

Responsible Dog Ownership: Knowledge, Attitudes, and Practices of adults residing in a semi-urban Medical Officer of Health area in Sri Lanka

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Abstract

Introduction- Rabies is a 100% vaccine-preventable and 100% fatal zoonotic, viral illness. Dogs are the source of nearly all the deaths from rabies in Sri Lanka. Annually nearly 20-30 persons die due to human rabies and the health system provides post-exposure prophylaxis for 300,000 individuals in the country. One of the main strategies in the prevention of rabies in the country is the promotion of responsible dog ownership (RDO). This study was done with the aim of describing the knowledge, attitude, and practice on Responsible Dog Ownership and their associated factors among persons aged 20-59 years in a semi-urban Medical Officer of Health (MOH) 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 the MOH area Maharagama, 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 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 Responsible Dog Ownership (RDO) was good among 69.3% (n=223) with: > 50% knew about rabies vaccine and breeding control but < 40% knew about parvo & distemper vaccines. Overall attitudes on RDO were favorable in 73.3% (n=236) with: >95% on dog vaccination against rabies but <30% on caring of dogs. >60% had practiced: immunization; de worming but < 40% had practiced breeding control. The factors associated with good knowledge on RDO: age 20-39 years (OR=1.7, 95% CI- 1.1 -2.8, p=0.01); being Sinhalese (OR=2.7, 95% CI- 1.01 -6.8, p=0.03); being Buddhists (OR=2.1, 95% CI- 1.01 -4.0, p=0.03), having higher education (OR=21.4, 95% CI- 10.2 -44.9, p<0.0001); having higher income (OR=3.5, 95% CI- 2.1 -5.8, p<0.001), being employed (OR=2.7, 95% CI- 1.6 -4.4, p<0.001) and owning dog (OR=18.9, 95% CI- 2.5 -139.7, p<0.001). The factors associated with favorable attitudes on RDO: age 20-39 years (OR=2.6, 95% CI- 1.6 -4.3, p<0.001); being Sinhalese (OR=2.6, 95% CI- 1.03 -6.7, p=0.04); being Buddhists (OR=2.3, 95% CI- 1.2 -4.6, p=0.01); being unmarried (OR=2.5, 95% CI- 1.2 -5.2, p=0.01); having higher education (OR=1.7, 95% CI- 1.1 -2.9, p=0.02). Practices on RDO among dog owners: having a higher level of education was associated with hygienic disposal of dung (OR=12.8, 95% CI 2.1 -78.6, p<0.01) and expression of ownership (OR=8.1, 95% CI-1.7-38.6, p=0.01). Being employed was associated with measures taken to prevent pet dog becoming a public nuisance (OR=6.6, 95% CI 1.3-32.5, p=0.04).

Conclusions and Recommendations: The majority of study participants had good knowledge, attitudes, and practices with regard to the prevention of Rabies. However, their knowledge, attitudes, and practices on other elements of RDO are not as good. Responsible Dog Ownership should be introduced as a regulation for the general public by the Ministry of Health in order to further reduce deaths due to Rabies in Sri Lanka.

Keywords—Responsible Dog Ownership, Rabies, Sri Lanka.

I. INTRODUCTION

The domestic dog (*Canis lupus familiaris*) is considered the man's best friend. The dog is the first domesticated animal, and it is kept as the man's companion for working, hunting, and pet for thousands of years (1). The responsible dog ownership concept includes mainly three aspects i.e., protection of the rights of the dogs, that of the owner as well as that of the community. These rights are ensured by the enforcement of different laws and regulations in different countries including Sri Lanka (2,3). Registration of the pet dog is done in many countries. The owner has been made accountable for the pet dog's wrongdoings. Disciplining and training are the responsibility of the owner. A collar should be worn around the neck of the pet dog in order to express its ownership and it should be kept under control either by leashing or caging. The steps should be taken to dispose of their dung separately in a hygienic manner (4). Provision of adequate nutrition via balance diet, de-worming, immunization (against rabies, Parvo viral infection, Distemper, etc.), regulation of breeding either by sterilization or by giving hormonal injections, and ultimately treating the pet dog as a family member without any cruelty towards it are the important aspects of this concept towards the dog (4). The main advantages to the community by practicing responsible dog ownership are prevention of injuries, prevention of disease transmission, prevention of becoming a public nuisance e.g. sound pollution, and minimize the damages done for the public properties. In the global as well as in the local situation, a dog is identified as the main responsible animal for the transmission of rabies. Therefore, in many countries promotion of responsible dog ownership has been identified as one of their main strategies to control rabies (5,6).

Globally more than 3 billion people, about 50% of the world's population are living in the territories where canine rabies exists and potentially exposed to rabies (7). Sri Lanka is among the countries in the world that reports the highest rates of human deaths due to rabies (8). Annually, 20-30 persons die from human rabies (7) and nearly 300,000 individuals require post exposure therapy to prevent rabies in Sri Lanka (9). Sri Lanka adopts several strategies to prevent human rabies that includes mass dog vaccination against rabies, female dog sterilization, programs for adoption of puppies at community level, provision of post exposure prophylaxis for dog bite victims, promotion of responsible dog ownership etc. Also, Human rabies has been a notifiable disease since 1971(9). A study has shown a negative and statistically significant correlation between human rabies death rate and dog vaccination rate as human deaths had been declined and dog vaccination had been increased over the years (10).

The knowledge on responsible dog ownership includes both knowledge of the dog owners as well as the non-dog owners regarding this concept since both parties are affected if this is breached. Local and international studies have revealed that the level of knowledge among children and adults with regard to responsible dog ownership is poor with few exceptions such as the necessity of vaccination against rabies in regular intervals (11,12,13,14). In the majority of the studies, participants had favorable attitudes towards vaccination and spending their money on vaccination of dogs against rabies. But comparatively lesser numbers had favorable attitudes towards prevention of free-roaming, regulation of their breeding, and provision of euthanasia (12,13,14,15,16). Studies had revealed that participants were having satisfactory with regard to vaccination of their dogs against rabies but lesser numbers of participants have taken measures to prevent free-roaming of their pet dogs, provide care when they are ill and provide reasonably good food (12,15,17,18,19,20).

Good knowledge, attitudes, and practices with regard to responsible dog ownership have been found to be associated with sex, level of education, type of occupation, being a pet owner or not (13,21,22). Responsible dog ownership is a concept with a border view in protecting dogs', dog owners' as well as the community's rights to live in harmony. If the community has good awareness about this and if they practice it properly, that will help to minimize the number of adverse effects that occur by the dogs. Therefore, invariably this concept has become a part of the control of rabies. This concept is very useful in increasing the accountability for dog's wrongdoing and will reduce the number of community and stray dogs, most of the time that are ownerless. Also, if it is practiced fully, that will also facilitate fulfillment of other strategies such as increase dog vaccination coverage, control of dog population. At the same time, it will help for the cost-cutting of post-exposure prophylaxis. The promotion of responsible dog ownership has been adopted as one of the main strategies of control of rabies by the World Health Organization's strategic framework for elimination of human rabies in South East Asia as well as the national rabies control program of Sri Lanka (5). Assessment of knowledge, attitudes and practices among the persons residing in a semi-urban medical officer of health area would help to get an overall idea. Therefore assessment of people's level of knowledge, attitude, and practices in this regard is vital to identify the existing gaps and to design a tailor-made solution for each and every identified gap.

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 (23).

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

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(19). 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 sampling 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 Maharagama, 17 GNDs were selected by probability proportionate to the population size sampling technique. The secondary sampling unit was a household. The index house of the GND was randomly selected from the voters list of the GND by using a random number table. Then rests of the houses were selected in a pre-determined manner i.e., every other house in 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 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, Attitudes, and Practice on responsible dog ownership

This section consisted of ten questions on knowledge, six questions on practices, and six attitudinal statements based on responsible dog ownership

Data collection:

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

Data Analysis:

Knowledge of RDO was determined by 10 questions. For each question, if the response is correct 10 marks were given and if it is wrong or the answer is not known, a zero mark was allocated. If an individual had obtained 50% or more from aggregate marks, he/she was considered to have good knowledge.

Practices on RDO were assessed only among dog owners. Six practices were inquired as self-declared responses with regard to immunization, de-worming, expression of ownership, regulation of breeding, hygienic disposal of dung, and measures taken to avoid the dog being a public nuisance. Responses for each practice was assessed separately.

Attitudes on RDO were assessed by using six attitudinal statements each with a five-point Likert scale. An average attitudinal score was calculated for each respondent. He/she was considered to have favorable attitudes if he/she was found to have a >3 average attitudinal score.

Data were analyzed by using descriptive statistics and associations were determined by using the Chi-Square test. 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 RESPONSIBLE DOG OWNERSHIP

Of the participants, 17% (n=54) were aware of the concept of 'responsible dog ownership'. The frequency distribution of the knowledge of the participants on identified items is as follows (Table 1).

Table 1: Distribution of the participants by knowledge on RDO

Response	Number	Percentage
Availability of vaccination against rabies	319	99.1
The first dose of the anti-rabies vaccine is given to a puppy at the age of three months	154	47.8
Recommended frequency of immunization of dogs against rabies after one year of age is once a year	251	78.0

The responsible one for any offense caused by a dog is the owner of the dog	249	77.3
Availability of vaccination against parvo infection	99	30.7
Availability of vaccination against Distemper	82	25.2
Composition of meals to be provided to dogs	234	72.7
A dog could cause injuries	315	97.8
A dog could spread diseases	205	63.7
A dog could cause sound pollution	95	29.5
A dog could damage properties e.g. Crops	52	16.1

THE FACTORS ASSOCIATED WITH GOOD KNOWLEDGE OF RDO

Having good knowledge of RDO was associated with being young, being Sinhalese, being Buddhist, having a higher level of education, having employment, having a higher income, and being a dog owner. The significant associations of the status of knowledge on RDO with selected factors are as follows (Table 2)

Table 2: Associations between the status of knowledge on RDO and selected factors

	Good Knowledge		Poor Knowledge		Total		Significance
Factor	n= 223		n= 99		N=322		
	No.	%	No.	%	No.	%	
Age in years							
20-39	138	74.2	48	25.8	186	100.0	OR=1.7 (95% CI- 1.1 -2.8) χ² =5.0, df=1 P=0.01
40-59	85	62.5	51	37.5	136	100.0	
Ethnicity							
Sinhalese	214	70.6	89	29.4	303	100.0	OR=2.7 (95% CI- 1.01 -6.8) χ² =4.5,df=1 p=0.03
Other	09	47.3	10	52.7	19	100.0	
Religion							
Buddhist	200	71.4	80	28.6	280	100.0	OR=2.1 (95% CI- 1.01 -4.0) χ² =4.8, df=1 p=0.03
Other	23	54.8	19	45.2	42	100.0	
Educational Level ^a							

							OR=21.4
High	152	94.4	9	5.6	161	100.0	(95% CI- 10.2 - 44.9)
Low	71	44.1	90	55.9	161	100.0	$\chi^2=95.7$, df=1
							p<.0001
Employment status							
							OR=2.7
Employed	160	76.9	48	23.1	208	100.0	(95% CI- 1.6 -4.4)
Unemployed	63	55.3	51	44.7	114	100.0	$\chi^2=16.2$, df=1
							P=0001
Monthly Family Income ^b							
							OR=3.5
High	140	81.4	32	18.6	172	100.0	(95% CI- 2.1 -5.8)
Low	83	59.3	67	47.8	140	100.0	$\chi^2=26.7$, df=1
							p<.0001
Status of dog ownership							
							OR=18.9
Yes	36	97.3	1	2.7	37	100.0	(95% CI- 2.5 - 139.7)
No	187	65.6	98	34.4	285	100.0	$\chi^2=15.4$,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

ATTITUDES ON RESPONSIBLE DOG OWNERSHIP

Of the respondents 95.3 % (n=307,) and 88.2% (n=284) had favorable attitudes with regard to pet dogs' should be vaccinated against rabies at regular intervals and with the fact that the owner of the dog should produce its immunization card in an event of a dog bite respectively. However, less than half of the participants had favorable attitudes regarding non-disposal of dog's dung with common garbage and considering a dog as a family member. Nearly nineteen percent of the participants (n=63) had a favorable attitude with the statement that stated a dog should be hit with a cane (Table 3).

Table 3: Distribution of favorable attitudes on RDO among participants

Statement	Favorable Attitudes	
	Number	Percentage
The pet dog should be vaccinated against Rabies in regular intervals	307	95.3
The pet dog's dung should not be disposed of with the common garbage	95	29.5
The pet dog should be considered as a family member	53	16.4
The pet dog should not be allowed to have the freedom of roaming freely with other dogs	285	88.5
If a pet dog bites a person, always the owner must produce the dog's immunization book/card	284	88.2
The pet dog must be hit with a cane if it does the wrong thing.	63	19.6

THE FACTORS ASSOCIATED WITH FAVOURABLE ATTITUDES ON RDO

There were statistically significant associations between having favorable attitudes with being young, being Sinhalese, being Buddhist, being unmarried, and being educated. The associations between the status of attitudes on RDO and selected factors (Table 4).

Table 4: Factors associated with having favorable attitudes on RDO

	Favorable attitudes		Unfavorable attitudes		Total		Significance
Factor	n= 236		n= 86		N=322		
	No.	%	No.	%	No.	%	
Age in years							
20-39	151	81.2	35	18.8	186	100.0	OR=2.6 (95% CI- 1.6 -4.3)
40-59	85	62.5	51	37.5	136	100.0	
							χ^2 =14.0, df=1
							P<0.001
Ethnicity							
Sinhalese	226	74.6	77	25.4	303	100.0	OR=2.6

							(95% CI- 1.03 -6.7)
Other	10	52.6	09	47.4	19	100.0	$\chi^2 = 4.4, df=1$ p=0.04
Religion							
Buddhist	212	75.7	68	24.3	280	100.0	OR=2.3 (95% CI- 1.2 -4.6)
Other	24	57.1	18	42.9	42	100.0	$\chi^2 = 6.4, df=1$ p=0.01
Marital status							
Unmarried	59	85.5	10	14.5	69	100.0	OR=2.5 (95% CI- 1.2 -5.2)
Ever married	177	70.0	76	30.0	253	100.0	$\chi^2 = 6.7, df=1$ P=0.01
Educational Level ^a							
High	127	78.9	34	21.1	161	100.0	OR=1.7 (95% CI- 1.1 -2.9)
Low	109	67.7	52	32.2	161	100.0	$\chi^2 = 5.1, df=1$ p=0.02

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

PRACTICES ON RESPONSIBLE DOG OWNERSHIP

Of the 322 respondents, only 37 (11.5%) were dog owners. The practices on responsible dog ownership were inquired only from the dog owners of the study sample. Of the 37 dog owners, 94.6% (n=35) had vaccinated their pet dogs against rabies regularly, but only two-third (n=24, 64.9%) of them had given warm treatment and one-third (n=12, 32.4 %) had taken measures to regulate their pet dogs' breeding.

More than 75% (n=28) of the dog owners had practiced right disposal of dog's dung. Out of the dog owners 67.6 % (n=25) and 54.1% (n=20) had taken measures to prevent dogs from becoming a nuisance to neighbors and expressed their dog ownership by hanging a collar around the neck respectively.

FACTORS ASSOCIATED WITH GOOD PRACTICES ON RDO

A composite score was not given for all the practices; therefore, each practice was considered in the determination of associations. This was assessed only among dog owners out of the study participants. Statistically significant associations were found between 'hygienic disposal of dog's dung, 'having a collar around dog's neck and having a higher level of education' and 'taking measures to prevent dog becoming a nuisance to the neighbors and being employed' at p=0.05 level (Table 5).

Table 5: Factors associated with good practices on RDO

Factor	Good practice		Bad Practice		Total		Significance
	No.	%	No.	%	No.	%	
HYGIENIC DISPOSAL OF DOG'S DUNG							
Level of Education ^a							
Higher	22	91.7	02	8.3	24	100.0	OR=12.8 (95% CI- 2.1 -78.6)
Lower	06	46.1	07	53.9	13	100.0	
P<0.01							
HAVING A COLLAR AROUND THE NECK OF THEIR PET DOG							
Level of Education ^a							
Higher	17	70.8	07	29.2	24	100.0	OR=8.1 (95% CI- 1.7 -38.6)
Lower	03	23.1	10	76.9	13	100.0	
χ2 =7.7, df=1 p=0.01							
MEASURES TAKEN TO PREVENT DOG BECOMING A NUISANCE TO THE NEIGHBORS							
Employment status							
							OR=6.6 (95% CI- 1.3 -32.5)
Employed	22	81.5	05	18.5	27	100.0	
Unemployed	04	40.0	06	60.0	10	100.0	P=0.04

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

IV. DISCUSSION

In summary of results, the study participants had good knowledge, attitudes, and practices with regard to vaccination against Rabies. The study participants were knowledgeable about the accountability of wrongdoings of dogs, provision of food for dogs, and risk of diseases spread by dogs. But their knowledge was found to be less with regard to other vaccines available for dogs and harms that dog could cause other than spreading of diseases. Their attitudes with regard to matters related to the prevention of Rabies were found to be favorable. But overall attitudes with regard to care for dogs are found to be unfavorable among the majority of the participants. Out of the dog owners, the majority have not taken measures to regulate their breeding.

The sex ratio of the study participants was nearly 1:1 and the proportion of study participants belonging to 20-29 years, 30-39 years, 40-49 years, and 50-59 years were also similar to that of the MOH area, Maharagama. Therefore, the age-sex composition of the sample was similar to that of the MOH area, Maharagama. In this study, 11.5% (n=37) of the respondents were dog owners. A

dog ecology study done in the 1980s on the island had revealed that the dog: human ratio as 1:8 (24) tallies with the present study.

A cross-sectional descriptive study was conducted to describe knowledge, attitudes, and practices on RDO, knowledge on rabies, knowledge on treatment following dog bites, and the associated factors. A minimal sample size was calculated in order to obtain the maximum statistical power for the study. A higher degree of internal validity and representativeness was ensured since a multi-stage sampling technique was adapted by selecting primary sampling units by probability proportionate to size sampling technique and by selecting index house of each cluster randomly from the voters' list by using a random number table. The selection bias was minimized by adhering to eligibility criteria. Measures were taken to make sure that the age-sex composition of the sample is similar to that of the MOH area. This would have increased the external validity of the study. The study instrument (IAQ) was prepared by PI following a thorough literature survey with expert opinion. The allocation of marks and decision on cut-off marks were taken with expert opinion. IAQ was pre-tested before use. The response rate of 94.7% was achieved by visiting the recruited households on weekdays as well as weekends. These measures would have helped in increasing the internal and external validity of this study.

In this study, only 16.8% (n=54) had heard of the concept called 'responsible dog ownership' but they were aware of its components. Similarly, a study carried out in Nugegoda educational division in Sri Lanka had revealed that only 14.9 % (n=103) of the respondents were aware of the 'responsible dog ownership' concept. (14).

In this study, nearly all the participants (99.1%, n=319) were aware that a vaccine is available against rabies for dogs, nearly three-quarters of them (78%, n= 251) knew that it is given once a year but less than half of them (36.3%, n=117) knew the correct age of commencing vaccination against rabies for puppies. A study carried out by using convenient sampling had revealed that 86.7%(n=1361) were aware of the availability of a vaccine against rabies for dogs (13). A cross-sectional study carried out in the National Hospital of Sri Lanka by using purposive sampling among dog bite victims revealed 84% (n=84) were aware of the availability of vaccines for dogs(12). Therefore high awareness on the availability of a vaccine against rabies was found and this may be due to effective awareness programs carried out by Public Health Veterinary Services of Sri Lanka. In this study, nearly one-third of the respondents (35.7%, n=115) were not aware of the availability of measures to regulate breeding. Similarly, a cross-sectional study carried out in the National Hospital of Sri Lanka by using purposive sampling among dog bite victims revealed that 39% (n=39) were unaware of the availability of breeding control measures (12). The reason for this may be the health education messages in this regard had not reached the public effectively.

Immunization of dogs against rabies is the responsibility of the owner in order to protect the dog as well as the community. The majority of the participants had positive attitudes toward vaccination of the pet dog against rabies in regular intervals (95.3%, n=307) Similarly, positive attitudes were reported among 77.7% (n=539) participants with this regard among school children in a cross-sectional study carried out in Nugegeda, educational zone(14). Another study done in Ethiopia had revealed that 98% (n= 1215) of the participants irrespective of the dog ownership status have stated that pet dogs should be vaccinated against rabies(15). Therefore people are having a favorable attitude on vaccination of dogs against rabies. According to the national guideline immunization status of the offending dog is a key factor in deciding the method of post-exposure therapy (25). The vaccination card of the dog is evidence for this. The majority of the participants had a positive attitude towards the production of a dog's vaccination card by the owner if it bites someone (88.2%, n=284). The cruelty towards the animal has not been accepted under the responsible dog ownership (3,4,6) concept but more than half of the respondents (60.1%, n=194) had a positive attitude toward punishing a pet dog by hitting with a cane. This is maybe due to the unawareness among participants regarding this aspect of the RDO concept.

Also under the RDO concept disposal of dog dung should be done separately in a hygienic manner(3,4,6) but the majority (70.5%, n=227) had a positive attitude on disposal of dog's dung with common garbage. This is also due to the unawareness among participants regarding this aspect of the RDO concept. Under the RDO concept dog should be kept under control either by leaching and caging and should not allow freeing roam since this may increase the risk of causing injuries, damaging properties, and spreading of diseases(3,4,6). The majority of the participants (88.5%, n=285) had a positive attitude towards not allowing the dog to roam freely with other dogs similar to a study carried out among grade 10 school children in Nugegoda educational zone reported that (75.9%,n=527) had a positive attitude towards the statement 'Free-roaming dogs are a public nuisance' and also 78.6% (n=545) stated that the irresponsible owners were the main cause for free-roaming dogs(14). The findings of this study with regard to attitudes on RDO could be considered to be consistent with the findings of the other studies.

The practices on RDO were assessed only among dog owners as self-reported. Of dog owners, 94.6 % (n=35) had vaccinated

their dogs against rabies. Similarly, a study carried out among grade 10 children of the Nugegoda educational zone reported that the majority of the participants who own dogs (71.6%, n=179) had vaccinated their pet dogs (14). This may be due to the fact that the availability of mass immunization programs, increased awareness with this regard, and availability of veterinary services in the area since Nugegoda and Maharagama are situated in close proximity. A cross-sectional study carried out among 100 dog bite victims at RTU, NHSL revealed that 46% (n=100) were pet owners and out of pet owners, 60.9% (n=28) were vaccinated their pet dogs against rabies. (12). But in contrast to this, a study done in Kandy revealed that Only 38.6% (n=106) participants with pet dogs had vaccinated their pets against rabies (13). Another study done in Gujarat, India revealed that only 24.4% (n= 54) had vaccinated their dogs against rabies. (22). These differences may be due to the differences in knowledge and available facilities for vaccination. But in the current study, only one-third (32.4%, n=12) had taken measures to regulate breeding. Also in the study carried out among school children in Nugegoda educational zone only 9%(n=30) had sterilized their pet dogs(14). But in that study, other methods of regulating breeding were not considered. The reasons for the low level with regard to these practices may be due to lack of knowledge, lack of motivation, and lack of facilities.

As significantly more participants among those found to have good knowledge on RDO were aged between 20-39 years (p=0.02), Sinhalese (p=0.03) and Buddhists (p=0.03), having a higher level of education (p<0.001), having a higher monthly income (p<0.001), employed (p<0.001) and owned a dog (p<0.001) among those had good knowledge on RDO. The reasons for these may be that young people have more access to sources of information than the older ones, members of other religions and ethnicities may be showing less interest in a dog due to cultural reasons, higher accessibility for information among those with a higher level of education & higher income and dog owners possess their own experiences with this regard respectively. Similarly, a cross-sectional study done in the Kandy district by purposive sampling technique revealed that there is a statically significant difference between pet owners and non-pet owners with regard to knowledge on the availability of anti-rabies vaccine (OR=1.97, 95%CI 1.38-2.81 p=0.001)(13).

Among those with favorable attitudes on RDO, significantly more participants were aged between 20-39 years (p<0.001), Sinhalese (p=0.04), Buddhists (p=0.01) and, having higher level of education (p=0.02). But there wasn't a statistically significant association between the status of dog ownership and attitudes on RDO in contrast to with knowledge on RDO. Young people's thinking patterns may be different from others resulting in more favorable attitudes. The individuals who belong to 'other' ethnicities and religions may be having less interest in dogs, so their attitudes may be unfavorable towards RDO. Those who are educated may be having an influence on their attitudes from the knowledge that they have gained. In contrast to the current study, a cross-sectional study done in the Kandy district by purposive sampling technique revealed that there is a statically significant difference between pet owners and non-pet owners with regard to attitude on animal birth control (OR=1.46, 95%CI 1.10-1.93, p=0, 09) (13). This may be due to the difference in the region as the socio-demographic composition of the two populations.

When factors associated with good practices of RDO: there were significantly more dog owners with a higher level of education among those who practice correct method in disposing dog's dung and among those who had put a collar around their pet dog's neck to express the ownership. With education they might have learnt good practices. Those who are employed might be having more exposure to the society and more conscious about the matters with public interest. So this might be the reason for significantly more employed dog owners among those who had taken any measure to prevent their pet dogs becoming a nuisance to the neighbors.

V. CONCLUSIONS AND RECOMMENDATIONS

The majority of study participants had good knowledge, attitudes, and practices with regard to the prevention of Rabies. But their knowledge, attitudes, and practices on other elements of RDO are not as good.

Responsible Dog Ownership should be introduced as a regulation for the general public by the Ministry of Health in order to further reduce deaths due to Rabies in Sri Lanka.

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] Ovodov ND, Crockford SJ, Kuzmin YV, Higham TF, Hodgins GW, van der Plicht J. A 33,000-year-old incipient dog from the Altai Mountains of Siberia: evidence of the earliest domestication disrupted by the Last Glacial Maximum. *PloS one*. 2011;6(7):e22821.
- [2] Westgarth C, Christley RM, Marvin G, Perkins E. The responsible dog owner: the construction of responsibility. *Anthrozoös*. 2019;32(5):631–46.
- [3] American Veterinary Medical Association. Guidelines for responsible pet ownership [Internet]. 2021. Available from: <https://www.avma.org/resources-tools/avma-policies/guidelines-responsible-pet-ownership>
- [4] DOG AND CAT BOARD.COM.AU. Responsible Dog Ownership [Internet]. 2021. Available from: [https://dogandcatboard.com.au/?p=files/Dog_Owners_H\]andbook.pdf](https://dogandcatboard.com.au/?p=files/Dog_Owners_H]andbook.pdf)
- [5] World Health Organization. WHO Expert Consultation on Rabies [Internet]. 2018. Available from: <https://apps.who.int/iris/bitstream/handle/10665/272364/9789241210218-eng.pdf?sequence=1&isAllowed=y>
- [6] American Kennel Club. Responsible Dog Ownership [Internet]. 2021. Available from: <https://www.akc.org/expert-advice/health/responsible-dog-ownership-veterinarian-edition/>
- [7] Seneviratne S. Human Rabies-Weekly Epidemiological Report, Ministry of Health [Internet]. 2017. Report No.: Vol.44 No.09. Available from: https://www.epid.gov.lk/web/images/pdf/wer/2017/vol_44_no_09-english.pdf
- [8] World Health Organization. Rabnet [Internet]. 2008. Available from: <http://who.int/globalatlas/DataQuary/default.asp>
- [9] 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
- [10] 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
- [11] Shen J, Li S, Xiang H, Pang S, Xu G, Schwebel DC. A multi-site study on knowledge, attitudes, beliefs and practice of child-dog interactions in rural China. *International Journal of Environmental Research and Public Health*. 2013;10(3):950–62.
- [12] 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;
- [13] 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.
- [14] Jayawardena DMS. Knowledge attitude and practices regarding human rabies and factors associated with knowledge among grade 10 students in Nugegoda educational Division (in). PGIM, University of Colombo.; 2012.
- [15] 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.
- [16] Lunney M, Fèvre SJ, Stiles E, Ly S, San S, Vong S. Knowledge, attitudes and practices of rabies prevention and dog bite injuries in urban and peri-urban provinces in Cambodia, 2009. *International health*. 2012;4(1):4–9.
- [17] Butler J, Bingham J. Demography and dog-human relationships of the dog population in Zimbabwean communal lands. *Veterinary Record*. 2000;147(16):442–6.
- [18] Mshelbwala P, Ogunkoya A, Abdullahi S, Maikai B, Atuman J. Knowledge, attitude and practice about dog bite and rabies exposure among dog meat consumers and processors in Abia state, Nigeria. *J Vet Adv*. 2014;4(2):398–404.
- [19] De Ramos Mem, Bravo Lc. Knowledge, Attitudes and Practices of the Community. 2004;
- [20] Umrigar P, Parmar GB, Patel PB, Bansal R. Epidemiology of animal bite cases attending municipal tertiary care centres in Surat city: a cross sectional study. *Natl J Community Med*. 2013;4(1):153–7.

- [21] Guadu T, Shite A, Chanie M, Bogale B, Fentahun T. Assessment of knowledge, attitude and practices about rabies and associated factors: in the case of Bahir Dar town. *Global Veterinaria*. 2014;13(3):348–54.
- [22] 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.
- [23] Lwanga SK, Lemeshow S. Sample size determination in health studies: a practical manual. World Health Organization; 1991.
- [24] World Health Organization. Report of dog ecology studies related to rabies. WHO/Rab Res/8825 Geneva: World Health Organization. 1988;
- [25] Ministry of Health, Sri Lanka. Protocol for anti-Rabies post exposure therapy (PET). 2019.