

A Study on Knowledge, Attitudes, and Practices on Rabies in the Philippines

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Abstract

In 2007, the Philippine government passed the Anti-Rabies Act to address rabies in the country. However, rabies is still a major public health concern in many provinces. This study aimed to evaluate the knowledge, attitude, and practices (KAP) of residents on rabies, the Anti-Rabies Act, and responsible pet ownership (RPO) in Pampanga, Philippines. A cross-sectional survey was done from October 2017 to February 2018 in 92 randomly selected *barangays* in the province. Questionnaires were adapted from the similar studies. Logistic regression was used to identify factors associated with KAP. Results showed that most people have good knowledge of the Anti-Rabies Act, RPO, and moderate knowledge of rabies. Their attitude toward rabies was appropriate, and on RPO, moderate. The RPO practices by most dog owners were good and moderate for most cat owners. Moreover, the subjects' area of residence was a significant factor in their knowledge of RPO, and pet ownership status was a significant factor in their RPO attitude. In general, respondents showed satisfactory knowledge; however, there is a need to intensify information and education campaigns in rural areas.

Keywords: attitude, knowledge, Philippines, practices, rabies

Introduction

Rabies is a disregarded zoonotic disease brought about by the *Rabies virus* (RABV). Rabies is fatal if left untreated but eminently preventable via an effective vaccine.¹ All mammalian vertebrates are susceptible to the virus, but unvaccinated domesticated canines are the most significant human source rabies cases. Current statistics show that there are 59,000 human deaths per year due to canine rabies. By far, over 99% of all reported RABV infected-human cases were caused by exposure to unvaccinated domesticated canines. Most were reported in Africa and Asia.¹ Monitoring of human and animal rabies cases are insufficient to almost non-existent in certain areas of the world where rabies is most prevalent.^{2,3} Mostly, in rabies-endemic countries, official reports and exposure remain substandard. The lack of reliable surveillance data for nations where the disease more prevalent is a significant hindrance in evaluating rabies' spread and prevalence. It is acknowledged that the actual number of rabies cases is underestimated due to unreported cases.^{2,3}

In the Philippines, the Department of Health reports about 200–300 deaths each year due to rabies, but the

actual number is likely higher.⁴ The Philippine Government has taken legislative actions to address the issue by the Anti-Rabies Act of 2007, which encouraged mass vaccination, a centralized database system, animal impounding and control, an education campaign, administration of pre-exposure prophylaxis and post-exposure treatment to animal bite victims, and a call for pet owners to be more responsible. With this legislation, the goal of a “Rabies-Free Philippines by 2022” is more attainable, but the program still faces certain stumbling blocks like program funding, lack of local government support, lack of awareness in prevention and control, and the lack of support from other sectors of government and industry.⁵

This study's objectives were to describe the knowledge, attitude, and practices (KAP) on rabies, the Anti-Rabies Act, and responsible pet ownership (RPO), and identify factors associated with it.

Method

The survey was conducted in the province of Pampanga, located on the island of Luzon, Philippines. The province is divided into an independent city, two

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component cities, and 19 municipalities, with 12 district hospitals and one regional hospital. In 2017, Pampanga was one of the top ten provinces with a high incidence of animal rabies in the Philippines.

With a population of 2.6 million in 2015, a minimum sample size of 451 Pampanga residents was calculated using the sample size computation for estimating proportion with 95% confidence level, 5% margin of error, 50% response distribution, and 1.17 design effect. Multi-stage sampling was utilized. A total of 538 *barangays* (the smallest administrative division in the Philippines, known as the basic community/unit in municipalities) were divided into strata according to the occurrence of animal rabies cases in the area; 125 with cases and 413 with no cases. The target number was set to 460, consisting of 92 *barangays* with five respondents each. Random selection from the alphabetical list was made using a random number generator, yielding 21 *barangays* with rabies cases and 71 *barangays* without rabies. Then, five households were selected per *barangay*. The first household was selected randomly; then the next four closest households were included in the study. Within each household, one adult (18 years old and over) was interviewed.

A questionnaire-based on similar studies was adapted and contextualized to the local setting.⁶⁻¹¹ Knowledge was assessed through true-or-false questions, a Likert scale of 1–4 was used for the attitude, and yes-or-no questions were utilized for the practice. Demographic information was also obtained. The interviews were conducted from October 2017 to February 2018 in Kapampangan, the most common language spoken in Pampanga.

Data encoding, management, and analysis were done using MS Excel and Stata 13 (serial no. 301306217523). Descriptive statistics were calculated for the demographics and variables of interest. Stratified analysis was used to compare responses between locations. The KAP scores were also categorized according to Bloom's cut off point (less than 60% is low, 60% - 80% is moderate, and more than 80% is high).⁷ Logistic regression analysis was used to identify the KAP (categorized based on median (Md): 0 = score Md and 1 = score > Md). Initially, each demographic variable's crude association to the dependent variable, KAP, was determined using simple logistic regression; all variables with p-value 0.25 were included in the full model using multiple logistic regression, then the final model was selected using backward elimination. A p-value of < 0.05 was considered significant.

Results

A total of 453 participants were included in the study. Table 1 shows the demographic characteristics of the

respondents. More than half of the respondents were aged 42 years and over. Most (58.5%) of the respondents owned two or more dogs and around 35% owned one dog. Almost half of the respondents are cat owners: 28.5% owned one while 17.3% had two or more.

Table 2 presents a descriptive analysis of the respondents' knowledge of rabies, the Anti-Rabies Act, and RPO. Almost all (93.2%) of the respondents had heard of rabies. The majority (81.2%) believed that a virus causes rabies; it can be transmitted from cats (97.4%), bats (53.6%), and snakes (53.2%); and can be transmitted through bites, licks, or scratches from rabid animals (93.4%). On the other hand, most did not believe that rabies can be transmitted through inhalation (69.1%), or bites from mosquitos and other insects (62.0%). Most of them believed that a rabid animal displays excess salivation (87.9%); is not quiet and inactive (73.1%); that leashing or caging of pets (82.6%) and vaccination (94.5%) can help in controlling rabies, and that immediate and thorough washing of bite wounds is necessary (93.2%). Most (79.5%) also believed that seeking help from a faith healer after a biting incident is inappropriate. However, more than half (53.6%) did not believe that rabies has no cure. A similar pattern was observed in the responses when the location is considered, except for the belief that rabies has no cure, where 51.2% in the rural area believed it is incurable.

On the Anti-Rabies Act, 90.7% of the participants were aware that dog registration is required and those dog owners who fail to vaccinate their pets are penalized (72.2%). For most of the provisions of the Act, the respondents were well aware of the given information. However, only 41.9% of the participants were aware that there is a law about rabies control. A similar pattern was also observed when stratified by location.

On RPO, most understood that proper care of pets helps to prevent the spread of rabies (92.1%); that they should restrain their pets from wandering (75.3%), and not allow them to defecate anywhere without cleaning up (87.9%); and give food to pets on a regular basis (95.4%). About 75.7% were aware that a pet owner should have an immunization record of the pet, and 79% were aware that a sick pet should be taken to a veterinarian. They also believed that animal bites' incidences should be reported to the proper authorities (84.6%), and the pet owner should agree to keep the pet leashed if it bites someone (91.4%). However, they disagreed that a pet involved in a bite incident should be destroyed (58.1%). Almost the same percentages were observed in the stratified analysis.

None of the demographic variables were associated with knowledge on rabies or Anti-Rabies Act from the logistic regression analysis. On factors associated with

the RPO, results showed that the area of residence is a significant influence. Having above-median knowledge on RPO is twice as likely in respondents living in urban *barangays* (OR = 1.990, 95% CI: 1.299, 3.049) compared to those in rural *barangays*.

In terms of attitudes toward rabies, almost all of the respondents claimed that they would report and seek medical help if they are bitten (92.8%), scratched (85.0%) by a stray dog or cat, and bitten by their pet (89.7%). In addition, the community showed a positive attitude towards the rabies control campaign. These patterns were consistent in urban and rural areas and areas with and without rabies' presence.

Regarding RPO's attitudes, the community, in general, strongly agreed that leashing or caging of their pets is their responsibility (66.9%). Amongst all, 63.1% strongly agreed that they were responsible for the cost of vaccinating their pets. Additionally, 59.8% said they were willing to have their pets spayed or neutered, with 61% claiming that allowing their pets to become pregnant or impregnate another animal must not be permitted. Amongst all, 63.2% believed that it is not a cruel thing to leash or cage a pet. A similar pattern of responses was observed per area of residence and per area of presence of a rabies case. Table 3 shows the summary distribution of the responses on attitude toward rabies and RPO.

Moreover, logistic regression showed that none of the demographics were significantly associated with attitude toward rabies (p-value > 0.05). On the other hand, pet ownership status was a significant factor in RPO attitude. Respondents with dogs were 1.53 times more likely to have an above-median attitude compared to those without pets.

On practices on RPO, Table 4 presents the summary. Most pet owners ensured that their pets (80.2% and 64.9% for dogs, and cats, respectively) are vaccinated, but only some (37.9%) had records of their immunization on hand. Almost 60% of the pet dogs were always leashed, 65.2% were leashed when outside the house, and 45.2% were always caged. On the other hand, only a small percentage of cat owners kept their pet leashed (24.5%) or caged (27.9%). Most of the dogs (68.5%) were not allowed to wander free, while most cats (47.6%) were. Almost all dog owners (92%) fed their dogs every day, while only 85.1% of the cat owners fed their cats every day. Only 54% take their pets to the veterinarian when they are ill.

Age and area of residence are significant factors in terms of dog owners' RPO. Dog owners aged 30–41 years are 2.15 times and > 42 years are 1.43 times more likely to have an above-median practice than those < 29 years. Those in urban *barangays* are 2.17 times more likely to have an above-median practice than those in

Table 1. Demographic Characteristics of Respondents in Pampanga Province, Philippines

Demographic	Category	Presence of Rabies Case					
		Total		With (n = 117)		Without (n = 336)	
		n	%	n	%	n	%
Sex	Male	190	41.9	44	37.6	146	43.5
	Female	260	57.4	73	62.4	187	55.7
	No response	3	0.6	0	0.0	3	0.9
Age	< 29	88	19.4	27	23.1	61	18.2
	30–41	95	21.0	25	21.4	70	20.8
	42	265	58.5	63	53.9	202	60.1
	No response	5	1.1	2	1.7	3	0.9
Highest educational attainment	Elementary	76	16.8	20	17.1	56	16.7
	High school	219	48.3	60	51.3	159	47.3
	College	135	29.8	32	27.4	103	30.7
	Vocational	3	0.7	0	0.0	3	0.9
	No response	20	4.4	5	4.3	15	4.5
Dogs owned	None	28	6.2	12	10.3	16	4.8
	1	159	35.1	44	37.6	115	34.2
	2	101	22.3	27	23.1	74	22.0
	3	94	20.6	22	18.8	72	21.4
	4	37	8.2	7	6.0	30	8.9
	5	16	3.5	4	3.4	12	3.6
	> 5	18	4.0	1	0.9	17	5.1
Cats owned	None	245	54.1	57	48.7	188	56.0
	1	129	28.5	34	29.1	95	28.3
	2	44	9.7	13	11.1	31	9.2
	3	15	3.3	7	6.0	8	2.4
	4	7	1.5	1	0.9	6	1.8
	5	7	1.5	2	1.7	5	1.5
	> 5	6	1.3	3	2.6	3	0.9

rural ones. On factors associated with RPO of cat owners, sex is a significant factor. Men are 2.06 times more likely to have an above-median practice compared to women.

Overall, most (45.2%) had a good knowledge of the Anti-Rabies Act and RPO (65.1%) and a good attitude toward rabies (75.3%). The majority of dog owners also exhibited good RPO practices (58.5%). In addition, a

Table 2a. Distribution of Responses on Knowledge on Rabies, Anti-Rabies Act, and Responsible Pet Ownership

Statements	Category	Area of Residence						Presence of Rabies Case			
		Total		Urban (n = 273)		Rural (n = 180)		With (n = 117)		Without (n = 336)	
		n	%	n	%	n	%	n	%	n	%
Have heard of rabies	Yes	422	93.2	255	94.4	167	94.9	109	93.2	313	93.2
	No	24	5.3	15	5.6	9	5.1	4	3.4	20	6.0
	No response	7	1.6	3	1.1	4	2.2	4	3.4	3	0.9
Rabies is caused by a virus	Yes	368	81.2	224	83.9	144	82.3	93	79.5	275	81.8
	No	74	16.3	43	16.1	31	17.7	18	15.4	56	16.7
	No response	11	2.4	6	2.2	5	2.8	6	5.1	5	1.5
Cats can have rabies	Yes	441	97.4	267	98.2	174	98.9	111	94.9	330	98.2
	No	7	1.6	5	1.8	2	1.1	2	1.7	5	1.5
	No response	5	1.1	1	0.4	4	2.2	4	3.4	1	0.3
Bats can transmit rabies	Yes	243	53.6	151	58.3	92	57.1	56	47.9	187	55.7
	No	177	39.1	108	41.7	69	42.9	51	43.6	126	37.5
	No response	33	7.3	14	5.1	19	10.6	10	8.5	23	6.8
Snakes can transmit rabies	Yes	241	53.2	146	54.7	95	56.2	65	55.6	176	52.4
	No	195	43.1	121	45.3	74	43.8	46	39.3	149	44.3
	No response	17	3.7	6	2.2	11	6.1	6	5.1	11	3.3
Rabies can be transmitted through inhalation	Yes	122	26.9	74	28.4	48	27.6	31	26.5	91	27.1
	No	313	69.1	187	71.7	126	72.4	79	67.5	234	69.6
	No response	18	4.0	12	2.2	6	3.3	7	6.0	11	3.3
Rabies is transmitted through bites of mosquito and other insects	Yes	155	34.2	93	35.1	62	36.3	45	38.5	110	32.7
	No	281	62.0	172	64.9	109	63.7	67	57.3	214	63.7
	No response	17	3.8	8	2.9	9	5.0	5	4.3	12	3.6
Rabies is transmitted through bites of rabid animals	Yes	423	93.4	256	94.1	167	95.4	105	89.7	318	94.6
	No	24	5.3	16	5.9	8	4.6	8	6.8	16	4.8
	No response	6	1.3	1	0.4	5	2.8	4	3.4	2	0.6
Rabies is transmitted when licked or scratched by a rabid animal	Yes	372	82.1	224	82.7	148	86.6	101	86.3	271	80.7
	No	70	15.5	47	17.3	23	13.5	13	11.1	57	17.0
	No response	11	2.4	2	0.7	9	5.0	3	2.6	8	2.4
Rabies is transmitted through the ingestion of meat from a rabid dog	Yes	329	72.6	197	73.8	132	76.3	84	71.8	245	72.9
	No	111	24.5	70	26.2	41	23.7	29	24.8	82	24.4
	No response	13	2.9	6	2.2	6	3.3	4	3.4	9	2.7
Rabies has no cure	Yes	200	44.6	112	41.3	88	51.2	43	36.8	157	46.7
	No	243	53.6	159	58.7	84	48.8	69	59.0	174	51.8
	No response	10	2.2	2	0.7	8	4.4	5	4.3	5	1.5
Rabid animals have excess salivation	Yes	398	87.9	240	89.6	158	91.3	104	88.9	294	87.5
	No	43	9.5	28	10.5	15	8.7	9	7.7	34	10.1
	No response	12	2.7	5	1.8	7	3.9	4	3.4	8	2.4
A rabid animal is quiet and inactive	Yes	103	22.7	67	25.6	36	20.9	18	15.4	85	25.3
	No	331	73.1	195	74.4	136	79.1	92	78.6	239	71.1
	No response	19	4.2	11	4.0	8	4.4	7	6.0	12	3.6
Vaccination can control rabies	Yes	428	94.5	262	96.3	166	97.1	110	94.0	318	94.6
	No	15	3.3	10	6.7	5	2.9	2	1.7	13	3.9
	No response	10	2.2	1	0.4	5	2.8	5	4.3	5	1.5
Killing stray helps control rabies	Yes	179	39.5	110	41.2	69	40.4	49	41.9	130	38.7
	No	259	57.2	57	58.8	102	59.7	62	53.0	197	58.6
	No response	15	3.3	5	2.2	9	5.0	6	5.1	9	2.7
Neutering can control rabies	Yes	177	39.1	95	35.5	82	48.0	40	34.2	137	40.8
	No	262	57.8	173	64.6	89	52.1	70	59.8	192	57.1
	No response	14	3.1	5	1.8	9	5.0	7	6.0	7	2.1
Killing unvaccinated dogs/cats can control rabies	Yes	190	41.9	112	41.8	78	45.1	47	40.2	143	42.6
	No	251	55.4	156	58.2	95	54.9	65	55.6	186	55.4
	No response	12	2.7	5	1.8	7	3.9	5	4.3	7	2.1
Leashing/caging can control rabies	Yes	374	82.6	229	83.9	145	84.3	95	81.2	279	83.0
	No	71	15.7	44	16.1	27	15.7	17	14.5	54	16.1
	No response	8	1.8	0	0.0	8	4.4	5	4.3	3	0.9
Bite wounds must be immediately washed with soap and water	Yes	422	93.2	259	94.9	163	94.2	110	94.0	312	92.9
	No	24	5.3	14	5.1	10	5.8	2	1.7	22	6.5
	No response	7	1.6	0	0.0	7	3.9	5	4.3	2	0.6

moderate level of knowledge on rabies (79.9%) and attitude toward RPO (60.9%) was noted. Most of the cat owners also had moderate scores on RPO practice (52.4%). Table 5 presents a summary of the KAP scores

categorized using Bloom’s cut off point.

A significant association was found between the presence of rabies cases and the level of knowledge on RPO (p-value = 0.001), rabies (p-value = 0.014), and

Table 2b. Distribution of Responses on Knowledge on Rabies, Anti-Rabies Act, and Responsible Pet Ownership

Statements	Category	Total		Area of Residence				Presence of Rabies Case			
				Urban (n = 273)		Rural (n = 180)		With (n = 117)		Without (n = 336)	
				n	%	n	%	n	%	n	%
Seek help from a faith healer after a bite incident	Yes	83	18.3	44	16.2	39	22.8	20	17.1	63	18.8
	No	360	79.5	228	83.8	132	77.2	92	78.6	268	79.8
	No response	10	2.2	1	0.4	9	5.0	5	4.3	5	1.5
Aware that there is a law on rabies	Yes	190	41.9	119	43.9	71	39.4	44	37.6	146	43.5
	No	254	56.1	152	55.7	102	56.7	69	59.0	185	55.1
	No response	9	2.0	2	0.7	7	3.9	4	3.4	5	1.5
Registration of dogs is required	Yes	411	90.7	253	92.7	158	87.8	108	92.3	303	90.2
	No	34	7.5	18	6.6	16	8.9	5	4.3	29	8.6
	No response	8	1.8	2	0.7	6	3.3	4	3.4	4	1.2
Pet owner fined if fails to have his dog registered or vaccinated	Yes	327	72.2	199	72.9	128	71.1	88	75.2	239	71.1
	No	108	23.8	69	25.3	39	21.7	23	19.7	85	25.3
	No response	18	4.0	5	1.8	13	7.2	6	5.1	12	3.6
Dog owner fined is failed to leashpet outside premises	Yes	272	60.0	167	61.2	105	58.3	68	58.1	204	60.7
	No	156	34.4	99	36.3	57	31.7	41	35.0	115	34.2
	No response	25	5.5	7	2.6	18	10.0	8	6.8	17	5.1
Slaughtering dogs and selling dog meat is prohibited	Yes	398	87.9	238	87.2	160	88.9	100	85.5	298	88.7
	No	37	8.2	29	10.6	8	4.4	9	7.7	28	8.3
	No response	18	4.0	6	2.2	12	6.7	8	6.8	10	3.0
Pet owner fined if refuses to put pet under observation after a bite	Yes	335	74.0	200	73.3	135	75.0	81	69.2	254	75.6
	No	92	20.3	65	23.8	27	15.0	27	23.1	65	19.3
	No response	26	5.7	8	2.9	18	10.0	9	7.7	17	5.1
Pet owner fined if refuses to shoulder the medical expenses of the victim	Yes	334	73.7	204	74.7	130	72.2	80	68.4	254	75.6
	No	94	20.8	61	22.3	33	18.3	28	23.9	66	19.6
	No response	25	5.5	8	2.9	17	9.4	9	7.7	16	4.8
Any person caught selling dog meat is subject to imprisonment	Yes	397	87.6	242	88.6	155	86.1	99	84.6	298	88.7
	No	35	7.7	23	8.4	12	6.7	9	7.7	26	7.7
	No response	21	4.6	8	2.9	13	7.2	9	7.7	12	3.6
A personselling dog meat will be fined	Yes	395	87.2	239	87.5	156	86.7	100	85.5	295	87.8
	No	36	7.9	25	9.2	11	6.1	10	8.5	26	7.7
	No response	22	4.9	9	3.3	13	7.2	7	6.0	15	4.5
Proper care of pets can help prevent the spread of rabies	Yes	417	92.1	250	91.6	167	92.8	103	88.0	314	93.5
	No	23	5.1	18	6.6	5	2.8	7	6.0	16	4.8
	No response	13	2.9	5	1.8	8	4.4	7	6.0	6	1.8
Pet owner allows pets to wander	Yes	99	21.9	59	21.6	40	22.2	22	18.8	77	22.9
	No	341	75.3	209	76.6	132	73.3	88	75.2	253	75.3
	No response	13	2.9	5	1.8	8	4.4	7	6.0	6	1.8
Pet owner shall give food to pets	Yes	432	95.4	264	96.7	168	93.3	108	92.3	324	96.4
	No	8	1.8	5	1.8	3	1.7	2	1.7	6	1.8
	No response	13	2.9	4	1.5	9	5.0	7	6.0	6	1.8
Pet owner brings a sick pet to a vet	Yes	358	79.0	224	82.1	134	74.4	88	75.2	270	80.4
	No	81	17.9	45	16.5	36	20.0	22	18.8	59	17.6
	No response	14	3.1	4	1.5	10	5.6	7	6.0	7	2.1
Pet owner does not allow the pet to defecate anywhere	Yes	398	87.9	254	93.0	144	80.0	98	83.8	300	89.3
	No	42	9.3	15	5.5	27	15.0	12	10.3	30	8.9
	No response	13	2.9	4	1.5	9	5.0	7	6.0	6	1.8
Incidence of animal bites are reported to the proper authority	Yes	383	84.6	237	86.8	146	81.1	103	88.0	280	83.3
	No	55	12.1	32	11.7	23	12.8	7	6.0	48	14.3
	No response	15	3.3	4	1.5	11	6.1	7	6.0	8	2.4
The pet owner shall agree to have the pet leashed or caged if it bites a victim	Yes	414	91.4	252	92.3	162	90.0	103	88.0	311	92.6
	No	24	5.3	17	6.2	7	3.9	7	6.0	17	5.1
	No response	15	3.3	4	1.5	11	6.1	7	6.0	8	2.4
Pet owner has an immunization record	Yes	343	75.7	221	81.0	122	67.8	91	77.8	252	75.0
	No	96	21.2	48	17.6	48	26.7	19	16.2	77	22.9
	No response	14	3.1	4	1.5	10	5.6	7	6.0	7	2.1
Pet involved in a bite incident must be decapitated	Yes	174	38.4	94	34.4	80	44.4	39	33.3	135	40.2
	No	263	58.1	173	63.4	90	50.0	71	60.7	192	57.1
	No response	16	3.5	6	2.2	10	5.6	7	6.0	9	2.7

RPO practice of cat owners (p-value = 0.021). The association between the area of residence and level of knowledge on the Anti-Rabies Act (p-value = 0.026), RPO (p-value = 0.009), RPO practice by a dog (p-value

Table 3. Distribution of Responses on Knowledge on Rabies and Responsible Pet Ownership

Statements	Category	Total		Area of Residence				Presence of Rabies Case			
				Urban (n = 273)		Rural (n = 180)		With (n = 117)		Without (n = 336)	
		n	%	n	%	n	%	n	%	n	%
Will report and seek medical help ... if get bitten by a stray dog/cat	Strongly agree	374	(82.6)	236	(86.4)	138	(76.7)	99	(84.6)	275	(81.8)
	Agree	46	(10.2)	22	(8.1)	24	(13.3)	9	(7.7)	37	(11.0)
	Disagree	16	(3.5)	9	(3.3)	7	(3.9)	3	(2.6)	13	(3.9)
	Strongly disagree	9	(2.0)	5	(1.8)	4	(2.2)	2	(1.7)	7	(2.1)
	No response	8	(1.8)	1	(0.4)	7	(3.9)	4	(3.4)	4	(1.2)
if get bitten by own dog/cat	Strongly agree	335	(74.0)	208	(76.2)	127	(70.6)	93	(79.5)	242	(72.0)
	Agree	71	(15.7)	39	(14.3)	32	(17.8)	13	(11.1)	58	(17.3)
	Disagree	19	(4.2)	13	(4.8)	6	(3.3)	1	(0.9)	18	(5.4)
	Strongly disagree	19	(4.2)	9	(3.3)	10	(5.6)	6	(5.1)	13	(3.9)
	No response	9	(2.0)	4	(1.5)	5	(2.8)	4	(3.4)	5	(1.5)
scratched by stray a dog/cat	Strongly agree	303	(66.9)	187	(68.5)	116	(64.4)	79	(67.5)	224	(66.7)
	Agree	82	(18.1)	50	(18.3)	32	(17.8)	20	(17.1)	62	(18.6)
	Disagree	34	(7.5)	22	(8.1)	12	(6.7)	5	(4.3)	29	(8.6)
	Strongly disagree	27	(6.0)	15	(4.8)	14	(7.8)	9	(7.7)	18	(5.4)
	No response	7	(1.5)	1	(0.4)	6	(3.3)	4	(3.4)	3	(0.9)
Will report suspected outbreak	Strongly agree	332	(73.3)	193	(70.7)	139	(77.2)	82	(70.1)	250	(74.4)
	Agree	84	(18.5)	58	(21.2)	26	(14.4)	26	(22.2)	58	(17.3)
	Disagree	23	(5.1)	17	(6.2)	6	(3.3)	3	(2.6)	20	(6.0)
	Strongly disagree	5	(1.1)	3	(1.1)	2	(1.1)	0	(0.0)	5	(1.5)
	No response	9	(2.0)	2	(0.7)	7	(3.9)	6	(5.1)	3	(0.9)
Will kill a stray if suspected of rabies	Strongly agree	95	(21.0)	45	(16.5)	50	(27.8)	21	(17.9)	74	(22.0)
	Agree	84	(18.5)	54	(19.8)	30	(16.7)	24	(20.5)	60	(17.9)
	Disagree	93	(20.5)	58	(21.2)	35	(19.4)	22	(18.8)	71	(21.1)
	Strongly disagree	173	(38.2)	114	(41.8)	59	(32.8)	46	(39.3)	127	(37.8)
	No response	8	(1.8)	2	(0.7)	6	(3.3)	4	(3.4)	4	(1.2)
Important to control dog population	Strongly agree	214	(47.2)	130	(47.6)	84	(46.7)	51	(43.6)	163	(48.5)
	Agree	110	(24.3)	69	(25.3)	41	(22.8)	34	(29.1)	76	(22.6)
	Disagree	68	(15.0)	36	(13.2)	32	(17.8)	14	(12.0)	54	(16.1)
	Strongly disagree	53	(11.7)	36	(13.2)	17	(9.4)	13	(11.1)	40	(11.9)
	No response	8	(1.8)	2	(0.7)	6	(3.3)	5	(4.3)	3	(0.9)
Supports campaign on rabies control	Strongly agree	360	(79.5)	218	(79.9)	142	(78.9)	96	(82.1)	264	(78.6)
	Agree	78	(17.2)	46	(16.8)	32	(17.8)	16	(13.7)	62	(18.5)
	Disagree	3	(0.7)	2	(0.7)	1	(0.6)	1	(0.9)	2	(0.6)
	Strongly disagree	5	(1.1)	5	(1.8)	0	(0.0)	0	(0.0)	5	(1.5)
	No response	7	(1.5)	2	(0.7)	5	(2.8)	4	(3.4)	3	(0.9)
Leashing or caging the dogs	Strongly agree	303	(66.9)	184	(67.4)	119	(66.1)	79	(67.5)	224	(66.7)
	Agree	93	(20.5)	56	(20.5)	37	(20.6)	20	(17.1)	73	(21.7)
	Disagree	33	(7.3)	22	(8.1)	11	(6.1)	8	(6.8)	25	(7.4)
	Strongly disagree	13	(2.9)	8	(2.9)	5	(2.8)	4	(3.4)	9	(2.7)
	No response	11	(2.4)	3	(1.1)	8	(4.4)	6	(5.1)	5	(1.5)
Willing to pay for the vaccination	Strongly agree	286	(63.1)	177	(64.8)	109	(60.6)	75	(64.1)	211	(62.8)
	Agree	116	(25.6)	72	(26.4)	44	(24.4)	28	(23.9)	88	(26.2)
	Disagree	23	(5.1)	11	(4.0)	12	(6.7)	5	(4.3)	18	(5.4)
	Strongly disagree	17	(3.8)	10	(3.7)	7	(3.9)	3	(2.6)	14	(4.2)
	No response	11	(2.4)	3	(1.1)	8	(4.4)	6	(5.1)	5	(1.5)
Willing to have a pet spayed/neutered	Strongly agree	187	(41.3)	107	(39.2)	80	(44.4)	43	(36.8)	144	(42.9)
	Agree	84	(18.5)	45	(16.5)	39	(21.7)	18	(15.4)	66	(19.6)
	Disagree	83	(18.3)	60	(22.0)	23	(12.8)	26	(22.2)	57	(17.0)
	Strongly Disagree	85	(18.8)	57	(20.9)	28	(15.6)	24	(20.5)	61	(18.2)
	No response	14	(3.1)	4	(1.5)	10	(5.6)	6	(5.1)	8	(2.4)
Leashing/caging is cruel to pets	Strongly agree	81	(17.9)	50	(18.3)	31	(17.2)	18	(15.4)	63	(18.8)
	Agree	74	(16.3)	41	(15.0)	33	(18.3)	21	(17.9)	53	(15.8)
	Disagree	162	(35.8)	110	(40.3)	52	(28.9)	43	(36.8)	119	(35.4)
	Strongly disagree	124	(27.4)	68	(24.9)	56	(31.1)	29	(24.8)	95	(28.3)
	No response	12	(2.6)	4	(1.5)	8	(4.4)	6	(5.1)	6	(1.8)
Allows pets to reproduce	Strongly agree	53	(11.7)	32	(11.7)	21	(11.7)	16	(13.7)	37	(11.0)
	Agree	88	(19.4)	48	(17.6)	40	(22.2)	19	(16.2)	69	(20.5)
	Disagree	133	(29.4)	93	(34.1)	40	(22.2)	43	(36.8)	90	(26.8)
	Strongly disagree	143	(31.6)	76	(27.8)	67	(37.2)	24	(20.5)	119	(35.4)
	No response	36	(7.9)	24	(8.8)	12	(6.7)	15	(12.8)	21	(6.3)

Table 4. Distribution of Responses on Practices on Responsible Pet Ownership

Statements	Category	Area of Residence						Presence of Rabies Case			
		Total		Urban		Rural		With		Without	
		n	%	n	%	n	%	n	%	n	%
¹ Pet dogs vaccinated	Yes	341	(80.2)	219	(85.9)	122	(71.8)	79	(75.2)	262	(71.9)
	No	71	(16.7)	30	(11.8)	41	(24.1)	18	(17.1)	53	(16.6)
	No response	13	(3.1)	6	(2.4)	7	(4.1)	8	(7.6)	5	(1.6)
¹ Pet dogs always leashed	Yes	252	(59.3)	164	(64.3)	88	(51.8)	61	(58.1)	191	(59.7)
	No	158	(37.2)	85	(33.3)	73	(42.9)	38	(36.2)	120	(37.5)
	No response	15	(3.5)	6	(2.4)	9	(5.3)	6	(5.7)	9	(2.8)
¹ Pet dogs leashed when outside house	Yes	277	(65.2)	187	(73.3)	90	(52.9)	69	(65.7)	208	(65.0)
	No	133	(31.3)	63	(24.7)	70	(41.2)	30	(28.6)	103	(32.2)
	No response	15	(3.5)	5	(2.0)	10	(5.9)	6	(5.7)	9	(2.8)
¹ Pet dogs always caged	Yes	192	(45.2)	121	(47.5)	71	(41.8)	48	(45.7)	144	(45.0)
	No	215	(50.6)	127	(49.8)	88	(51.8)	51	(48.6)	164	(51.3)
	No response	18	(4.2)	7	(2.7)	11	(6.5)	6	(5.7)	12	(3.8)
¹ Pet dogs allowed to loiter	Yes	117	(27.5)	68	(26.7)	49	(28.8)	24	(22.9)	93	(29.1)
	No	291	(68.5)	179	(70.2)	112	(65.9)	75	(71.4)	216	(67.5)
	No response	17	(4.0)	8	(3.1)	9	(5.3)	6	(5.7)	11	(3.4)
¹ Pet dogs fed every day	Yes	391	(92.0)	241	(94.5)	150	(88.2)	97	(92.4)	294	(91.9)
	No	21	(4.9)	9	(3.5)	12	(7.1)	1	(1.0)	20	(6.3)
	No response	13	(3.1)	5	(2.0)	8	(4.7)	7	(6.7)	6	(1.9)
² Pet cats vaccinated	Yes	135	(64.9)	79	(70.5)	56	(58.3)	36	(60.0)	99	(66.9)
	No	60	(28.8)	29	(25.9)	31	(32.3)	16	(26.7)	44	(29.7)
	No response	13	(6.3)	4	(3.6)	9	(9.4)	8	(13.3)	5	(3.4)
² Pet cats always caged	Yes	58	(27.9)	36	(32.1)	22	(22.9)	19	(31.7)	39	(26.4)
	No	137	(65.9)	71	(63.4)	66	(68.8)	32	(53.3)	105	(70.9)
	No response	13	(6.3)	5	(4.5)	8	(8.3)	9	(15.0)	4	(2.7)
² Pet cats always leashed	Yes	51	(24.5)	28	(25.0)	23	(24.0)	17	(28.3)	34	(23.0)
	No	145	(69.7)	80	(71.4)	65	(67.7)	34	(56.7)	111	(75.0)
	No response	12	(5.8)	4	(3.6)	8	(8.3)	9	(15.0)	3	(2.0)
² Pet cats allowed to loiter	Yes	99	(47.6)	55	(49.1)	44	(45.8)	28	(46.7)	71	(48.0)
	No	96	(46.2)	52	(46.4)	44	(45.8)	24	(40.0)	72	(48.6)
	No response	13	(6.3)	5	(4.5)	8	(8.3)	8	(13.3)	5	(3.4)
² Pet cats fed every day	Yes	177	(85.1)	102	(91.1)	75	(78.1)	48	(80.0)	129	(87.2)
	No	15	(7.2)	4	(3.6)	11	(11.5)	0	(0.0)	15	(10.1)
	No response	16	(7.7)	6	(5.4)	10	(10.4)	12	(20.0)	4	(2.7)
³ Has an immunization record	Yes	169	(37.9)	115	(42.9)	54	(30.3)	44	(38.6)	125	(37.7)
	No	242	(54.3)	138	(51.5)	104	(58.4)	57	(50.0)	185	(55.7)
	No response	35	(7.8)	15	(5.6)	20	(11.2)	13	(11.4)	22	(6.6)
³ Brings sick pet to a vet	Yes	241	(54.0)	163	(60.8)	78	(43.8)	70	(61.4)	171	(51.5)
	No	180	(40.4)	95	(35.4)	85	(47.8)	34	(29.8)	146	(44.0)
	No response	25	(5.6)	10	(3.7)	15	(8.4)	10	(8.8)	15	(4.5)

Notes: ¹respondents with dogs (total: 425; urban: 255, rural: 170; with rabies case: 105, without rabies case: 320); ²respondents with cats (total: 208; urban: 112, rural: 96; with rabies case: 60, without rabies case: 148); ³respondents with dog/cat (total: 446; urban: 268, rural: 178; with rabies case: 114, without rabies case: 332)

= 0.003), and cat (p-value = 0.031) owners were also significant.

Discussion

Rabies, due to its acute fatality, is an important concern in public health, especially in the Philippines. The World Health Organization (WHO) declares that the Philippines is one of the top ten countries battling the disease. The Department of Health (DOH) in the Philippines established a Rabies Prevention and Control Program that aims to achieve a "rabies-free" country by the year of 2022. In line with this national vision, this study explored the current KAP of pet owners from the province of Pampanga, Philippines.

Results showed that the respondents had a good working knowledge of rabies. Pet owners are aware that they should immediately report bite incidents, especially from pets suspected of rabies. However, only 42.9% of the participants were aware that there is an existing law on rabies control in the country. The study in Tanzania stated that people who had experienced suspected rabid bites within their households exhibited higher knowledge of rabies.¹² Knowledge of rabies is also said to be high among respondents who had attained higher education (e.g., secondary education and above).^{8,12-14} This finding is consistent with this study as the respondents, whose highest educational attainment was mostly high school and above, exhibited moderate to good knowledge of ra-

Table 5. Community Levels of Knowledge, Attitude, and Practice on Rabies

Level of Knowledge, Attitude, and Practice	Area of Residence						p-value	Presence of Rabies Case				p-value
	Total		Urban		Rural			With		Without		
	n	%	n	%	n	%		n	%	n	%	
Knowledge of rabies												
Poor (< 60%)	58	12.8	32	11.7	26	14.4	0.662	20	17.1	38	11.3	0.119
Moderate (60%–80%)	362	79.9	220	80.6	142	78.9		92	78.6	270	80.4	
Good (> 80%)	33	7.3	21	7.7	12	6.7		5	4.3	28	8.3	
Knowledge of Anti-Rabies Act												
Poor (< 60%)	100	22.1	65	23.8	35	19.44	0.026*	28	23.9	72	21.4	0.362
Moderate (60%–80%)	148	32.7	76	27.8	72	40.0		32	27.4	116	34.5	
Good (> 80%)	205	45.2	152	48.4	73	40.6		57	48.7	148	44.0	
Knowledge on RPO												
Poor (< 60%)	31	6.8	15	5.5	16	8.9	0.009*	16	13.7	15	4.5	0.001*
Moderate (60%–80%)	127	25.1	65	23.8	62	34.4		23	19.7	104	30.9	
Good (> 80%)	295	65.1	193	70.7	102	56.7		78	66.6	217	64.6	
Attitude on Rabies												
Poor (< 60%)	11	2.4	3	1.1	8	4.4	0.063	6	5.1	5	1.5	0.014*
Moderate (60%–80%)	101	22.3	59	21.6	42	23.3		18	15.4	83	24.7	
Good (> 80%)	341	75.3	211	77.3	130	72.2		93	79.5	248	73.8	
Attitude on RPO												
Poor (< 60%)	80	17.7	44	16.1	36	20.0	0.108	25	21.4	55	16.4	0.271
Moderate (60%–80%)	276	60.9	177	64.8	99	55.0		72	61.5	204	60.7	
Good (> 80%)	97	21.4	52	19.1	45	25.0		20	17.1	77	22.9	
Practice on RPO of dog owners ¹												
Poor (< 60%)	33	7.8	14	5.5	19	11.2	0.003*	10	9.5	23	7.2	0.740
Moderate (60%–80%)	140	32.9	74	29.0	66	38.8		34	32.4	106	33.1	
Good (> 80%)	252	59.3	167	65.5	85	50.0		61	58.1	191	59.7	
Practice on RPO of cat owners ²												
Poor (< 60%)	42	20.2	19	17.0	23	24.0	0.031*	18	30.0	24	16.2	0.021*
Moderate (60%–80%)	109	52.4	54	48.2	55	57.3		23	38.3	86	58.1	
Good (> 80%)	57	27.4	39	34.8	18	18.7		19	31.7	38	25.7	

Notes: ¹respondents with dogs; ²respondents with cats; RPO: Responsible Pet Ownership

bies.

Overall, a positive attitude toward the rabies control campaign was also observed. There are also around 89% who are willing to pay for the vaccination of their pets. However, only a few of the respondents have records of their pets' immunization. A study by Beyene, *et al.*,¹⁵ revealed that willingness to pay is significantly influenced by the pet owner's knowledge on rabies, transportation of pets, and distance of the owner's residence from the vaccination center. It is also said that immunization against rabies may be affected by the misunderstanding that the rabies vaccine is included in routine pet immunizations.¹⁶ Study showed that dog owners in the community were found to practise RPO more frequently, and those cat owners were observed to be less accustomed to leashing or caging their pets.

Conclusion

In general, most of the respondents demonstrated a satisfactory knowledge of rabies, the Anti-Rabies Act, and RPO. In terms of the Anti-Rabies Act, it was notable that respondents were aware of key provisions of the law relating to actual practices such as vaccination, leashing, and meat trade. However, less than half of the respon-

dents were aware of the existence of the law. This indicates the need to strengthen the advocacy and education of the residents on the Anti-Rabies Act. In RPO's case, the history of a rabies case in the community was associated with the knowledge of responsibility of reporting bite incidence in the area. Furthermore, respondents from urban areas had better knowledge of RPO, indicating the need further to intensify information and education campaigns in rural areas.

Abbreviations

KAP: Knowledge, Attitudes, and Practices; RPO: Responsible Pet Ownership; RABV: *Rabies virus*; Md: Median; DOH: Department of Health.

Ethics Approval and Consent to Participate

An ethics clearance was obtained from the Pampanga State Agricultural University Ethics Review Committee with ethical approval no. 0010605 issued last July 5, 2018, before the conduct of the study. Participants were provided an informed consent form to sign containing details on the study's purpose and objectives, the nature of involvement of the participants, and possible direct and indirect benefits. Voluntariness, confidentiality, and data management were also stated in the consent form.

Competing Interest

Author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The data and materials to support the study's findings are available upon request to the corresponding author. The data are not available to the public due to the participants' privacy and confidentiality in the study.

Authors' Contribution

Reynaldo Jr. DL. Bundalian conceptualized and designed the study, prepared, edited, and reviewed the manuscript. Monalisa B Lacson, Catherine S Bacani, Remedios D San Jose, Maria Fe S Bulao, and Neil C Tanquilut reviewed literature and collected data. Dinah R O Soriano, Agnes P Garing, and Artemio Jr. B Aquino performed data collection. Archie R Policarpio and Joey K T Mallari did data analysis and interpretation. Patricia J P Magsino designed the methodology, analyzed the data, and edited the manuscript. All authors discussed the study and contributed to the manuscript preparation and review.

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Additional Information

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References

1. Devleeschauwer B, Aryal A, Sharma BK, Ale A, Declercq A, Depraz S, et al. Epidemiology, impact, and control of rabies in Nepal: a systematic review. *PLoS Neglected Tropical Disease*. 2016; 10 (2): 1–18.
2. Taylor L, Nel L. Global epidemiology of canine rabies: past, present, and future prospects. *Veterinary Medicine: Research and Reports*. 2015; 6: 361-71.
3. Hampson K, Coudeville L, Lembo T, Sambo M, Kieffer A, Atflan M, et al. Estimating the global burden of endemic canine rabies. *PLoS Neglected Tropical Diseases*. 2015; 9 (4): 1–20.
4. Davlin SL, Lapiz SM, Miranda ME, Murray KO. Knowledge, attitudes, and practices regarding rabies in Filipinos following implementation of the bohol rabies prevention and elimination programme. *Epidemiology & Infection*. 2014; 142 (7): 1476–85.
5. The ASEAN Secretariat. ASEAN rabies elimination strategy. Thailand: OIE World Organization for Animal Health; 2015.
6. Nilsson, M. Effect of rabies education programs on rabies awareness, attitudes towards dogs, and animal welfare among children in Lilongwe, Malawi. *Swedish University Agriculture Science*. 2014; Examensarbete 2014: 26.
7. Malhotra V, Balgir RS, Watts A, Kaur S, Nirwan PS, Cheema R. Awareness regarding animal bite management among resident doctors of tertiary care institute of Northern India. *Medical Journal of Dr. D.Y. Patil Vidyapeeth*. 2017 [cited 2020 May 20]; 10 (4): 359–64.
8. Tenzin, Dhand NK, Rai BD, Changlo, Tenzin S, Tsheten K, et al. Community-based study on knowledge, attitudes, and perception of rabies in Gelephu, South-central Bhutan. *International Health*. 2012; 4 (3): 210–9.
9. Wera E, Mourits MCM, Hogeveen H. Uptake of rabies control measures by dog owners in Flores Island, Indonesia. *PLoS Neglected Tropical Diseases*. 2015; 9 (5): 1–23.
10. Digafe RT, Kifelew LG, Mechesso AF. Knowledge, attitudes, and practices towards rabies: questionnaire survey in rural household heads of Gondar Zuria District, Ethiopia. *BMC Research Notes*. 2015; 8: 400 (1–7).
11. Dzikwi AA, Ibrahim AS, Umoh JU. Knowledge, attitude, and practice about rabies among children receiving formal and informal education in Samaru, Zaria, Nigeria. *Global Journal of Health Science*. 2012; 4 (5): 132-9.
12. Sambo M, Lembo T, Cleaveland S, Ferguson HM, Sikana L, Simon C, et al. Knowledge, attitudes, and practices (KAP) about rabies prevention and control: a community survey in Tanzania. *PLoS Neglected Tropical Diseases*. 2014; 8 (12): e3310.
13. Ali A, Ahmed EY, Sifer D. A study on knowledge, attitude, and practice of rabies among residents in Addis Ababa, Ethiopia. *Ethiopian Veterinary Journal*. 2014; 17 (2): 19.
14. 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.
15. Beyene TJ, Mindaye B, Leta S, Cernicchiaro N, Revie CW. Understanding factors influencing dog owners' intention to vaccinate against rabies evaluated using health belief model constructs. *Frontiers in Veterinary Science*. 2018; 5: 159 (1–9).
16. Sor S, Higuchi M, Sarker MAB, Hamajima N. Knowledge of rabies and dog-related behaviors among people in Siem Reap Province, Cambodia. *Tropical Medicine and Health*. 2018; 46 (1): 20 (1–10).