughout the country(12). Nearly 300,000 individuals requires post

exposure therapy annually to prevent rabies in Sri Lanka (24).

Rabies is 100% fatal but 100% preventable disease (2). As Human Rabies is endemic in Sri Lanka, the community must have basic knowledge about this disease i.e., characteristics of the reservoirs, route of transmission, clinical features, etc. (11). Therefore, it is very important to assess gaps in knowledge on rabies in order to assess the effectiveness of activities carried out on educating the public. A dog bite is considered a medical emergency it is essential to undergo timely and appropriate treatment following a dog bite by the public to prevent this deadly disease. As per the latest post-exposure therapy guideline, the public has to play a vital role by adhering to the health care professionals' instructions, e.g., observation of the offended dog for a certain time duration, submission of dog's immunization card, submission of PET card for previous exposure if available (12). The whole treatment modality depends on the responses of dog bite victims in this regard. Based on the level of public awareness on PET, a tailor-made awareness campaign can be developed which will maximize the effectiveness of PET. The objective of this study is to assess knowledge on rabies and treatment following dog bites among adults residing in a semi-urban Medical Officer of Health area in Sri Lanka.

II. METHOD

Study design: Community-based descriptive cross-sectional study with an analytical component

Study setting: Medical Officer of Health area, Maharagama in the district of Colombo in Sri Lanka

Study period- August to December 2014

Study population- Adults aged 20-59 years

Sample size calculation: The sample size was calculated by using the following formula (13).

$$n = Z^2 P(1 - P)/d^2$$

n = Sample size

Z=1.96 required confidence level (95%)

P=anticipated proportion

The p was taken as 89.6% which was based on the level of knowledge on Rabies reported by a cross-sectional study which was carried out among household members who are aged 15 years or more in the Kandy district(14). This value was used in the calculation since data on knowledge, attitudes, and practice of responsible dog ownership

d = degree of accuracy or the desired margin of error was set at 5%

$$n = 1.96^2 \times 89.6(100 - 89.6)/5^2 = 143$$

Since cluster sampling was used, the cluster effect was considered as 2.

A non-respondent rate of 20% was considered since it is a community-based study.

Therefore, the final sample size was= 143 X 2 X 120/100= 344, and it was rounded off to 340

Sampling technique:

A multi-stage clustersampling method was used in this study. The Grama Niladari Division (GND) was selected as the primary sampling unit of the cluster. The size of the cluster was decided as 20 persons who were aged between 20-59 years after considering the logistics available for data collection. Therefore 17 clusters were needed to recruit the calculated sample of 340 (340/20=17). Out of the 34 GNDs in the MOH area of Maharagama, 17 GNDs were selected by probability proportionate to the population size sampling technique. The secondary sampling unit was a household. The index house was randomly selected from the voters' list by using a random number table. Then rests of the houses were selected in a pre-determined manner i.e., every other house on the same side of the road until the required numbers of households with eligible participants

were recruited. Only one individual was selected from one household i.e all the eligible people were listed and one out of them was selected by drawing lots

Study instrument:

A pre-tested interviewer-administered questionnaire (IAQ) was used to collect data from the participants. The IAQ was prepared by the principal investigator following a review of literature, discussions with the experts in this subject area. Originally the IAQ was prepared in English and later translated into the main native language Sinhala. Then it was back-translated into English in order to check the consistency of the questions. It is consisting of the following section

Section 1: – socio-demographic characteristics

This section consisted of questions based on the socio-demographic characteristics of the respondents

Section 2: Knowledge on Human Rabies

This section consisted of eight questions on human rabies

Section 3: Knowledge on treatment following dog bites

This section consisted of ten questions based on knowledge on treatment following dog bites

Data collection:

Data were collected by two trained pre-intern doctors by using pretested IAQ by adhering to the above-mentioned data collection technique after obtaining informed written consent from the study participants.

Data Analysis:

Knowledge on Rabies and Treatment following dog bites were determined by eight and tens questions respectively. For each question, if the response is correct 10 marks were given and if it is wrong or the answer is not known, zero marks were allocated. If an individual had obtained 50% or more from aggregate marks, he/she was considered to have good knowledge.

Data were analyzed by using descriptive statistics and associations were determined by using the Chi-Square test and Odds Ratios with 95% Confidence Intervals. SPSS software was used for data analysis

Ethical considerations:

Ethical clearance was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Colombo (ERC-14-107).

III. RESULTS

The computed sample size was 340 participants of which 322 participated giving a response rate of 94.7% (n=322). The mean age of the respondents was 38.1 years (SD=11.2 years), 51.0% (n=165) were females, 94.1% (n=303) were Sinhalese and 87.0% (n=280) were Buddhists and 74.2% (n=239) were married, 63.7% (n=205) had monthly family income of rupees 15,000.00-44,000.00, 70.2% (n=226) had received education between grade six to 11, 64.6% (n=208) were employed and 11.5% (n=37) were dog owners.

KNOWLEDGE ON RABIES

Of the 322 participants, 99.7% (n=321) were aware of the illness rabies. However only 63 % (n=203) knew that rabies incurable and 68.6% (n=221) knew it is preventable. More than seventy percent of the respondents knew correctly that the causative agent of rabies is a virus (74.9%, n=241) and the route of entry of the causative agent is through the breeched skin (70.8%, n=228) (Table 1).

Table 1: Distribution of the participants by knowledge of Rabies

Response	Number	Percentage
Knowledge on the causative agent of rabies	241	74.9
Knowledge on the common route of entry of the causative agent into the human body	228	70.8
Awareness of dogs could act as a reservoir of rabies	319	99.1
Awareness of cats could act as a reservoir of rabies	143	44.1
Awareness of bats could act as a reservoir of rabies	94	29.2
Knowledge on how humans could acquire rabies from infected animals Saliva	281	87.3
Knowledge on the possibility of a rabid dog could bite without an arousal	308	95.7
Knowledge of features of rabid animals including hydrophobia	101	31.4
Knowledge on the possibility of a rabid animal may have an agitated behavior	142	44.1
A Rabid animal may have drooling of saliva	100	31.1

FACTORS ASSOCIATED WITH GOOD KNOWLEDGE ON RABIES

In studying the associations of knowledge on rabies, the group that rated as ‘good knowledge’ was compared with those who were identified as having ‘poor knowledge’.

Statistically significant ($p < 0.05$) associations found with having good knowledge on rabies were being Sinhalese, having a higher level of education, being employed, having a higher monthly income, and being a dog owner (Table 2).

Table 2: Associations between the status of knowledge on rabies and selected factors among the participants

Factor	Good Knowledge		Poor Knowledge		Total		Significance
	n= 209		n= 113		N=322		
	No.	%	No.	%	No.	%	
Ethnicity							
Sinhalese	202	66.7	101	33.3	303	100.0	OR=3.4 (95% CI- 1.3 -8.9)
Other	07	4.4	12	10.6	19	100.0	
χ ² =6.9, df=1 P=0.01							
Educational Level ^a							
Higher Level	148	91.9	13	08.1	161	100.0	OR=18.7 (95% CI- 9.7 -35.8)
Lower Level	61	37.8	100	62.2	161	100.0	
χ2 =103.2,df=1 p<.0001							
Employment status							
Employed	149	71.6	59	28.4	208	100.0	OR=2.3

							(95% CI- 1.4 -3.6)
Unemployed	60	52.6	54	47.3	114	100.0	$\chi^2 = 11.7$, df=1 p<.0001
Monthly Family Income^b							
Higher Level	139	80.8	33	19.2	172	100.0	OR=4.8 (95% CI- 2.9 -7.9)
Lower Level	70	46.6	80	53.3	150	100.0	$\chi^2 = 41.0$, df=1 p<.0001
Status of dog ownership							
Yes	36	97.3	1	0.7	37	100.0	OR=2.7 (95% CI- 1.6 -4.4)
No	173	60.7	112	39.3	285	100.0	$\chi^2 = 19.2$, df=1 P<.0001

a-Those who has passed GCE (O/L) and those who have failed or below the level of education are considered to have a higher level or lower level of education respectively

b- Those who have Rs.38,000 or more are considered to have a higher level of income and below this level, as to have a lower level of income

KNOWLEDGE ON TREATMENT FOLLOWING DOG BITES

Of the participants 89.4% (n=288) would wash the wound with soap and water as a first-aid measure following a dog bite however only 33.8% (n=109) participants would seek medical care immediately. Of the participants, 43.3% (n=139,) stated that the duration of the post-exposure therapy injection course and less than half of the participants stated that post-exposure vaccine certificates should be kept securely for five years (41%, n=132). Nearly twenty-seven percent (n=88) of the participants have mentioned correctly that the dog should be observed for 14 days if it is suspected to have rabies. Only 16% (n=52) of the respondents knew that there is a positive impact on PET in an event of a subsequent dog bite by receiving the complete course of anti-rabies vaccine (ARV) for the current event. (Table 3).

Table 3: Distribution of the participants by knowledge on treatment following a dog bite

Response	Number	Percentage
Awareness to seek medical when bitten by a stray dog	321	99.7
Awareness to take dog's vaccination card to the hospital when seeking treatment following a dog bite	293	91.0
Awareness to take his/her anti-rabies vaccination card if he/she has received them earlier when seeking treatment following a dog bite	111	34.5
Awareness to making a note of the health of the offending dog when seeking treatment following a dog bite	68	21.1
Awareness of making a note of the observability of the offending dog when seeking treatment following a dog bite	57	17.7

Awareness of the importance of washing the wound with soap and water immediately after a dog bite	288	89.4
Knowledge on the infiltration of a dog bite wound with serum if indicated	222	68.1
Knowledge on receiving an instruction to observe the offending dog for a specified time	76	23.6
Knowledge on the importance of taking the full course of anti-rabies vaccines	224	69.6

FACTORS ASSOCIATED WITH GOOD KNOWLEDGE ON TREATMENT FOLLOWING DOG BITES

In studying the associations of knowledge on treatment following dog bites, the group that rated as ‘good knowledge’ was compared with those who were recognized to have ‘poor knowledge’.

Out of the factors considered, there were statistically significant ($p < 0.05$) associations between having good knowledge on treatment following dog bites with being ever married, having a higher level of education, having a higher level of monthly income, being employed, and being a dog owner (Table 4).

Table 4: Association between status of knowledge on treatment following dog bites and selected factors among the participants

	Good Knowledge		Poor Knowledge		Total		Significance
Factor	n= 197		n= 125		N=322		
	No.	%	No.	%	No.	%	
Marital status							
Ever Married	163	64.4	90	35.6	253	100.0	OR=1.7 (95% CI- 1.1 -3.2)
Unmarried	34	49.3	35	50.7	69	100.0	
χ² =5.2, df=1 P=0.02							
Educational Level							
Higher Level	141	87.5	20	12.5	161	100.0	OR=13.3 (95% CI- 7.5-23.5)
Lower Level	56	34.8	105	65.2	161	100.0	
χ² =94.4,df=1 p<.0001							
Employment status							
Employed	141	67.8	67	32.2	208	100.0	OR=2.2 (95% CI- 1.4 -3.5)
Unemployed	56	49.1	58	50.9	114	100.0	
χ² =10.8, df=1 p<0.0001							
Monthly Family Income (Rs.)							
Higher Level	126	73.3	46	26.7	172	100.0	OR=3.0

							(95% CI-1.9 -4.8)
Lower Level	71	47.3	79	52.7	150	100.0	$\chi^2 = 22.7, df=1$ $p < .0001$
Status of dog ownership							
Yes	36	97.3	01	2.7	37	100.0	OR=27.7 (95% CI-3.7 - 205.0)
No	161	56.5	124	43.5	285	100.0	$\chi^2 = 22.9, df=1$ $P < .0001$

a-Those who has passed GCE (O/L) and those who have failed or below the level of education are considered to have a higher level or lower level of education respectively

b- Those who have Rs.38,000 or more are considered to have a higher level of income and below this level, as to have a lower level of income

IV. DISCUSSION

In summary of results, the majority of the participants had a good knowledge of rabies. The awareness of rabies with regard to features of rabid dogs and other animals that could cause rabies was minimal among the majority of the participants. There was a statistically significant association between having good knowledge of rabies with being Sinhalese, being employed, having a higher level of education, having a higher level of monthly income, and being a dog owner. Also, the majority of the respondents had a good knowledge of treatment following a dog bite. Their knowledge with regard to a certain act that needs to take into account to decide treatment modality was deficient such as knowledge on the importance of noting down the health of the offending dog, the importance of taking the previous vaccination card if available. There were statistically significant associations with having good knowledge on treatment following a dog bite and being ever married, having a higher level of education, being employed, having a higher monthly income, and being a dog owner.

Two third of the participants (68.6%, n=221) were aware that rabies is preventable even if bitten by a rabid dog by taking appropriate PET but nearly one-fifth (16.1%, n=52) thought wrongly that rabies is curable when the clinical features are established. Similarly, a cross-sectional study carried out among grade 10 children of the Nugegoda educational zone revealed that 67.6%(n=467) of them knew that rabies is preventable and 30.1%(n=228) incorrectly thought it is not fatal(15). A cross-sectional study done among dog bite victims by using the purposive sampling method revealed that 43% (n=43) of participants knew that rabies is a fatal disease and 44%(n=44) of them said it is curable. (3). Another cross-sectional study carried out in the same unit among randomly selected 213 bite victims in order to assess the knowledge on post-exposure treatment revealed that only 36.6% of the participants knew that rabies is a 100% fatal disease (16). These studies indicate the lack of awareness of rabies in the community. More than two-thirds were aware of the route of infection (70.8%, n=228). Even though the majority knew that dog (99.1%, n=319) is a reservoir of rabies only less than half of the respondents knew that cat (44.4%, n=143) and bat (29.2%, n=143) are also reservoirs. But any of these animals can cause rabies (10), therefore, awareness in this regard is very important and the reason for the lack of awareness may be due to all most all the education programs are directed at canine rabies.

Of the respondents, 64.9% (n=209) had overall good knowledge on rabies based on the marks that they had received for equally weighted questions. Similarly, the study carried out in four PHI areas in the Colombo district revealed that 67.4% (n=1061) among adults had good knowledge of rabies, and the method adopted to assess knowledge was more or less similar to the current study(15). In contrast to these, a study done among school children of Nugegoda educational zone reported that overall knowledge was good only in 31.8%(n=221) of respondents and method adapted here to assess the knowledge by allocating weighted marks for questions and had taken 60% of the total mark to distinguish good & poor knowledge(17). But there is no evidence in research for any benefit in weighting the item as opposed to weighted scoring, especially when there are many items in the tool(18). Therefore, the difference observed in the later and former two may be due to the difference in study participants and use of 60% as cut off in later.

There were significantly more participants belonging to Sinhala ethnicity ($p=0.01$) among those who had good knowledge on rabies, and this may be due to the fact that the least interest shown towards dogs & its related matters by other ethnicities due to cultural reasons. Significantly more participants among those found to have good knowledge on rabies were having a higher level of education, being employed, were getting a higher monthly family income, and owns a dog. The reasons for these findings might be acquiring knowledge with this regard with education, when employed more exposure to sources of information, with good financial status more access to media, and increased personal interest in diseases spread by dogs when owning a dog.

A population-based cross-sectional study was done in Karachi, Pakistan had revealed a statistically significant association between good knowledge of rabies and a higher level of education among the participants ($OR= 3.65$, $95\%CI$ $1.06-9.85$, $p=0.02$)(19). Similarly, another cross-sectional study was done in the city of Addis Abba in Ethiopia reveals that statically significant associations between knowledge and educational level ($p=0.001$) and knowledge and occupational status ($p=0.001$) (20). Another study conducted in Istanbul, Turkey among 890 doctors, a statically significant relationship between knowledge status and the dog ownership status ($p=0.003$)(21).

In this study, nearly 90% ($n=288$) were aware of correct first aid following a dog bite i.e., washing of the wound with flowing water and soap (10), even though a dog bite is an emergency, less than one-third of the respondents would seek medical care immediately. Similarly, a study carried out among school children in Nugegoda educational zone revealed that 84.9%($n=587$) would do appropriate first aid following a dog bite but in contrast to the current study, 66.6% ($n=311$) would seek medical advice immediately (17). The difference in treatment-seeking may be due to the fact that the school children would have received knowledge through their lessons on health sciences and the community is not educated to that extent. A cross-sectional study carried out among 100 dog bites, revealed that 97% of the study participants had taken correct first aid following dog bite and 92% of the sample came with the information of the bitten animal (3). This may be an overestimate due to the selection bias as this had adapted the purposive sampling method. Another study carried out among dog bite victims attending hospital had revealed that 22.3%($n=94$) had come for treatment within 0-2 hours following exposure and 26.8%($n=113$) had come for treatment later than 24 hours since the exposure (22). This also shows that majority has not sought treatment on time. This may be to their lack of knowledge in this regard. All dog bite victims should seek medical care following any dog bite (10).

The treatment regimen of the post-exposure therapy depends on the category of the wound of the victim and health, observable status & immunization status of the dog. According to the recommended guidelines, if the offending dog is healthy, observable, and immunized against rabies properly, the victim does not have to receive any vaccine or immunoglobulin even for a major exposure provided that the dog remains healthy for 14 days from the day of the dog bite(12). Therefore, correct information about the offending dog's health, whether it is observable and the status of immunization is very important for clinical management. Provision of this information by the dog bite victim would help to avoid unnecessary exposure to vaccines & immunoglobulin since both are reported to have so many side effects ranging from anaphylaxis to chronic leukemia and at the same time to save a lot of money for the state. In this study, when participants seek medical care following a dog bite, more than three-quarters of the respondents would take the offending dog's vaccination card (91.0%, $n=293$) but less than one-third of them would make a note of health status(21.1%, $n=68$) and observable status(17.7%, $n=57$) of the offending dog. The reasons for unawareness with regard to making a note of the offending dog may be due to the deficiencies in the health education programs that were done.

While receiving post-exposure care, the recommended method to follow, when the offending dog is suspected to have rabies is to observe it for 14 days either by leaching or caging and to report immediately if any change occurs in the dog suggestive of rabies(12). Nearly one-quarter (27.3%, $n=88$) of the respondents were aware of this method. This may be due to gaps in health education programs. If someone has received the full course of ARV, for subsequent dog bites, he/she does not have to receive any vaccine for six months from the date of completion of the course and if it occurs after six months but before five years, only vaccination for two days i.e., D0 & D3 is sufficient and there is no necessity of receiving immunoglobulin in both occasions(12). Therefore, the production of a previous vaccination card in an event of a dog bite and retention of the card for a minimum of 5 years is very important. Nearly one-third (34.5%, $n=111$) of the participants knew that it's important to take this card if available to the hospital after an event of a dog bite and less than half of them, knew the minimum duration to retain this card. Only 16%($n=52$) of the respondents knew that there is a positive impact on PET in an event of a subsequent dog bite by receiving the complete course of anti-rabies vaccine(ARV) for the current event. Less than half of the respondents were aware of the maximum duration of the ARV course. This may be due to less penetration of health-related information to the community. Nearly two-thirds of the

respondents knew correctly that the injections are given to the wound if indicated but nearly one-quarter of them were aware that observation of the offending dog is a part of PET. This shows a lack of holistic knowledge among the participants with regard to treatment following dog bites.

The ever-married individuals might be having more experience related to day-to-day events, so this might be the reason for significantly more ever-married participants ($p=0.02$) among those who had good knowledge on treatment following dog bites.

Among those who had good knowledge on treatment following dog bites, significantly more participants were having a higher education level as they might have acquired knowledge through education, had a higher monthly family income since they may be having more opportunities to receive information, being employed as they might be having more exposure to the society & to current events and owning a dog ($p<0.001$) as they might be having their own experiences. Similarly, a study was done in Gujarat, India among adults had revealed that there was a significant association between knowledge on the availability of the PET vaccine and educational level ($p<0.05$) (23).

V. CONCLUSIONS AND RECOMMENDATIONS

The majority of the study participants had good overall knowledge on rabies and treatment following a dog bite. In general, knowledge on non-canine reservoirs of rabies and knowledge on treatment following dog bites on specific events were deficient.

There is a need to give holistic knowledge with regard to rabies as well as treatment following a dog bite to the general public.

VI. ACKNOWLEDGMENT

The research team would like to express their gratitude to the Regional Director of Health Services, Colombo, Medical Officer of Health, Maharagama, and all the study participants.

REFERENCES

- [1] Clark ML, Kumar P. Kumar and Clark's Clinical Medicine. 2017.
- [2] World Health Organization. WHO expert consultation on rabies: third report. Vol. 1012. World Health Organization; 2018.
- [3] Vithanarachchi S, Rodrigo P. Responsible pet ownership: knowledge, attitudes and practices of victimized patients attended the rabies control unit of the national hospital of Sri Lanka. 2012;
- [4] Pan American Health Organization Resolution CD49. R9. Elimination of neglected diseases and other poverty-related infections. 2009;
- [5] Knobel DL, Cleaveland S, Coleman PG, Fèvre EM, Meltzer MI, Miranda MEG, et al. Re-evaluating the burden of rabies in Africa and Asia. *Bulletin of the World health Organization*. 2005;83:360–8.
- [6] Sudarshan M, Madhusudana S, Mahendra B, Rao N, Narayana DA, Rahman SA, et al. Assessing the burden of human rabies in India: results of a national multi-center epidemiological survey. *International Journal of Infectious Diseases*. 2007;11(1):29–35.
- [7] Kumarapeli V, Awerbuch-Friedlander T. Human rabies focusing on dog ecology—A challenge to public health in Sri Lanka. *Acta tropica*. 2009;112(1):33–7.
- [8] Pinidiyapathirage M, Wimalaratne O. Appropriateness of rabies post-exposure treatment received by patients presenting to an anti-rabies treatment unit: P574. *Clinical Microbiology & Infection*. 2006;12.
- [9] Blanton JD, Palmer D, Dyer J, Rupprecht CE. Rabies surveillance in the United States during 2010. *Journal of the American Veterinary Medical Association*. 2011;239(6):773–83.
- [10] World Health Organization. Strategic framework for elimination of human rabies transmitted by dogs in the South-East Asia region. 2012;
- [11] Ministry of Health, Sri Lanka. PUBLIC HEALTH VETERINARY SERVICES [Internet]. 2021. Available from: <http://www.rabies.gov.lk/english/>
- [12] Ministry of Health, Sri Lanka. Protocol for anti Rabies post exposure therapy (PET). 2019.

- [13] Lwanga SK, Lemeshow S, World Health Organization. Sample size determination in health studies: a practical manual. World Health Organization; 1991.
- [14] Matibag GC, Kamigaki T, Kumarasiri PV, Wijewardana TG, Kalupahana AW, Dissanayake DA, et al. Knowledge, attitudes, and practices survey of rabies in a community in Sri Lanka. *Environmental health and preventive medicine*. 2007;12(2):84–9.
- [15] Damboragama SN. Study of health seeking behavior of dog bite victims and a comparison of the effectiveness of different interventions on canine immunization coverage in four PHI areas in Colombo district. PGIM, University of Colombo.; 1999.
- [16] Wickramasinghe, WADCH. Rabies post exposure treatment: Cost reduction through responsible pet ownership. 2010.
- [17] Jayawardena DMS. Knowledge attitude and practices regarding human rabies and factors associated with knowledge among grade 10 students in Nugegoda educational Division (ine). PGIM, University of Colombo.; 2012.
- [18] Chang M-W, Brown R, Nitzke S. Scale development: factors affecting diet, exercise, and stress management (FADESM). *BMC Public Health*. 2008;8(1):1–7.
- [19] Wasay M, Malik A, Fahim A, Yousuf A, Chawla R, Daniel H, et al. Knowledge and attitudes about tetanus and rabies: a population-based survey from Karachi, Pakistan. *Journal of the Pakistan Medical Association*. 2012;62(4):378.
- [20] Ali A, Ahmed EY, Sifer D. A study on knowledge, attitude and practice of rabies among residents in Addis Ababa, Ethiopia. *Ethiopian Veterinary Journal*. 2013;17(2):19–35.
- [21] Gönen I, Soysal A, Topuzoğlu A, Bakir M. Clinical knowledge and attitudes of Turkish physicians toward rabies caused by animal bites. *Japanese journal of infectious diseases*. 2011;64(5):382–90.
- [22] Bellana MRE. Selected factors affecting timely post exposure prophylaxis of human rabies at Colombo South Teaching Hospital. [Internet]. Available from: PGIM University of Colombo
- [23] Singh U, Choudhary S. Knowledge, attitude, behavior and practice study on dog-bites and its management in the context of prevention of rabies in a rural community of Gujarat. *Indian Journal of Community Medicine*. 2005;30(3):81.
- [24] Harischandra PL, Gunsekera A, Janakan N, Gongal G, Abela-Ridder B. Sri Lanka takes action towards a target of zero rabies death by 2020. *WHO South-East Asia Journal of Public Health*. 2016;5(2):113