

## A pilot study on the usefulness of information and education campaign materials in enhancing the knowledge, attitude and practice on rabies in rural Sri Lanka

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### Abstract

**Background:** Rabies remains endemic in Sri Lanka despite a strong government patronized anti-rabies campaign. Personal, cultural or religious beliefs have been thought to influence health practices that could render rabies prevalent in the country.

**Methodology:** The knowledge, attitudes, and beliefs of 580 household heads/members from Nuwara Eliya District, Sri Lanka, regarding rabies were explored through a structured questionnaire. An improvement/deterioration in their knowledge and practices after the use of information and education campaign (IEC) materials was assessed through a repeat exploration at an interval of four weeks.

**Results:** Respondents showed inclination toward animal birth control (60%) rather than elimination methods (24%). There was disparity between pet owners' enthusiasm to take pets for rabies inoculation (57%) and their ability to show dog vaccination cards (40%). Almost twice more pet owners than non-pet owners believed that it is their responsibility to control the population of roaming pet dogs (aOR=1.78; 95% CI: 1.14 to 2.76). The rabies leaflets were very effective in informing the people on how to deal with rabid animals, the earliest schedule for anti-rabies vaccine (ARV), and repeat vaccination.

**Conclusions:** Awareness and proper attitude toward rabies management and canine population control are adequate among the rural Sinhalese and Buddhist populations of Sri Lanka; however, their current health practices should be improved. The rabies KAP could be further enhanced through the use of IEC materials.

**Key Words:** Rabies; knowledge; attitude; health practice; Sri Lanka

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### Introduction

Of the estimated 55,000 annual deaths due to human rabies in the world, more than 33,000 fatalities are likely to take place in the South-East Asia Region (SEAR). Rabies is endemic in seven countries of the SEAR (Bangladesh, India, Indonesia, Myanmar, Nepal, Sri Lanka, and Thailand) with the exception of Bhutan, DPR Korea, Maldives, and Timor-Leste. The estimated annual cost of human and animal anti-rabies biologics in the region is US\$57 million [1-3]. Although Sri Lanka has been implementing rabies control programs for nearly three decades, rabies remains a public health threat in the country. Between 1973 and 2008, although

there were fluctuations, a decreasing trend in incidence was observed. In 1973, the country recorded its highest number of human rabies deaths of 377 (20 per million population) and the lowest of 55 (3 per million population) in 2005 [4-6]. According to the World Health Organization (WHO), between 1987 and 2007, with the total number of human fatalities reaching 2,042, the country ranks number three in the region and seven in the world in disease fatalities (India 24,4478; Bangladesh 22,900; China 13,995; Philippines 5,658; Viet Nam 5,183; Pakistan 2,843; Myanmar 1,683; Thailand 1,377; Indonesia 1,208) [6]. From 2003 to

2007, Sri Lanka reported 359 (19 per million population) human rabies deaths (range: 55-97) [6-9].

Persistence, and to some extent expansion, of the overall rabies situation in the countries of the region indicate inadequacy of control activities. The various constraints that are responsible for the situation include:

- a) lack of a national policy and a comprehensively coordinated national rabies control program
- b) inadequacies in partnership between stakeholders, infrastructure and capacity, quantities of safe and potent immunizing agents, and dog population management programmes
- c) non-implementation of technically sound strategies
- d) weak epidemiological surveillance
- e) inadequate research and development and absence of health education.

In the SEAR, information and education campaign (IEC) activities are few and far between. Efforts to educate the public about the epidemiological features of rabies and simple “Dos and Don’ts” that can protect them as well as help in bringing about a reduction in the incidence of rabies are nil [1].

A study on rabies knowledge, attitude and practice (KAP) in Kandy District, Central Province, showed that there was high level of awareness and receptiveness to rabies control measures among the people [10]. The practice attributes relevant to rabies control in urban and rural areas were dismal. The practices that need to be improved include: reporting of dog bites; knowledge and enthusiasm to take suspected animals to a diagnostic laboratory for disease confirmation; preference for animal birth control (ABC) as against euthanasia; seeking medical treatment after a dog bite; pet restriction and vaccination. Pet owners were more supportive of rabies control activities than non-pet owners. It was also noted that the willingness and awareness of the people did not guarantee that they would cooperate in government rabies control programs [10].

It is possible that religious beliefs have played a role in the persistence of rabies in the country. The major religions, Buddhism and Hinduism, do not favor slaughter of animals and hence the “capture and kill” policy is widely deemed unacceptable [11-15]. Considering this, the government encourages and provides mass canine vaccination and sterilization to control rabies and dog population growth [10,16]. Like Thailand, destruction of dogs and cats is rarely practiced in Sri Lanka due to firmly rooted Buddhist ethics [17-19]. An earlier survey showed a low rate of

submission of animal specimens for laboratory confirmation of rabies (2/357), which is inconsistent with the respondents’ will to destroy rabies-suspect pets (71.1%) and strays (85.5%) [10, 20]. In neighboring India, a predominantly Hindu nation, 74.5% of animals responsible for the bites were killed in order to avert potential harm to humans [21].

From 2003 to 2006, although there was improvement in canine rabies vaccination in Sri Lanka (30%, 32%, 38% and 42%), the overall coverage still remains low [6]. In Kandy District, 58% of households were pet owners and only 48% of pet dogs were vaccinated. It is a common practice among dog owners (33%) to allow pets to roam around unsupervised and 8.5% of these animals have no cages and stay within the house of their owners, which could increase the possibility of dog bites [10].

In order to control the disease, knowledge about rabies, proper and adequate pet care practices, and responsible dog ownership should be emphasized to the people, especially those in rural areas [10]. Health educational drives through the use of IEC materials may be a cost-effective method to disseminate correct information to the priority population.

Thus, we conducted a pilot study in three selected rural communities in Sri Lanka. This study will serve as a basis to strategize for further anti-rabies interventions in the future. The objectives of this study are to compare the KAP of people in Nuwara Eliya District, and to evaluate the effect of IEC materials (rabies leaflets) with regard to knowledge about rabies, pet care, and responsible ownership of dogs.

## Materials and Methods

### *Study design*

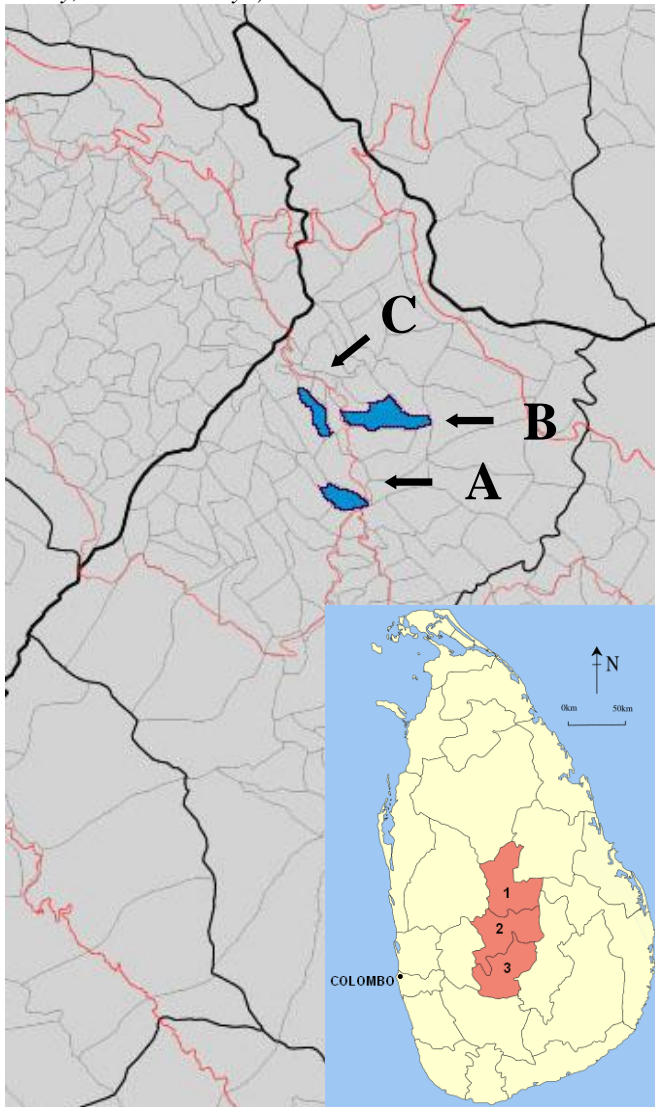
This biphasic exploratory study was conducted from 31 January to 15 February 2008 (pre-intervention) and from 7 to 19 March 2008 (post-intervention).

### *Study locations, sampling and sample population*

Armed conflicts, bombing episodes, and security concerns in different parts of Sri Lanka have been major constraints to random selection of study areas at the time of survey [22-26]. Thus, the survey was conducted in a fairly safe location in Hanguranketa Division, Nuwara Eliya (NE) District, Central Province (7°10’39.01”N, 80°46’43.05”E, elevation: 1,990 meters). Within this mountainous rural division, three villages were selected, namely, Rikillagaskada (2007 population: 1,490 residents; 441 households), Kottala (962 residents; 231 households), and Ambaliyedda (834

residents; 195 households) (Figure 1) [27]. Prioritizing the remote areas, we selected these three villages due to a low canine rabies vaccination coverage and, hence possibly an inadequate rabies information campaign. Household selection started from the health center of each village and went outwardly. Whereas qualified household heads/members in Rikillagaskada were chosen from every other house on sight, we enrolled all willing and capable respondents in Kottala and Ambaliyedda. When no eligible respondents were available, the house was revisited the following day. For this study, a rural area would be a rural or an estate sector (plantation areas having more than 20 acres/8 hectares and more than 10 residential laborers with

**Figure 1.** Map of Hanguranketa Division showing the locations of the three study areas (A-Rikillagaskada, B-Kottala, C-Ambaliyedda). Insert shows the three districts that compose the Central Province of Sri Lanka (1-Matale, 2-Kandy, 3-Nuwara Eliya).



a single administration body) [28].

The population distribution is similar between the NE District and Sri Lanka with regard to age, gender, and educational attainment. However, in contrast to national data (rural: 85%; Tamil race: 9%; Hinduism: 8%), the rural sector (94%), Tamil (57%), and Hinduism (51%) were over-represented in the NE District [28,29]. Face-to-face interviews were conducted for all available household heads/members aged 15 and above who consented and were available during weekday interviews (10:00-16:00) for baseline and follow-up periods. Only one respondent was interviewed for every household.

For the pre-intervention study, a total of 676 houses were visited. Of these, 602 household members agreed to participate. During the post-intervention study, 594 respondents were available for interview. There were 14 questionnaires that did not match for age or sex of the respondents for the pre- and post-intervention interviews, hence, were disregarded. A total of 580 respondents were included in the final analysis.

#### *Survey method and questionnaire*

A standard structured questionnaire was developed to assess the respondents' KAP before and after the use of IEC materials. The questionnaire included items regarding respondents' profile, levels of KAP with respect to rabies and dog population management and control, pet care practices, and responsible dog ownership. The English questionnaire was translated to Sinhalese with back-translation to ensure accuracy. Pre-testing was performed prior to the actual survey.

After the baseline interview, the study participants were given a copy of the rabies IEC leaflet and were encouraged to read the material. They were also informed that a follow-up interview would be held four weeks later to determine any change in rabies KAP. All study participants were included during the follow-up interview. No new participants were recruited. Those who were not available, despite repeated visits during the post-intervention period, were excluded from the study.

#### *IEC materials*

Rabies leaflets were developed in English and translated to Sinhalese. The following information was included: the nature of human rabies, signs and symptoms of human and canine rabies, modes of transmission, what to do after an animal bite, proper and adequate pet care practices, and responsible dog ownership. The information was drafted from various

sources such as the WHO, pet care websites, and from veterinary faculty members of the University of Peradeniya [30-35]. Colorful illustrations were included to attract and encourage the participants to read the material. All respondents were provided one copy each.

### Ethical clearance

Approval for the study was obtained from the Ethics Committee of the University of Peradeniya, Sri Lanka. A clearance for conducting the survey was also acquired from the Department of Health Services of Central Province.

### Data analysis

The priority population was grouped according to pet ownership status and highest educational attainment. The Chi-square test or Fisher's exact test was used, as appropriate, to evaluate the statistical significance of the differences in responses of participants. To compare the change in KAP, the McNemar change test was used. A *P* value of <0.05 was considered to be statistically significant. To control the effects of gender and educational level on the responses, logistic regression analysis was applied. Data analysis was done using SPSS version 14.0.

## Results

### Demographic characteristics of the study population

The median age of the respondents was 40 years (mean: 42.02±1.27). Male subjects comprised 35.5% of the cohort (median: 48 years; mean: 46.32±2.15). Female subjects constituted 64.5% of the population (median: 36 years; mean: 39.66±1.53). There were no significant differences in age and gender distribution, educational attainment, religion, ethnicity, and use of tri-media resources between pet- and non-pet owners (Table 1).

The majority of respondents had heard of rabies (94.5%). Most of the information came from various sources such as tri-media (radio, newspaper, television) (44.3%); school, neighbors and friends (28.5%); and government campaigns (26.5%). Most of the respondents (89.7%) read the leaflet provided to them. Approximately 89.0% agreed that the IEC materials were useful (Table 1).

### Attitude toward control of rabies and dog population growth

Both pet- and non-pet owners agreed that 1) stray dogs are annoying (*P* = 0.428); 2) ABC methods are the

**Table 1.** Demographic characteristics of respondents in selected areas of Nuwara Eliya, Sri Lanka.

|  | Total no. of respondents |       | Pet owner       |       | Non-pet owner    |       | <i>P</i> value     |
|--|--------------------------|-------|-----------------|-------|------------------|-------|--------------------|
|  | n=580                    |       | n=284           |       | n=296            |       |                    |
| <b>Gender</b>                                    |                          |       |                 |       |                  |       |                    |
| Male   | 206                      | 35.5% | 110             | 38.7% | 96               | 32.4% | 0.119              |
| Female   | 374                      | 64.5% | 174             | 61.3% | 200              | 67.6% |                    |
| <b>Age (years)<sup>†</sup></b>                   |                          |       |                 |       |                  |       |                    |
| 15-19  | 29                       | 5.1%  | 18              | 6.6%  | 11               | 3.8%  | 0.592 <sup>‡</sup> |
| 20-29  | 96                       | 17.0% | 41              | 15.0% | 55               | 19.0% |                    |
| 30-39  | 148                      | 26.2% | 62              | 22.6% | 86               | 29.7% |                    |
| 40-49  | 107                      | 19.0% | 57              | 20.8% | 50               | 17.2% |                    |
| 50-59  | 96                       | 17.0% | 60              | 21.9% | 36               | 12.4% |                    |
| ≥60  | 88                       | 15.6% | 36              | 13.1% | 52               | 17.9% |                    |
| <b>Educational level</b>                         |                          |       |                 |       |                  |       |                    |
| Primary <sup>†</sup>                             | 216                      | 37.2% | 101             | 35.6% | 115              | 38.9% | 0.609              |
| Secondary and above <sup>‡</sup>                 | 350                      | 60.3% | 177             | 62.3% | 173              | 58.4% |                    |
| Not stated                                       | 14                       | 2.4%  | 6               | 2.1%  | 8                | 2.7%  |                    |
| <b>Religion</b>                                  |                          |       |                 |       |                  |       |                    |
| Buddhism   | 569                      | 98.1% | 280             | 98.6% | 289              | 97.6% | 0.554              |
| Hinduism/Islam/Christianity                      | 7                        | 1.2%  | 2               | 0.7%  | 5                | 1.7%  |                    |
| Not stated                                       | 4                        | 0.7%  | 2               | 0.7%  | 2                | 0.7%  |                    |
| <b>Ethnicity</b>                                 |                          |       |                 |       |                  |       |                    |
| Sinhalese  | 575                      | 99.1% | 283             | 99.6% | 292              | 98.6% | 0.373              |
| Tamil/Moor                                       | 5                        | 0.9%  | 1               | 0.4%  | 4                | 1.4%  |                    |
| <b>No. of households surveyed</b>                |                          |       |                 |       |                  |       |                    |
| Rikillagaskada                                   | 206                      | 35.5% | 95              | 33.5% | 111              | 37.5% | 0.007              |
| Kottala  | 199                      | 34.3% | 115             | 40.5% | 84               | 28.4% |                    |
| Ambaliyedda                                      | 175                      | 30.2% | 74              | 26.1% | 101              | 34.1% |                    |
| <b>No. of household members</b>                  |                          |       |                 |       |                  |       |                    |
| Male   | 1227                     | 49.9% | 627             | 49.8% | 600              | 49.9% | 0.028 <sup>‡</sup> |
| Female   | 1234                     | 50.1% | 633             | 50.2% | 601              | 50.1% | 0.020 <sup>‡</sup> |
| <b>Average household size</b>                    | 4.24±0.11                |       | 4.44±0.17       |       | 4.06±0.15        |       | 0.001 <sup>‡</sup> |
| <b>Average monthly household income (Rupees)</b> | 9775.82±945.65           |       | 9518.72±1123.52 |       | 10067.09±1577.21 |       | 0.570 <sup>‡</sup> |
| <b>Have heard about rabies</b>                   |                          |       |                 |       |                  |       |                    |
| Yes  | 548                      | 94.5% | 273             | 96.1% | 275              | 92.9% | 0.208              |
| No   | 25                       | 4.3%  | 8               | 2.8%  | 17               | 5.7%  |                    |
| No answer  | 7                        | 1.2%  | 3               | 1.1%  | 4                | 1.4%  |                    |
| <b>Sources of information<sup>§</sup></b>        |                          |       |                 |       |                  |       |                    |
| Tri-media <sup>  </sup>                          | 491                      | 44.3% | 239             | 43.5% | 252              | 45.2% | 0.457              |
| School/Friends/Neighbors                         | 316                      | 28.5% | 150             | 27.3% | 166              | 29.7% |                    |
| Government rabies vaccination campaigns          | 294                      | 26.5% | 157             | 28.5% | 137              | 24.6% |                    |
| Did not receive information                      | 7                        | 0.6%  | 4               | 0.7%  | 3                | 0.5%  |                    |
| <b>Study participants read the leaflet</b>       |                          |       |                 |       |                  |       |                    |
| Yes  | 520                      | 89.7% | 260             | 91.5% | 260              | 87.8% | 0.164              |
| No   | 59                       | 10.2% | 23              | 8.1%  | 36               | 12.2% |                    |
| No answer  | 1                        | 0.2%  | 1               | 0.4%  | 0                | 0.0%  |                    |
| <b>Leaflet was useful</b>                        |                          |       |                 |       |                  |       |                    |
| Yes  | 516                      | 89.0% | 258             | 90.8% | 258              | 87.2% | 0.263              |
| No   | 1                        | 0.2%  | 0               | 0.0%  | 1                | 0.3%  |                    |
| Undecided  | 63                       | 10.9% | 26              | 9.2%  | 37               | 12.5% |                    |

\*Missing data were excluded in the analysis. †Includes no schooling, Kindergarten up to Grade 10. ‡Has passed the General Certificate of Education, Ordinary Level Examination including college level and above. §Some information sources were counted more than once. ||Television, radio, and newspaper ¶One-way ANOVA.

best measures to control stray dog population (*P* = 0.267); 3) it is the responsibility of the people and non-governmental organizations (NGOs) to control the population of poorly supervised pet dogs (*P* = 0.737) (Table 2).

Controlling for respondents' age and educational level, pet owners were more likely than non-pet owners to think that 1) it is the people and NGOs who are responsible in controlling stray dog population

**Table 2.** Attitude toward control of rabies and dog population among respondents in selected areas of Nuwara Eliya, Sri Lanka.

|   | Total no. of respondents |      | Pet owner |      | Non-pet owner |      | p value |
|---|--------------------------|------|-----------|------|---------------|------|---------|
|   | n=580                    | %    | n=284     | %    | n=296         | %    |         |
| <b>Are you annoyed with stray dogs?</b>   |                          |      |           |      |               |      |         |
| Yes   | 463                      | 79.8 | 232       | 81.7 | 231           | 78.0 | 0.428   |
| No  | 30                       | 5.2  | 15        | 5.3  | 15            | 5.1  |         |
| Undecided   | 87                       | 15.0 | 37        | 13.0 | 50            | 16.9 |         |
| <b>Which of the following procedures do you think is the best thing to do to control stray dog population?</b>  |                          |      |           |      |               |      |         |
| Animal birth control  | 350                      | 60.3 | 179       | 63.0 | 171           | 57.8 | 0.267   |
| Other <sup>a</sup>  | 141                      | 24.3 | 68        | 23.9 | 73            | 24.7 |         |
| Undecided   | 89                       | 15.3 | 37        | 13.0 | 52            | 17.6 |         |
| <b>Who or which institution/agency do you think should be responsible in controlling the stray dog population?</b>                                    |                          |      |           |      |               |      |         |
| People in the community/NGOs <sup>†</sup>   | 383                      | 66.0 | 205       | 72.2 | 178           | 60.1 | 0.008   |
| Government  | 111                      | 19.1 | 43        | 15.1 | 68            | 23.0 |         |
| Undecided   | 86                       | 14.8 | 36        | 12.7 | 50            | 16.9 |         |
| <b>Which of the following procedures do you think would be best to control the population of poorly supervised pet dogs?</b>                          |                          |      |           |      |               |      |         |
| Animal birth control  | 384                      | 66.2 | 204       | 71.8 | 180           | 60.8 | 0.016   |
| Other <sup>a</sup>  | 111                      | 19.1 | 43        | 15.1 | 68            | 23.0 |         |
| Undecided   | 85                       | 14.7 | 37        | 13.0 | 48            | 16.2 |         |
| <b>Who or which institution/agency do you think should be responsible in controlling the poorly supervised pet dog population?</b>                    |                          |      |           |      |               |      |         |
| People in the community/NGOs <sup>†</sup>   | 405                      | 69.8 | 202       | 71.1 | 203           | 68.6 | 0.737   |
| Government  | 74                       | 12.8 | 36        | 12.7 | 38            | 12.8 |         |
| Undecided   | 101                      | 17.4 | 46        | 16.2 | 55            | 18.6 |         |
| <b>In your community, if there is a regulation banning stray dogs, are you willing to report to authorities if you see one?</b>                       |                          |      |           |      |               |      |         |
| Yes   | 469                      | 80.9 | 241       | 84.9 | 228           | 77.0 | 0.050   |
| No  | 18                       | 3.1  | 6         | 2.1  | 12            | 4.1  |         |
| Undecided   | 93                       | 16.0 | 37        | 13.0 | 56            | 18.9 |         |
| <b>In your community, if there is a regulation banning owned but poorly supervised dogs, are you willing to report to authorities if you see one?</b> |                          |      |           |      |               |      |         |
| Yes   | 418                      | 72.1 | 218       | 76.8 | 200           | 67.6 | 0.041   |
| No  | 63                       | 10.9 | 24        | 8.5  | 39            | 13.2 |         |
| Undecided   | 99                       | 17.1 | 42        | 14.8 | 57            | 19.3 |         |

<sup>a</sup>Dog elimination; pound/restriction methods. <sup>†</sup>Non-governmental organizations.

(adjusted OR = 1.778; 95% CI: 1.145-2.761; *P* = 0.010); 2) the best way to control the population of poorly supervised pet dogs is through ABC methods (adjusted OR = 1.837; 95% CI: 1.185-2.848; *P* = 0.007); 3) poorly supervised pets should be reported to authorities (adjusted OR = 1.771; 95% CI: 1.029-3.050; *P*=0.039).

*Practice of responsible dog ownership*

Although most dog owners (57.4%) were willing to take their pets to free rabies vaccination campaigns, only 40.5% of them were able to show certificates. Approximately 65.1% of dog owners preferred hormonal contraceptive methods while 58.1% preferred castration and/or ovariohysterectomy for their pets.

Among the reasons for not favoring non-surgical and surgical methods of dog population control included personal beliefs and religion (10.2%, 16.5) and owner-specific reasons such as having no time to take pets and ignorance of vaccination schedule (6.0%, 10.6%). Most dog owners kept their old and disabled pets (67.3%) and gave to other people their new puppies (47.5%). Approximately half (48.9%) of pet owners claimed that their dogs never go to other households or in the street for food (Table 3).

*Effect of educational attainment*

In general, there were no differences in the participants’ attitudes, beliefs, and health practices related to rabies and pet care based on educational level except that there were more respondents with a higher level of education (secondary level and above) who read the IEC materials (94.9% vs. 87.7%, *P* =0.039) and found them useful (93.6% vs. 87.2%, *P* =0.015) (Data not shown).

*Change in KAP toward rabies, pet care and responsible ownership of dogs*

After reading the IEC material, there was a significant improvement in KAP for both pet- and non-pet owners regarding the following: 1) the most common mode of rabies transmission is through bites of infected animals (pet owner: 4.9%, *P*=0.045; non-pet owner: 7.7%, *P*=0.015); 2) the most common source of rabies in Sri Lanka is the dog (pet owner: 4.9%, *P*=0.039; non-pet owner: 6.8%, *P*=0.001); 3) rabid animals should be captured and sent to laboratory (pet owner: 67.9%, *P*=0.000; non-pet owner: 62.1%, *P*=0.000); 4) pet dogs should be registered to local authorities by three months of age (pet owner: 7.1%, *P*=0.012; non-pet owner: 10.8%, *P*=0.002); 5) risk perception for rabies (pet owner: 6.3%, *P*=0.038; non-pet owner: 5.1%, *P* = 0.002); 6) dogs should receive rabies vaccine by six weeks of age (pet owner: 36.2%, *P* = 0.000; non-pet owner: 45.3%, *P* = 0.000). Among pet owners, there were improvements in showing dog registration certificates (9.1%, *P* = 0.454) and providing cages for their pets (7.1%, *P* = 0.003). However, there was a decrease in percentage among those who never allowed their pets to roam unsupervised (-10.9%, *P* = 0.006) (Table 4).

Improvement in KAP aspects for pet- and non-pet owners differed for the following points: 1) misconceptions on the mode of transmission of rabies (urine from an infected animal, eating street foods, and

**Table 3.** Practice of responsible dog ownership in Nuwara Eliya, Sri Lanka according to educational attainment.

|   | Total no. of pet owners |      | Primary <sup>†</sup> |      | Secondary <sup>‡</sup> |      | p value |
|---|-------------------------|------|----------------------|------|------------------------|------|---------|
|   | n=284                   | %    | n=206                | %    | n=78                   | %    |         |
| <b>Do you want your pet to undergo free surgical castration or ovariectomy for birth control?</b> |                         |      |                      |      |                        |      |         |
| Yes to both procedures  | 165                     | 58.1 | 115                  | 55.8 | 50                     | 64.1 | 0.319   |
| Yes to surgical castration only   | 16                      | 5.6  | 15                   | 7.3  | 1                      | 1.3  |         |
| Yes to ovariectomy only   | 15                      | 5.3  | 12                   | 5.8  | 3                      | 3.8  |         |
| No to both procedures   | 44                      | 15.5 | 32                   | 15.5 | 12                     | 15.4 |         |
| Undecided   | 44                      | 15.5 | 32                   | 15.5 | 12                     | 15.4 |         |
| <b>Reasons for not being in favor of surgical castration and/or ovariectomy for pet dogs</b>      |                         |      |                      |      |                        |      |         |
| Against beliefs and/or religion <sup>§</sup>  | 47                      | 16.5 | 30                   | 14.6 | 17                     | 21.8 | 0.340   |
| Other <sup>§</sup>  | 30                      | 10.6 | 22                   | 10.7 | 8                      | 10.3 |         |
| Uncertain   | 207                     | 72.9 | 154                  | 74.8 | 53                     | 67.9 |         |
| <b>Do you want your pet to undergo free contraceptive injection for birth control?</b>            |                         |      |                      |      |                        |      |         |
| Yes   | 185                     | 65.1 | 131                  | 63.6 | 54                     | 69.2 | 0.426   |
| No  | 50                      | 17.6 | 40                   | 19.4 | 10                     | 12.8 |         |
| Undecided   | 49                      | 17.3 | 35                   | 17.0 | 14                     | 17.9 |         |
| <b>Reasons for not being in favor of contraceptive injection for pet dogs?</b>                    |                         |      |                      |      |                        |      |         |
| Against beliefs and/or religion <sup>§</sup>  | 29                      | 10.2 | 24                   | 11.7 | 5                      | 6.4  | 0.427   |
| Other <sup>§</sup>  | 17                      | 6.0  | 12                   | 5.8  | 5                      | 6.4  |         |
| Uncertain   | 238                     | 83.8 | 170                  | 82.5 | 68                     | 87.2 |         |
| <b>When you had puppies, what did you do to them?</b>   |                         |      |                      |      |                        |      |         |
| Gave to other people/Abandoned  | 135                     | 47.5 | 95                   | 46.1 | 40                     | 51.3 | 0.735   |
| I kept the puppies  | 46                      | 16.2 | 34                   | 16.5 | 12                     | 15.4 |         |
| No answer   | 103                     | 36.3 | 77                   | 37.4 | 26                     | 33.3 |         |
| <b>What did you do to your old or disabled pet dogs?</b>  |                         |      |                      |      |                        |      |         |
| Gave to other people/Abandoned  | 33                      | 11.6 | 20                   | 9.7  | 13                     | 16.7 | 0.185   |
| I kept my old or disabled dogs  | 191                     | 67.3 | 139                  | 67.5 | 52                     | 66.7 |         |
| No answer   | 60                      | 21.1 | 47                   | 22.8 | 13                     | 16.7 |         |
| <b>Willing to take dogs for rabies vaccination</b>  |                         |      |                      |      |                        |      |         |
| Yes   | 163                     | 57.4 | 113                  | 54.9 | 50                     | 64.1 | 0.283   |
| No  | 2                       | 0.7  | 2                    | 1.0  | 0                      | 0.0  |         |
| Undecided   | 119                     | 41.9 | 91                   | 44.2 | 28                     | 35.9 |         |
| <b>Vaccination certificate shown?</b>   |                         |      |                      |      |                        |      |         |
| Yes   | 115                     | 40.5 | 80                   | 38.8 | 35                     | 44.9 | 0.516   |
| No  | 48                      | 16.9 | 34                   | 16.5 | 14                     | 17.9 |         |
| No answer   | 121                     | 42.6 | 92                   | 44.7 | 29                     | 37.2 |         |
| <b>Does your pet dog/cat go to other households or street for food?</b>                           |                         |      |                      |      |                        |      |         |
| Never   | 139                     | 48.9 | 92                   | 44.7 | 47                     | 60.3 | 0.057   |
| Other <sup>¶</sup>  | 99                      | 34.9 | 79                   | 38.3 | 20                     | 25.6 |         |
| Uncertain   | 46                      | 16.2 | 35                   | 17.0 | 11                     | 14.1 |         |

\*Primary level: Includes no schooling, Kindergarten up to Grade 10. †Secondary level and above: Has passed the General Certificate of Education, Ordinary Level Examination. ‡The procedure is unnecessary, will cause infections, or make the pet sick. §No time to take pets to veterinarians, or unaware where to take pets. ¶Most of the time or sometimes.

drinking contaminated water) (pet owner: -6.3%,  $P = 0.086$ ; non-pet owner: -8.8%,  $P = 0.004$ ); 2) adequate wound washing is the first thing to do after having been bitten by an animal (pet owner: 8.4%,  $P = 0.002$ ; non-pet owner: 5.1%,  $P = 0.093$ ); 3) vaccination is a protective measure against rabies (pet owner: 4.9%,  $P = 0.508$ ; non-pet owner: 9.4%,  $P = 0.013$ ); and, 4) rabies vaccination should be repeated annually (pet owner: 12.4%,  $P = 0.189$ , non-pet owner: 18.3%,  $P = 0.584$ ) (Table 4).

There was no improvement in knowledge when respondents were asked on the fatal nature of rabies (pet owner: 0%,  $P = 0.508$ ; non-pet owner: -2.7%,  $P = 0.625$ ) (Table 4).

**Discussion**

We studied the level of KAP of study participants based on pet ownership status and educational level, and

**Table 4.** Change in KAP among respondents in selected areas of Nuwara Eliya, Sri Lanka.

|   | Pet owner, n=284 |       |         | Non-pet owner, n=296 |       |         |
|---|------------------|-------|---------|----------------------|-------|---------|
|   | Intervention     |       | p value | Intervention         |       | p value |
|   | Pre              | Post  |         | Pre                  | Post  |         |
| <b>Human rabies is almost always fatal</b>  |                  |       |         |                      |       |         |
| True  | 257              | 257   | 0.508   | 262                  | 254   | 0.625   |
|   | 90.5%            | 90.5% |         | 88.5%                | 85.8% |         |
| <b>Knows the most common mode of rabies transmission in Sri Lanka</b>                       |                  |       |         |                      |       |         |
| Bite from an infected animal  | 244              | 258   | 0.045   | 234                  | 257   | 0.015   |
|   | 85.9%            | 90.8% |         | 79.1%                | 86.8% |         |
| <b>With misconceptions about rabies transmission<sup>*</sup></b>                            |                  |       |         |                      |       |         |
| No. of respondents  | 42               | 24    | 0.086   | 51                   | 25    | 0.004   |
|   | 14.8%            | 8.5%  |         | 17.2%                | 8.4%  |         |
| <b>Which animal is the most common source of rabies in Sri Lanka?</b>                       |                  |       |         |                      |       |         |
| Dog   | 234              | 248   | 0.039   | 238                  | 258   | 0.001   |
|   | 82.4%            | 87.3% |         | 80.4%                | 87.2% |         |
| <b>If bitten by an animal, what is the first thing that you would do to the bite wound?</b> |                  |       |         |                      |       |         |
| Wound wash  | 222              | 246   | 0.002   | 225                  | 240   | 0.093   |
|   | 78.2%            | 86.6% |         | 76.0%                | 81.1% |         |
| <b>What would you do if the responsible animal develops symptoms of rabies?</b>             |                  |       |         |                      |       |         |
| Capture and send the animal to laboratory   | 30               | 223   | 0.000   | 26                   | 210   | 0.000   |
|   | 10.6%            | 78.5% |         | 8.8%                 | 70.9% |         |
| <b>In your community, is it required to register pet dogs?</b>                              |                  |       |         |                      |       |         |
| Yes   | 235              | 255   | 0.012   | 222                  | 254   | 0.002   |
|   | 82.7%            | 89.8% |         | 75.0%                | 85.8% |         |
| <b>Do you think that you and your family are at risk for rabies?</b>                        |                  |       |         |                      |       |         |
| Yes   | 82               | 100   | 0.038   | 104                  | 119   | 0.002   |
|   | 28.9%            | 35.2% |         | 35.1%                | 40.2% |         |
| <b>How can you protect dogs against rabies?</b>   |                  |       |         |                      |       |         |
| Through vaccination   | 240              | 254   | 0.508   | 216                  | 244   | 0.013   |
|   | 84.5%            | 89.4% |         | 73.0%                | 82.4% |         |
| <b>When is the earliest rabies vaccination schedule for dogs in Sri Lanka?</b>              |                  |       |         |                      |       |         |
| At 6 weeks old  | 105              | 208   | 0.000   | 69                   | 203   | 0.000   |
|   | 37.0%            | 73.2% |         | 23.3%                | 68.6% |         |
| <b>How often should a pet dog be vaccinated for rabies?</b>                                 |                  |       |         |                      |       |         |
| Every year  | 208              | 243   | 0.189   | 175                  | 229   | 0.584   |
|   | 73.2%            | 85.6% |         | 59.1%                | 77.4% |         |
| <b>Pet registration certificate shown</b>   |                  |       |         |                      |       |         |
| Yes   | 65               | 91    | 0.454   |                      |       |         |
|   | 22.9%            | 32.0% |         |                      |       |         |
| <b>Does your pet dog have a cage?</b>   |                  |       |         |                      |       |         |
| Yes   | 150              | 169   | 0.003   |                      |       |         |
|   | 52.8%            | 59.9% |         |                      |       |         |
| <b>Do you allow your pet dog to roam around unsupervised?</b>                               |                  |       |         |                      |       |         |
| Never   | 115              | 84    | 0.006   |                      |       |         |
|   | 40.5%            | 29.6% |         |                      |       |         |

\*Urine from infected animal, eating street food, or drinking contaminated water.

evaluated the effects of rabies IEC materials concerning disease prevention, canine population control, and responsible dog ownership in three rural villages of NE District, Sri Lanka. As recommended in our previous work in Kandy District, this study focused on rural areas, which should be given the top priority in the implementation of rabies control programs since it constitutes the majority of the population, and may hardly be reached by awareness campaigns and modern diagnostic and treatment facilities. Because the security situation in Sri Lanka during the time of the survey did not allow for randomized selection of study areas, our priority population does not represent that of the country. In contrast to the Kandy survey (Sinhalese: 87.7%; Buddhist: 86.5%; primary educational level: 51.9%) [10], the participants in this survey consisted mostly of Sinhalese, Buddhist, and individuals who had

secondary levels of educational and above in rural areas. A similar exploratory study that focuses on urban areas, Tamils, and non-Buddhist populations (Hindus, Muslims, and Christians) would complement this investigation.

The results indicate that there was greater preference for ABC rather than the dog elimination method, particularly among pet owners. Since only 10-16% of respondents affirmed that religion and personal beliefs influenced their choice of dog population control method, a more in-depth study is necessary to establish this intricate relationship. The Rabies Elimination Act of 2005 (REA) grants the responsibility to the local authorities (the Mayor of a Municipal Council area; the Chairman of an Urban Council area or Pradeshiya area; Medical Officer of Health; Veterinary Surgeon; Divisional Secretary; Secretary of Local Authority; and two members of the public) to approve the method of dog population control to be implemented within its area of jurisdiction and ensure that such activities are conducted in a hygienic and humane manner [36].

Public concern with the nuisance created by strays and unsupervised pets is shown by the participants' annoyance with and their enthusiasm to report these animals to proper authorities. Moreover, there are twice more pet owners than non-pet owners who believe that it is the responsibility of the people themselves and NGOs to control the population growth of these animals. Most pet owners in Sri Lanka keep their old or disabled dogs or give to other people their puppies instead of abandoning them (old/disabled pets: 1.0%; puppies: 0.2%).

These are good indicators of community involvement since most people, especially pet owners, feel accountable for the increase in the stray dog population and do not believe it is right to pass the responsibility solely to authorities. Under the REA, the local authority should take adequate measures to seize and detain all stray dogs for a period of not less than three days. If a dog is not claimed after that period, the proper authorities (Medical Officer of Health; Veterinary Surgeon of the local authority; Public Health Inspectors; every Police Officer; every village officer or Grama Niladari; and every authorized person) may cause the dog to be euthanized or otherwise disposed of in a humane manner [36]. It is important to note that elimination of stray dogs is recommended as a disease control measure, and not as a critical component in dog population management [1,35].

The motivation of pet owners for canine inoculation did not correspond with their will to show documentary

evidence. This could be due to the low vaccination coverage of the study areas to begin with, and/or the lack of awareness of the importance of record keeping. In a study by Perera *et al.*, only 2.0% of the 627 vaccination cards that they examined had all the required information recorded in an acceptable manner [37].

This means that a major reason for people not to keep dog vaccination cards may be the poor recording of information on the cards, which reflects a lack of enthusiasm by the control program staff. Therefore, vaccinators should emphasize the importance of careful record keeping to pet owners.

The IEC materials were very effective mainly in informing the participants with how to deal with an animal suspected to be rabid, the earliest age for pets to receive anti-rabies vaccine (ARV), and repeat inoculation. They were also helpful in enhancing the awareness that adequate wound wash is the first line of action after animal bites, and that ARV provides protection against disease. Additionally, after reading the materials, more pet owners were able to show pet registration certificates, had built cages for their pets, and had fewer misconceptions with regard to rabies transmission than previously.

In Sri Lanka, dogs are the most important animals responsible for the transmission of the rabies virus [38-39]. The REA requires that all dogs over six weeks of age be vaccinated [36]. However, recent reports have shown that the disease had been detected among puppies at the age of six weeks, the reason for initiating immunization at an earlier age [17,40,41].

There are varied reports with regard to the earliest vaccination schedule in the literature [33,34,42,43]. The WHO recommends rabies immunization for all dogs and cats regardless of age, weight or state of health [30,44]. Rabies vaccination drives are generally conducted annually but more frequent campaigns may be required in areas where dog population birth and death rates are high.

The WHO further recommends immediate and vigorous washing with soap and water after a dog bite. This procedure should be followed by application of 70% ethanol, or tincture or aqueous solution of iodine. Medical consultation should then be sought for administration of anti-rabies immunoglobulins. ARV should be given for contact with broken skin [45]. Under the REA, every dog shall be registered to the local authority by the age of three months. The owner or custodian will be liable to a fine of 5,000.00 rupees

(approximately US\$46.36) if the dog does not possess a valid registration certificate [36].

In addition to the lack of improvement in knowledge about the fatality of human rabies, there were more pet owners who allowed their dogs to roam around unsupervised. The causes for the lack of improvement regarding knowledge of the fatal nature of the disease could be due either to the high pre-intervention awareness of more than 88%, which may have passed the learning curve, or the need to emphasize more fully its importance in the IEC materials. Furthermore, there seems to be a disparity between building more cages and allowing for increased dog mobility among pet owners. This may be secondary to the latter's false sense of security and increased complacency after having known that if their dogs were vaccinated, registered, or if animal bite recipients followed the recommended first aid measures, then the risk of disease would be remote, which is incorrect. Therefore, supplementary educational materials such as audio-visual aids and workshops could reinforce their KAP.

A multi-centric KAP survey in India revealed that 60.7% of respondents had misconceptions with regard to rabies transmission; only 31.9% felt that wound washing is the best action immediately after dog bites; and bite wounds were treated by local application of chilies, turmeric powder, lime, kerosene, and herbal paste (2.3%-11.4%) [46]. In another study in rural New Delhi, 84.0% of respondents were aware that dog bites might cause death, more than 50.0% preferred to kill the dog responsible for the bite, and as many as 48.0% of dog bite recipients used local home treatments such as chilies and salts [47].

In contrast to India, the participants of our survey showed higher pre-intervention levels of knowledge with regard to misconceptions on rabies transmission (16.0%), adequate wound washing after dog bites (77.1%), use of home or traditional remedies (0.2%, data not shown), and the fatal nature of rabies (89.5%). Further, there were fewer participants who saw the dog elimination method as a solution to canine population problems (19.1%-24.3%). Sri Lanka's achievements in health status could be explained by a higher literacy rate and density of health workers, better public health infrastructure, and improved sanitation as a result of the pursuance of the social welfare-oriented state policy over the past decades [48-49]. However, a great deal of work has to be done in order to completely eliminate rabies.

In Asia, eight countries are free of rabies, namely, Bahrain, Hong Kong, Japan, Malaysia, Qatar, Singapore, Taiwan and the United Arab Emirates [50]. Japan and Malaysia have been rabies-free since 1957 and 1967, respectively [14,51-53]. It is thought that strict enforcement of dog registration and vaccination policies, and stray dog destruction have made rabies control and eradication effective in these countries [14,19]. To curb the disease in rabies-endemic Pakistan, the WISE approach was suggested. This focuses on wound washing (W), injection of immunogenic vaccines and immunoglobulins (I), and stray dog euthanasia (SE) [54]. In Sri Lanka, although legislation for registration and vaccination of animals are in place, they should be enacted uniformly and enforced effectively; otherwise, rabies elimination programs will only be a paper exercise.

It would be worthwhile to determine the retention and enhancement of rabies KAP in the medium- or long-term; therefore, subsequent follow-up surveys should be performed six or 12 months after the initial survey. This study could serve as a basis for more effective evidence-based rabies and dog population control programmes in the future. As an initial step, meetings are underway among stakeholders in the province to conduct rabies awareness and responsible pet ownership campaigns for school-age children who are at most risk for dog bites.

In conclusion, although there is an encouraging level of awareness and appropriate attitude toward rabies management and canine population control among the rural Sinhalese and Buddhist populations of Sri Lanka, their current health practices should be improved. The rabies KAP could be further enhanced through the use of IEC materials.

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