Stray Dog Feeding and Self-Reported Stray Dog-Related Problems in Thailand.

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Abstract

Stray dog population leads to problems, which are directly related to humans and the environment, has transformed stray dog issues from a third world problem to a global, public health priority. Hence, this study aimed to determine factors related to the feeding of stray dogs and other factors, which influence the results of stray dogs-related problems. This was a community based cross-sectional study, performed in Bangdan village, Songkhla, Thailand. Data were collected through phone interviews. Binary logistic regression analysis was conducted to measure the association between the independent variables and the problems-related with stray dogs. Among 168 participants, 137 participants (81.5%) were bothered by problems caused by stray dogs. The most common problem reported was garbage scavenging (62.5%), which occurred predominantly from the hours of 6 pm. to Midnight. Feeding stray dogs was significantly associated with stray dog-related problems (Odds Ratio [OR] = 3.94 with 95% confidence interval [CI] 1.26-17.41). However, other factors; such as, gender, length of stay and owning pets had no statistically significant association. In conclusion, feeding stray dogs was significantly associated with stray dog-related problems, with garbage scavenging being the most common problem reported.

Introduction

Stray dogs are ownerless and neglected dogs [1]. The World Health Organization (WHO) estimates that there are more than 200, million stray dogs worldwide and that every year, 55,000 people die from rabies; while another 15 million receive post exposure treatment to avert the deadly disease [2]. Exploding populations, cause a unique convergence of risk factors; such as, rabies, noise pollution, dog attacks, road accidents, hygienic and other problems, that relate directly to humans and the environment, have transformed this stray dog issue from a third world problem to a global, public health priority [3].

Stray dogs roam freely, finding their own food and shelters, and can also breed uncontrollably without habitat control. A dog population study in Thailand from 2019, indicated that stray dogs accounted for 5.0% of the total dog population, with the total number of this population being 109,123 [4]. Stray dog problems are a major hurdle that can be found throughout Thailand. According to surveys, stray dog problems are one of the main public concerns and should be targeted in future efforts to discuss as a point of concern in the community, with all related and influential groups, for a systematic and sustained control program.

People feeding stray dogs is the source of one problem in handling stray dog populations worldwide [4] Since, stray dogs depend on food given by people the source of food for these stray dogs can be from food left for them or by direct feeding [5]. Feeding stray dogs in Thailand is an illegal act, because it is a cause of major public concern [6]. This study has identified sanitary problems that occur in the community related to stray dogs; this situation has resulted in the issuing of the law related to the feeding of stray dogs in public places, and violators of this law will face a fine of at least 2,000 THB (1 USD = 30 THB) [6].

Thus, some actions have been taken to reduce the stray dogs' access to food waste; such as, garbage bins, waste around abattoirs, butcher shops, market areas and protecting garbage dumps from scavengers [4]. These actions have been suggested as practical and sustainable ways to reduce free-roaming dog population sizes [4].

This study aimed to determine factors related to people feeding stray dogs and other factors that influence the results of stray dog-related problems.

Methods

Study design and study setting

The study was a community-based cross-sectional study. Bangdan village was chosen purposely for the initial step of the pilot project, because of its mixed urban-rural community, and its high performance of healthcare providers. This is a village of Khao Rupchang Subdistrict, Muang District, Songkhla Province, in Southern Thailand.

Population and sample

The community has a total population of 3,026 people, made up of 1,423 males and 1,603 females. There are 921 households. According to the phone interview method for our data collection, the source population was reduced to people with available telephone numbers: 1,229 people (40.6% of the total population), from 533 households. Convenience sampling was used to select participants from the

people who were contactable from each household. There was a well, spatial distribution of our participants or samples, compared with the distribution of population (Figure S1 in the Supplementary Appendix).

Data collection and instruments

Regarding the current COVID-19 situation, the phone interviews were performed by trained interviewers, so as to maintain physical distancing. The survey was conducted from 4 to 29 January, 2021; using structured questionnaires. Data entry was collected and validated using KoBoToolbox software version [7]. The data were cleaned and checked for consistency and accuracy.

Dependent variable: stray dog-related problems

A stray dog was defined as: any dog not under direct control by a person or not prevented from roaming.

Types of stray dogs: a) free-roaming, owned dogs, not under direct control or restriction at any particular time; b) free-roaming dogs with no owner; c) feral dogs: domestic dogs that have reverted to a wild state, and are no longer directly dependent upon humans for successful reproduction [8].

The problems were divided into six categories:

(i). Noise pollution [9]: Was defined as: *"Have you ever heard dog barking in the last 12 months?"* (Answer: Yes/No) and *"If Yes, during what time of the day?"* (Answer: 00.00-06.00/06.00-12.00/12.00-18.00/18.00-24.00)

(ii). Garbage scavenging [10]: Was defined as: *"Have you ever witnessed stray dogs scavenging trash can in the last 12 months?"* (Answer: Yes/No), and *"If Yes, during what time of the day?"* (Answer: 00.00-06.00/06.00-12.00/12.00-18.00/18.00-24.00)

(iii). Traffic accident [11]: Was defined as: *"Have you ever experienced stray dogs running pass in front of the car or got chased by the dogs in the last 12 months?"* (Answer: Yes/No) and *"If Yes, during what time of the day?"* (Answer: 00.00-06.00/06.00-12.00/12.00-18.00/18.00-24.00)

(iv). Being harmed [12,13]: Was defined as: *"Have you ever got bitten by stray dogs in the last 12 months?"* (Answer: Yes/No) and *"If Yes, during what time of the day?"* (Answer: 00.00-06.00/06.00-12.00/12.00-18.00/18.00-24.00)

(v). Unpleasant odor [14]: Was defined as: *"Have you ever encountered the problem of unpleasant odor from stray dogs?"* (Answer: Yes/No)

(vi). Destruction behavior [15]: We defined as: *"Have you ever had your possessions destroyed by stray dogs?"* (Answer: Yes/No)

Primary independent variable: Feeding stray dogs

Feeding stray dogs was defined as an act of giving food to stray dogs [16]. In our study, the times and frequency of feeding stray dogs was asked of the participants as: *"Have you ever feed stray dogs in the last 12 months?"* (Answer: Yes/No) and *"If Yes, how often?"* (Answer: 1-5 times per year / 5-10 times per year / more than 10 times per year).

Statistical analysis

Descriptive data are presented as frequencies and percentages, and as medians and interquartile ranges (IQR). Binary logistic regression analysis was conducted to measure the association between the independent variables and the problems-related with stray dogs. R- software version 3.5.3 and `odbc` [17], `data.table` [18], `epicalc` [19], `rio` [20], `tidyr` [21], `DBI` [22], `RMySQL` [23], `table1` [24], and `ggplot2` packages were used to analyse the data. A p-value less than 0.05 indicates statistical significance.

Results

Demographic characteristics of participants who reported problems from stray dogs

Among 168 participants, 99 participants provided information about their age. The median age was 42.6 (IQR, 27.6-58.7) years (Table 1). In each age group, the number of subjects who reported encountering stray dog-related problems was greater than the number of subjects who reported no problems. The most concerning problem in all age groups was garbage scavenging (80-89.5%). According to length of stay, the median length of stay of all subjects was 28 (IQR, 10-50) years.

According to the results, about 80% of male and female participants encountered problems from stray dogs. Female participants faced the problem of garbage scavenging (77.3%) the most; whereas, male participants were concerned more about noise pollution (85%).

Interestingly, participants who were dog feeders also faced problems from stray dogs, as many as 93.2%; wherein, the most common problems were garbage scavenging (82.9%), noise pollution (73.2%) and unpleasant odors (48.8%), consecutively. In addition, about 80% of pet and non-pet owners also faced problems from stray dogs.

Table 1 Demographic characteristics of participants who reported problems from stray dogs (n=168).

Factors	Encounter with any stray dogs-related problems, n (row%)			P-value	Specific stray dogs-related problems, n (row%)					
	Total (n=168)	No (n=31)	Yes (n=137)		Having traffic accidents	Being harmed	Unpleasant odor	Destructive behavior	Noise pollution	Garbage scavenging
Age (years)										
Median (IQR)	43.6 (23.8, 60.7)	44.3 (20.4, 60.4)	42.6 (27.6, 58.7)	0.85 _a	35.4 (21.7, 55.4)	39.6 (19.3, 61.3)	40.6 (27.7, 56.7)	31.9 (21.9, 53.3)	43.2 (27.7, 58.5)	45.6 (28.1, 60.9)
<20	19	4/19 (21.1)	15/19 (78.9)	0.42 _b	3/15 (20.0)	4/15 (26.7)	8/15 (53.3)	6/15 (40.0)	10/15 (66.7)	12/15 (80.0)
20-60	55	7/55 (12.7)	48/55 (87.3)		4/48 (8.3)	5/48 (10.4)	23/48 (47.9)	10/48 (20.8)	32/48 (66.7)	35/48 (72.9)
>60	25	6/25 (15.0)	19/25 (85.0)		3/19 (15.8)	3/19 (15.8)	8/19 (42.1)	3/19 (15.8)	13/19 (68.4)	17/19 (89.5)
Length of stay (years)										
Median (IQR)	28.0 (10.0, 50.0)	30 (14.5,47)	28 (10,50)	0.72 _a	25.0 (10.0, 61.8)	30.0 (17.8, 59.8)	29.5 (16.2, 51.0)	38.0 (25.0, 56.8)	30.0 (17.8, 55.2)	26.0 (10.0, 46.0)
<20	28	6/28 (21.4)	22/28 (78.6)	0.91 _b	4/22 (18.2)	5/22 (22.7)	7/22 (31.8)	1/22 (4.5)	15/22 (68.1)	20/22 (90.9)
20-60	106	19/106 (17.9)	87/106 (82.1)		6/87 (5.7)	12/87 (13.8)	47/87 (54.0)	25/87 (28.7)	62/87 (71.3)	65/87 (74.7)
>60	34	6/34 (17.6)	28/34 (82.4)		8/28 (28.6)	5/28 (17.9)	14/28 (50.0)	8/28 (28.6)	19/28 (67.8)	20/28 (71.4)
Gender										
Male	51	11/51 (21.6)	40/51 (78.4)	0.64 _b	13/40 (32.5)	7/40 (17.5)	20/40 (50.0)	12/40 (30.0)	34/40 (85.0)	30/40 (75.0)
Female	117	20/117 (17.1)	97/117 (82.9)		5/97 (5.2)	15/97 (15.5)	48/97 (49.5)	22/97 (22.7)	62/97 (63.9)	75/97 (77.3)
Feeding stray dog				0.04 _b *						
Yes	44	3/44 (6.8)	41/44 (93.2)		4/41 (9.8)	6/41 (14.6)	20/41 (48.8)	14/41 (34.1)	30/41 (73.2)	34/41 (82.9)
No	124	28/124 (22.6)	96/124 (77.4)		14/96 (20.3)	16/96 (19.8)	48/96 (50)	20/96 (20.8)	66/96 (68.8)	71/96 (74.0)
Owning pets										
Yes	83	14/83 (16.9)	69/83 (83.1)	0.75 _b	8/69 (11.6)	13/69 (18.8)	35/69 (50.7)	18/69 (26.1)	48/69 (69.6)	55/69 (79.7)
No	85	17/85 (20.0)	68/85 (80.0)		10/68 (14.7)	9/68 (13.2)	33/68 (48.5)	16/68 (23.5)	48/68 (70.6)	50/68 (73.5)
IQR = interquartile range, _a Mann–Whitney U test, _b Chi-square test; between factor and problem report, * p-value < 0.05										

Time distribution of stray dog-related problems.

In this study, we found that 137, of 168 respondents, (81.5%) were bothered by problems caused by stray dogs (Table 2). The most common problem troubling respondents was garbage scavenging (62.5%), followed by noise pollution (57.1%) and unpleasant odors (40.5%), respectively.

The proportion of events in periods of time are shown in Figure 1.; in that 6 p.m. to midnight was the most common time of the day problems; such as, noise pollution, garbage scavenging and traffic accidents, related to stray dogs occurred. More than half of noise pollution events as well as garbage scavenging events were reported in this period of time. Being harmed by stray dogs mostly occurred from 12 a.m. to 6 p.m.; accounting for 45.5%

Table 2 The percentage of each problem from stray dogs affecting respondents within the past year (n=168).

Problems	Affected (n/Total, %)	Time (n/Total, %)			
		00.01-06.00	06.01-12.00	12.01-18.00	18.01-00.00
Garbage scavenging	105/168 (62.5)	40/105 (38.1)	20/105 (19.0)	22/105 (21.0)	76/105 (72.4)
Noise pollution	96/168 (57.1)	47/96 (49.0)	15/96 (15.6)	19/96 (19.8)	70/96 (72.9)
Unpleasant odor	68/168 (40.5)	NA	NA	NA	NA
Destructive behavior	34/168 (20.2)	NA	NA	NA	NA
Being harmed	22/168 (13.1)	1/11 (9.1)	1/11 (9.1)	5/11 (45.5)	4/11 (36.4)
Having traffic accidents	18/168 (10.7)	1/12 (8.3)	2/12 (16.7)	5/12 (41.7)	6/12 (50.0)
Any Problems	137/168 (81.5)	NA	NA	NA	NA

NA = Data not available

Influencing factors for problems-related to stray dogs

Table 3 displays the multivariate analysis between the influencing factors and the problems caused by stray dogs. The feeding of stray dogs was significantly associated with the self-reports of stray dog-related problems (Odds Ratio [OR] = 3.94, with 95% confidence interval [CI] 1.26-17.41). However, other factors (i.e., gender, length of stay, and owning pets) pointed to no statistically significant association.

Table 3 Results of multivariate analysis of risk factors associated with any problems regarding stray dogs within the last year (n=168).

Factors	Adjusted OR (95%CI)
Gender (ref. = Male)	
Female	1.24 (0.52-2.85)
Length of stay (years) (ref. = <20)	
20-60	1.09 (0.35-3.01)
>60	1.26 (0.34-4.63)
Pet (ref. = No)	
Yes	1.02 (0.45-2.33)
Feeding (ref. = No)	
Yes	3.94 (1.26-17.41)*
OR = odds ratio, CI = confidence interval, * P-value < 0.05	

Methods used to deal with stray dogs

Half of the participants chose to retreat or walk away (Table 4), followed by ignoring the dogs (19.8%), making eye contact with the dogs (10.9%), or used commands to keep them back (8.6%). Other methods (i.e., preparing to attack, taking care and throwing objects) were

also used by a small number of the participants; approximately less than 5%.

Table 4 Patterns the participants used to deal with stray dogs (n=168).

Methods	n (%)
Retreat or walking away	81 (50.0)
Ignoring	32 (19.8)
Making eye contact	17 (10.9)
Commands to stay back	14 (8.6)
Throwing objects	2 (1.1)
Preparing to attack	8 (4.9)
Taking care	8 (4.9)

Discussion

Principal findings and relation to other studies

This study has shown that there is a significant, positive association between feeding stray dogs and incidents of problems related to them. On the contrary, no significant association was identified among other factors (i.e., gender, age, length of stay, and owning pets). The most common problems, comprising of more than 50%, were garbage scavenging and noise pollution. The aforementioned problems were found mainly during 18.01-00.00. Apart from that, the majority of subjects dealt with stray dogs by retreating or walking away.

In this current study, which is consistent with a previous study, the feeding of stray dogs was associated with all problems related to stray dogs. For example, the ecology of dog bite injury in St. Louis, Missouri [25] pointed out the association of feeding stray dogs and increased bite incidents. A comparative Study in Nepal and Japan [26] showed that the availability of food enhanced the survival rate of stray dogs, and lead to larger stray dog populations, which caused increased problems, such as noise pollution and garbage scavenging [10] Other factors (i.e., gender, age, length of stay and owning pets) were not significantly associated in our analysis. However, previous studies found that there were significant gender and age differences in bite incidents; males and children were affected the most [27]. This contrast might be explained by our data collection and sampling technique. This current study lacked comprehension in age groups, because the phone interviews had limitations on obtaining information from residents who were children, and a larger portion of our samples were female.

Based on our results, the most prevalent problem was garbage scavenging. According to a previous study; The meat of the matter: a rule of thumb for scavenging dogs? [28] revealed that dogs are scavengers, which primarily receive carbohydrate-rich food from humans. Their source for animal food is typically garbage bins. The second most common problem was noise pollution, which was in good agreement with previous results from Australia [29], which revealed that barking annoys many people in urban communities and was the most frequently reported problem to many local councils.

The period of time in which garbage scavenging occurred, and noise pollution were most likely found was 18.01-00.00. This confirms previous findings [30] that indicated that dogs appear to be much more active at night and always sleep during the day, which results in a chaotic night time having the most prevalence of stray dog-related problems. Moreover, we hypothesised that the time with the most prevalence of garbage scavenging was influenced by the daily routines of Thais, who tend to throw away their garbage after working hours or just before bedtime; whereas, the local government provides garbage collection in the morning. Because of the above-mentioned habit, stray dogs are able to access more food sources. The findings of noise pollution were consistent with a survey of public attitudes towards barking dogs in New Zealand [31], which mentioned the unavailability of people who were not home during other times of the day. Thus, they encountered less noise pollution than in the time periods of 18.01-0.00.

Limitations and strengths

Our study has a number of limitations. First, our study setting was in a specific area, with a small sample size. However, this study was an initial step towards a pilot study. The most important restriction was due to the project duration of 1 month, together with the COVID-

19 pandemic making direct observation impossible; leading to poor generalizability. Second, because of the COVID-19 pandemic, phone interviews were used to collect data. The data received might be incorrect, related to low internal validity. The researchers tried to overcome the problem by interviewer training to increase the effectiveness of phone interviews, so as to obtain the most accurate data. Lastly, this study has highlighted the association between feeding stray dogs and encountering problems from them. The act of feeding stray dogs is an illegal practice, but in fact the studies may present biased results in regard to the attitudes that believe feeding stray dogs is the right thing to do. Although, the findings should be interpreted with caution, this study has several strengths. This study has indicated that feeding stray dogs leads to an important increase of problems caused by them. This finding raised awareness of the problem, leading to a reduction in the act of feeding stray dogs. This paper gives precedence to stray dogs, which have become a serious problem around the world; particularly in Thailand.

Implications and future research

This study is the first step in enhancing our understanding of feeding stray dogs and other factors that influence the result of stray dog-related problems. This work has revealed that over half of the participants were bothered by problems caused by stray dogs. Moreover, feeding stray dogs was significantly associated with stray dog-related problems. We hope that our study will have important implications for creating awareness and concern about the consequences of feeding stray dogs. In addition this study will be valuable in community policymakers in order to solve the difficulty of stray dog problems, by using awareness of people in the community to motivate multi-sector cooperation.

At the same time, we believe that the data we collected may be beneficial for the community to cope with other problems related to stray dogs, such as waste management.

We recommended that further research should be undertaken by following these suggestions; (i) increasing the sample size and widen the study area, so as to provide more information and producing broad generalizability, (ii) enhancing data collecting procedures, (iii) face-to-face interviews should be added, as body language cannot be perceived via phone interviews. Moreover, the variety of sampling was reduced in this study, caused by the use of convenience sampling to select participants. The participants being available for phone interviews tended to be the ones who stayed at home, and did not often use any vehicle. This limitation can alter the results, (iv) more personal questions that could be factors influencing stray dog-related problems; such as, religion and attitudes toward feeding stray dogs, should be added to the questionnaire, and (v) collecting more details about each problem; especially the ones with impact on the community will be helpful in problem solving.

Conclusion

Our results indicate that the feeding of stray dogs was significantly associated with stray dog-related problems. However, other factors; such as, gender, length of stay, and owning pets had no statistically significant association. Garbage scavenging was the most common problem reported. Half of the people chose to retreat or walk away as their method in dealing with stray dogs.

Feeding stray dogs is not only the source of problems, but is also illegal. Consequently, media, local community leaders and other influential groups should raise awareness and promote community cooperation.

Declarations

Ethics approval and consent to participate

According with phone interviews, our staffs informed all participants about identify of investigator, objective of the phone call, interview details (i.e., approximate time, topics, and data confidentiality). Then, our staffs asked the participant for verbal consent prior to beginning data collection. All methods including verbal consent were performed in accordance with the ethical standards of the institutional and with 1964 Helsinki declaration. This study protocol was approved by the Human Research Ethics Committee (HREC) of the Faculty of Medicine, Prince of Songkla University (REC: 64-167-9-2).

Author contributions

All authors equally contributed to the conceptualization, methodology, data curation, data analysis, and writing – original draft preparation, review and edition.

Competing interests

The authors declare no competing interests.

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Figures

Figure 1

Heatmap shows proportion of events in period of time (n=168).

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