2026, Scienceline Publication
World's Veterinary Journal
World Vet J, 16(1): 171-181.
ISSN 2322-4568

DOI: https://dx.doi.org/10.54203/scil.2026.wvj16
PII: S232245682600016-16

Influences of Demographic Factors on Knowledge, Attitudes, and Practices Related to Animal Welfare among Pet Owners in Vietnam

Do Le Tuyet Minh, Nguyen Duc Dat, Nguyen Thi Huong Giang, and Tran Xuan Minh*

Institute of Agriculture and Natural Resources, Vinh University, 182 Le Duan Street, Truong Vinh Ward, 43100, Nghe An, Vietnam

*Corresponding author's Email: minhtx@vinhuni.edu.vn

ORIGINAL ARTICLE
Received: January 04, 2026
Revised: February 07, 2026
Accepted: February 29, 2026
Published: March 25, 2026

ABSTRACT

Animal welfare has become an increasingly important issue in rapidly urbanizing societies, particularly in developing countries where pet ownership is expanding. This study was conducted to examine the influence of demographic factors on pet owners' knowledge, attitudes, and practices (KAP) related to animal welfare in Nghe An Province, Vietnam, in 2025 and to analyze the relationships among knowledge, attitudes, and caregiving behaviors. A cross-sectional study design was employed, involving 297 pet owners who were surveyed using a semi-structured questionnaire. The results indicated that overall knowledge, attitudes, and practices regarding animal welfare were moderate, with mean scores of 3.18 ± 0.93, 3.28 ± 0.94, and 3.25 ± 0.93, respectively. No statistically significant associations were observed between demographic characteristics (gender, age, educational level, occupation, and income) and the knowledge, attitude, or practice scores in the adjusted regression models, except for pet ownership experience and the purpose of pet keeping. The results indicated that knowledge had a positive effect on attitudes and practices. Attitudes were identified as the strongest predictor of animal welfare practices. The results confirmed that attitudes partially mediated the relationship between knowledge and practices, with a statistically significant indirect effect. These findings suggested that improving knowledge alone is insufficient to enhance animal welfare practices, and effective interventions should prioritize attitude change and strengthen the role of community veterinary services in promoting responsible pet care.

Keywords: Behavioral determinant, Companion care, Mediation analysis, Responsible ownership

INTRODUCTION

Animal welfare (AW) has gained increasing global attention in recent decades. International organizations concerned with animal health and welfare, such as the World Organization for Animal Health (WOAH) and the European Union (EU), along with numerous developed countries, consider animal welfare an essential element of sustainable livestock systems, with implications for public health, human-animal relationships, and community safety (Keeling et al., 2019). The Five Freedoms, which include freedom from hunger and thirst, discomfort, pain, injury, and disease; freedom to express normal behavior; and freedom from fear and distress, have become an internationally accepted framework for assessing animal welfare standards (FAWC, 2009). Previous studies have demonstrated that knowledge and attitudes play a pivotal role in shaping behaviors related to animal welfare (Carnovale et al., 2021; Alemayehu et al., 2022). However, findings regarding the effects of demographic characteristics, such as gender, age, education, and income, on animal-related behaviors vary considerably across different countries, cultural contexts, and study populations (McKendree et al., 2014; García Castro et al., 2022). These inconsistent findings underscore the need for further empirical research, particularly in developing countries where socio-cultural norms and pet-keeping practices differ substantially.

Alongside economic growth and rapid urbanization, pet ownership in Vietnam has increased markedly. According to a TGM Research survey, 56% of Vietnamese respondents consider dogs and cats family members (TGM Research, 2025). This trend is especially pronounced among younger populations and has intensified in the post–COVID-19 period, when the demand for companionship and emotional bonding increased (TGM StatBox, 2024). Currently, approximately one in five households owns a dog, and one in seven owns a cat, with an average annual growth rate of about 5% since 2017. By 2023, the pet population in Vietnam was estimated at around 12 million dogs and cats, and is projected to reach 16 million by 2027 (Minh, 2024). Public interest has also risen online, with searches related to dogs and cats increasing from 1 million in 2019 to 1.9 million in 2021 (iPrice Group, 2021). Rapid growth in companion animal ownership presents considerable challenges regarding owners' responsibilities for physical health, psychological well-being, and adequate living conditions, which are fundamental dimensions of animal welfare.

To cite this paper: Minh DLT, Dat ND, Giang NTH, and Minh TX (2026). Influences of Demographic Factors on Knowledge, Attitudes, and Practices Related to Animal Welfare among Pet Owners in Vietnam. *World Vet. J.,* 16(1): 171-181. DOI: https://dx.doi.org/10.54203/scil.2026.wvj16

Despite the rapid expansion of companion animal ownership, research on pet owners' knowledge, attitudes, and practices (KAP) in Vietnam remains limited, particularly in the central region. Existing studies have primarily focused on rabies and other zoonotic diseases rather than on broader pet welfare (Phu et al., 2025; Truong et al., 2025). Nghe An Province, characterized by a large population and a rapidly developing economy, has experienced a growing trend in pet ownership. However, systematic evidence on local pet owners' awareness and caregiving behaviors is scarce, constraining the development of targeted educational programs and evidence-based policies to improve animal welfare. Accordingly, this study aimed to investigate how demographic characteristics are associated with pet owners' levels of knowledge, attitudinal perspectives, and care-related practices, while also exploring the interconnections among these dimensions within the KAP framework in Nghe An Province.

MATERIALS AND METHODS

Ethical approval

This study was reviewed and approved by the Animal Research Ethics Committee of the Institute of Agriculture and Natural Resources, Vinh University, Vietnam (Approval No. 05/QĐ-NNTN-DHV/2025).

Study area

The study was conducted from May to November 2025 in selected wards of Nghe An Province, Vietnam (Figure 1). The study area comprised six wards, covering approximately 166.25 km², with a population exceeding 568,700 inhabitants. These wards were characterized by a high density of pet ownership and included urban, peri-urban, and semi-rural settings. Variations in living standards, educational levels, and access to veterinary services across the wards provided a suitable basis for comparing pet owners' knowledge, attitudes, and practices (KAP) regarding animal welfare across different demographic groups, thereby offering a more comprehensive overview of the situation in Nghe An Province.

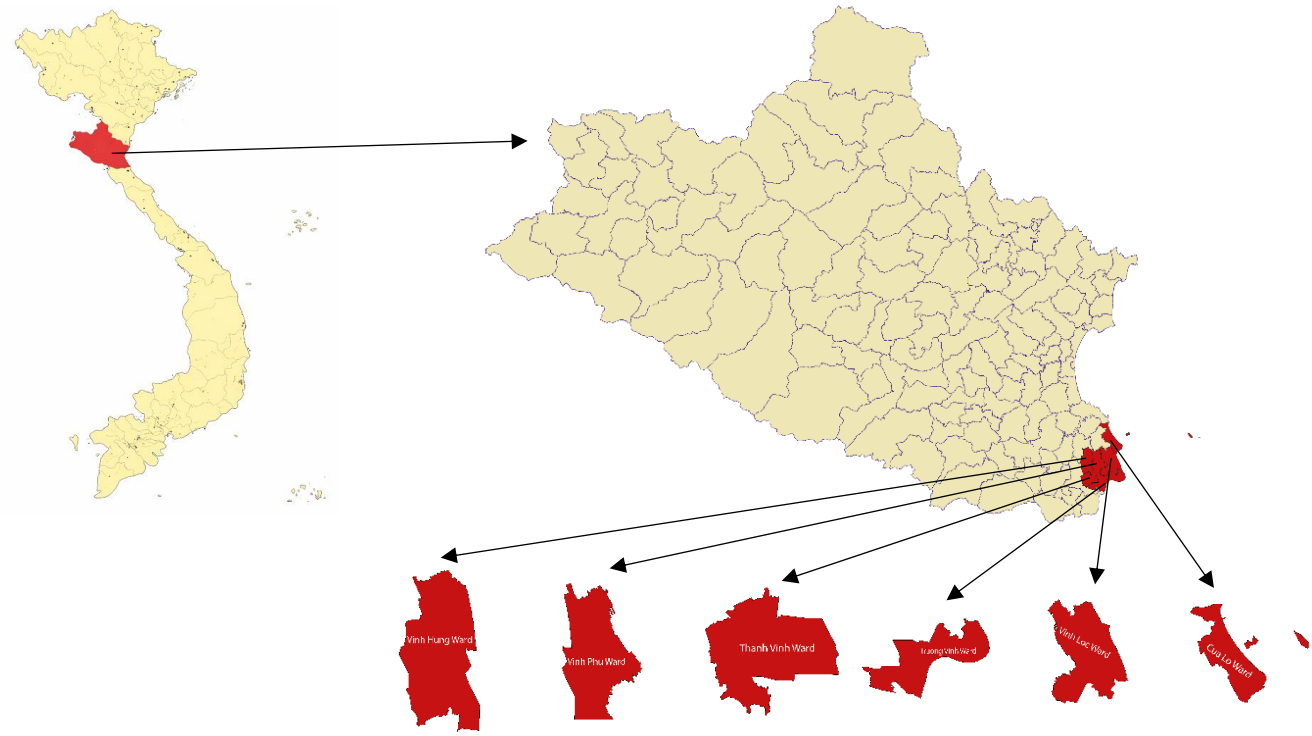

Figure 1. The location of the study areas in Nghe An Province, Vietnam

Study design

A cross-sectional mixed-methods design was employed to assess pet owners' knowledge, attitudes, and practices (KAP) regarding animal welfare in Nghe An Province and to examine the relationships among knowledge, attitudes, and welfare-related behaviors in pet care (Figure 2). The quantitative component consisted of a structured survey administered to 297 participants, whereas the qualitative component involved semi-structured in-depth interviews with 15 purposively selected participants to contextualize and enrich the interpretation of the survey findings. Eligible

participants were individuals aged 15 years or older who currently owned at least one companion animal (including dogs, cats, ornamental birds, or ornamental fish) and were directly involved in daily care activities. Individuals who were not primary caretakers or who submitted incomplete questionnaires were excluded from the final analysis. All participants received written information describing the study objectives and confidentiality procedures. Participation was voluntary, and withdrawal was permitted at any stage without consequences.

The questionnaire was developed within the Knowledge–Attitude–Practice framework and informed by the Theory of Planned Behavior and the Five Freedoms principles originally proposed by the UK Farm Animal Welfare Council. Items were adapted from previously validated KAP instruments used in veterinary and public health research (Forrest et al., 2023; Liang et al., 2024) and refined to ensure cultural relevance in the Vietnamese context. Knowledge of animal welfare (9 items) was measured using a five-point Likert scale ranging from not at all knowledgeable (1) to extremely knowledgeable (5). The items covered include understanding the Five Freedoms, recognizing pets' emotions and abnormal behaviors, knowledge of healthcare, legal awareness, and awareness of pets' environmental needs. Attitudes toward animal welfare (10 items) were assessed on a five-point Likert scale from strongly disagree (1) to strongly agree (5). The items captured affective attachment to pets, perceptions of responsibility for pet care and welfare, and support for animal welfare–related legislation and community education. Practices related to animal welfare (10 items) were evaluated using a five-point Likert scale from never (1) to always (5). The items addressed nutrition and water provision, hygiene and housing conditions, interaction, exercise and enrichment, and healthcare and monitoring of clinical signs.

Prior to formal data collection, the instrument was pilot-tested with 20 companion animal caretakers to assess clarity and contextual appropriateness. Face and content validity were evaluated through expert review by two specialists in veterinary public health and one researcher in social sciences, who independently assessed the questionnaire items for relevance to animal welfare concepts, clarity of wording, and suitability for the local study context. Internal consistency reliability was assessed using Cronbach's alpha coefficients (0.88) for each construct, indicating acceptable reliability.

To classify levels of knowledge, attitudes, and practices, mean scores were categorized into class intervals based on the assumption of equal distances between Likert-scale points, as suggested by Alkharusi (2022). Given that the five-point Likert scale ranged from 1 to 5, the class width was calculated according to Formula 1.

Class width = (5-1)/5 = 0.80 (Formula 1)

Accordingly, KAP levels were categorized as follows L1 was very low (1.00-1.80), L2 was low (1.81-2.60), L3 was moderate (2.61-3.40), L4 was high (3.41-4.20), and L5 was very high (4.21-5.00). This classification was consistently applied to all three KAP components to ensure comparability and coherent interpretation of the results.

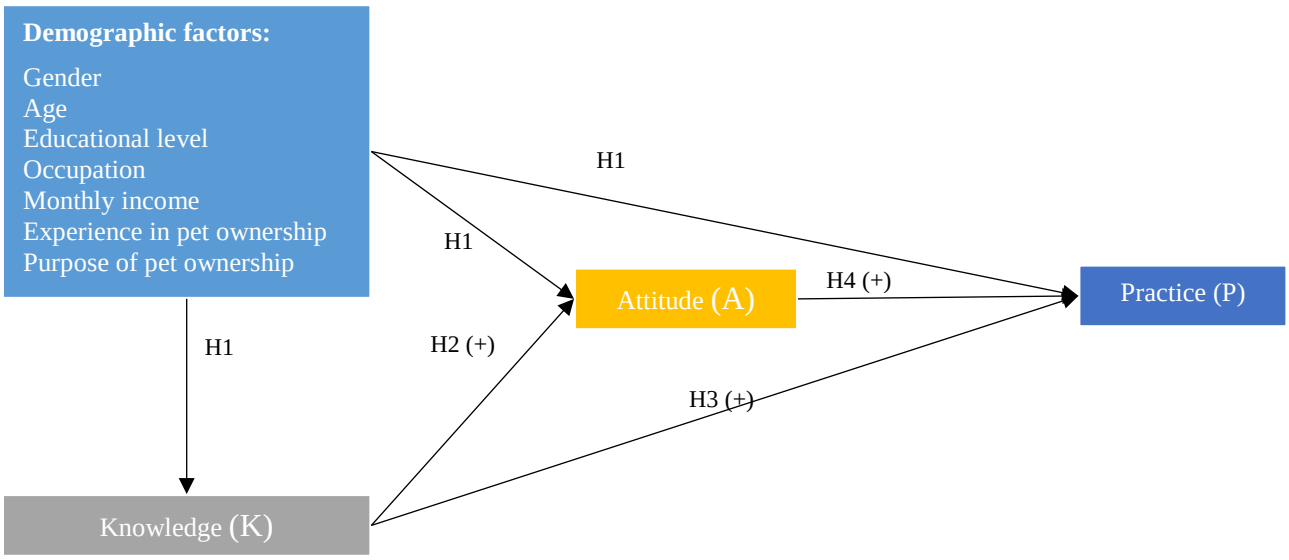

Figure 2. Conceptual framework of knowledge, attitudes, and practices (KAP) regarding animal welfare among pet owners in Nghe An Province, Vietnam. Arrows indicate the hypothesized relationships among variables. H1 examines the influence of demographic factors on knowledge, attitudes, and practices. H2 (+) indicates a positive relationship between knowledge and attitude. H3 (+) represents the positive effect of knowledge on practice. H4 (+) indicates the positive effect of attitude on practice.

Sample size determination and sampling procedure

The sample size was calculated following the formula proposed by Thrusfield et al. (2018). In the absence of prior studies in the study area, the expected proportion was assumed to be P_{exp} = 0.50. A 95% confidence level (Z = 1.96) and an absolute precision of d = 6% were applied. The required sample size was calculated using the following formulas 2 and 3.

$$n = \frac{1.96^2 \times [P_{exp}(1-P_{exp})]}{d^2}$$ (Formula 2)

where n is the required sample size, P_{exp} is the expected proportion, and d is the desired absolute precision. Using these parameters, the minimum calculated sample size was 267 participants.

To account for a potential non-response rate of 10%, the sample size was adjusted using Cochran's (1977) correction formula.

$$n' = \frac{n}{1-0.1} = \frac{267}{0.9} \approx 297$$ (Formula 3)

Accordingly, the final sample size for the study was set at 297 pet owners. Recruitment was organized to ensure spatial coverage across the urban and peri-urban districts of Nghe An Province. Within these geographical areas, participants were approached using convenience sampling at veterinary clinics, pet shops, pet care centers, public parks, residential communities, and online social media groups dedicated to companion animal caretakers. Although recruitment sites included veterinary clinics and online communities, which may attract more engaged caretakers, participants were also approached in residential areas and public parks to enhance heterogeneity in demographic characteristics and ownership experience.

Data collection

Data were collected concurrently using quantitative and qualitative approaches. For the survey component, 297 valid questionnaires were obtained. Of these, 178 responses were collected through face-to-face administration conducted by interviewers, whereas 119 responses were obtained through an online survey platform distributed via social media groups dedicated to companion animal caretakers. To assess potential mode effect bias, differences in overall knowledge, attitude, and practice scores between face-to-face and online respondents were statistically examined at the 0.05 significance level to evaluate the comparability of the two data collection modes.

The qualitative component involved 15 semi-structured interviews, purposively selected from survey respondents who agreed to participate in follow-up. Selection ensured variation in age, occupation, type of companion animal, and overall knowledge level, categorized as low, moderate, or high based on survey scores. The interviews aimed to explore key issues, including motivations for keeping pets, perceptions of pets' emotional and physical needs, attitudes toward vaccination, disease treatment, feeding, and housing conditions, as well as perceived barriers to proper animal welfare practices (including time constraints, financial limitations, and lack of knowledge).

Interviews were audio-recorded with consent, transcribed verbatim, and analyzed using deductive content analysis guided by the Knowledge-Attitude-Practice framework. Two researchers independently coded the transcripts, resolved discrepancies through discussion, and achieved substantial inter-coder agreement. Qualitative findings were used to contextualize and interpret quantitative results, particularly the identified mediating role of attitudes in the relationship between knowledge and welfare practices.

Data analysis

Quantitative data were entered, coded, and analyzed using SPSS version 26. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated. Associations between participant characteristics and KAP levels were examined using Gamma correlation coefficients where appropriate.

In regression analyses, knowledge was treated as the independent variable predicting attitudinal orientation and behavioral practice. Attitudinal orientation was treated as a dependent variable in the first model and as a mediator in the mediation analysis. Behavioral practice was treated as the dependent variable in the final model. Assumptions of linear regression, including normality of residuals, homoscedasticity, and multicollinearity, were examined before model estimation. Variance inflation factor values indicated no multicollinearity concerns.

The mediating role of attitudinal orientation in the relationship between knowledge and behavioral practice was tested using the PROCESS Macro (version 4.2) with 5,000 bootstrap samples and 95% confidence intervals. Continuous predictor variables were mean-centered before mediation analysis to reduce potential multicollinearity. Statistical significance was determined at $p < 0.05$.

RESULTS

Characteristics of pet owners and level of animal welfare knowledge

A total of 297 pet owners participated in the survey, of whom 68.0% were female, and 32.0% were male (Table 1). Most respondents were aged 18-25 years (30.0%) and 26-35 years (24.9%), followed by those aged 36-50 years (20.2%) and over 50 years (19.9%). Regarding educational attainment, the majority of respondents held a university degree (69.7%), whereas 14.1% had an education level below high school. In terms of occupation, students accounted for the

most significant proportion (37.7%), followed by civil servants/public employees and self-employed workers (22.2% each). The monthly income was mainly distributed in the < $114.20/month (33.7%) and $266.60-$571.40/month (32.7%) categories. Regarding pet ownership experience, nearly half of the respondents (47.1%) had kept pets for 6 months to 2 years, and 64.0% reported companionship or leisure as their primary reason for keeping pets.

Overall, the level of animal welfare knowledge among pet owners was classified as moderate (L3), with a mean score of 3.18 ± 0.93 (Table 1). Most respondents demonstrated moderate to high knowledge levels (L3-L4), while only a small proportion fell into the very low (L1) and low (L2) categories. No statistically significant associations were observed between knowledge level and demographic characteristics, including gender, age, education, occupation, income, or purpose of pet ownership ($p > 0.05$). Across these groups, knowledge scores were predominantly clustered at the moderate level (L3), with relatively similar distributions. Pet ownership experience was the only factor significantly associated with animal welfare knowledge ($p < 0.05$). Specifically, respondents with shorter ownership duration (<6 months) tended to exhibit higher knowledge levels. In contrast, those with long-term experience (>5 years) were more likely to fall within the moderate or low knowledge categories. Qualitative interviews provided contextual insight into the observed inverse association between pet ownership duration and knowledge level. Newer owners frequently reported actively searching for information through veterinary consultations, online forums, and social media platforms. In contrast, long-term owners often relied on accumulated personal experience and routine practices rather than updated welfare recommendations. The difference in information-seeking behavior may help explain why respondents with shorter ownership duration demonstrated higher knowledge scores.

Table 1. Correlation between pet owners' characteristics and knowledge of animal welfare in Nghe An Province, Vietnam, 2025

Pet owners' characteristics		N	L1	L2	L3	L4	L5	%	$\bar{K}$	SD	γ	p value
Gender	Male	95	12	12	35	20	16	32.0	3.13	0.98	0.043	0.567
	Female	202	17	37	58	59	31	68.0	3.20	0.91		
Age	< 18 years	15	0	1	5	6	3	5.1	3.59	0.77	-0.025	0.617
	18-25 years	89	7	15	33	20	14	30.0	3.15	0.88		
	26-35 years	74	8	11	23	22	10	24.9	3.17	0.92		
	36-50 years	60	7	11	18	12	12	20.2	3.14	1.01		
	> 50 years	59	7	11	14	19	8	19.9	3.16	0.98		
Education level	Below high school	42	5	7	12	12	6	14.1	3.10	0.98	-0.047	0.508
	High school graduate	5	1	1	1	0	2	1.7	3.04	1.43		
	Vocational/College	8	1	0	4	2	1	2.7	3.21	0.94		
	University	207	15	35	64	58	35	69.7	3.25	0.90		
	Postgraduate	35	7	6	12	7	3	11.8	2.87	0.98		
Occupation	Student	112	15	19	26	33	19	37.7	3.16	1.00	0.038	0.479
	Government officer/Civil servant	66	6	16	21	17	6	22.2	3.01	0.88		
	Office worker	28	2	1	12	7	6	9.4	3.37	0.86		
	Freelance worker	66	4	10	26	15	11	22.2	3.25	0.87		
	Business owner	19	2	3	7	3	4	6.4	3.13	1.05		
	Homemaker	3	0	0	1	1	1	1.0	3.63	0.68		
	Architect	3	0	0	0	3	0	1.0	3.85	0.36		
Monthly income**	< 114.2 USD/month	100	9	13	29	33	16	33.7	3.27	0.92	-0.057	0.270
	114.2-266.6 USD/month	26	1	10	6	5	4	8.8	3.11	0.94		
	266.6-571.4 USD/month	97	10	18	30	21	18	32.7	3.15	0.98		
	> 571.4 USD/month	74	9	8	28	20	9	24.9	3.12	0.89		
Pet-keeping experience	< 6 months	48	5	1	12	18	12	16.2	3.47^{b}	0.96	-0.159	0.002*
	6 months - 2 years	140	14	26	42	36	22	47.1	3.17^{ab}	0.92		
	2-5 years	48	4	8	13	13	10	16.2	3.27^{b}	0.97		
	> 5 years	61	6	14	26	12	3	20.5	2.89^{a}	0.83		
Purpose of keeping pets	Companionship/Recreation	190	21	33	65	44	27	64.0	3.12	0.92	-0.007	0.907
	Guarding/Security	56	2	9	15	18	12	18.9	3.39	0.91		
	Business	15	2	2	5	3	3	5.1	3.16	1.02		
	Other	36	4	5	8	14	5	12.1	3.19	0.99		
Knowledge of AW		297	29	49	93	79	47	100	3.18	0.93		

AW: Animal welfare. L1: Very low (1.00-1.80); L2: Low (1.81-2.60); L3: Moderate (2.61-3.40); L4: High (3.41-4.20); L5: Very high (4.21-5.00). $\bar{K}$: Mean score of animal welfare knowledge; SD: Standard deviation; γ: Gamma correlation coefficient. *$p < 0.05$ was considered statistically significant. **Monthly income was converted from VND to USD using an exchange rate of 1 USD: 26,265 VND. Different superscript letters ($^{a, b}$) within the same column indicate statistically significant differences between groups of the variable ($p < 0.05$).

Characteristics of pet owners and attitudes toward animal welfare

Overall, pet owners' attitudes toward animal welfare were classified as moderate (L3), with a mean attitude score of 3.28 ± 0.94 (Table 2). Attitudes were not significantly associated with gender, age, educational level, income, or ownership duration ($p > 0.05$). Across these groups, attitudes were predominantly moderate (L3), with relatively even distributions. Regarding occupation, although the association did not reach statistical significance ($p > 0.05$), a tendency toward more positive attitudes was observed among certain occupational groups, particularly office workers and household business owners. The primary purpose of pet ownership was the only factor significantly associated with attitudes toward animal welfare ($p < 0.05$). Interview findings suggested that respondents who perceived pets as integral household members expressed stronger moral responsibility and emotional attachment, which translated into more positive welfare attitudes. Conversely, when pets were viewed primarily in functional terms, attitudes were more pragmatic and less affectively driven. These results help contextualize the quantitative association between ownership purpose and attitudinal orientation.

Table 2. Correlation between pet owners' characteristics and attitudes toward animal welfare in Nghe An Province, Vietnam, 2025

Pet owners' characteristics		N	L1	L2	L3	L4	L5	%	$\overline{K}$	SD	γ	P value
Gender	Male	95	4	19	32	21	19	32.0	3.33	0.90	-0.029	0.688
	Female	202	19	37	53	58	35	68.0	3.26	0.96		
Age	< 18 years	15	1	3	5	3	3	5.1	3.26	0.92	-0.018	0.724
	18-25 years	89	4	19	23	30	13	30.0	3.32	0.90		
	26-35 years	74	5	15	17	24	13	24.9	3.30	0.94		
	36-50 years	60	6	11	23	10	10	20.2	3.18	0.89		
	> 50 years	59	7	8	17	12	15	19.9	3.29	1.07		
Education level	Below high school	42	1	10	13	10	8	14.1	3.29	0.89	-0.007	0.910
	High school graduate	5	1	2	0	0	2	1.7	3.06	1.73		
	Vocational/College	8	1	1	1	4	1	2.7	3.36	0.88		
	University	207	17	38	62	51	39	69.7	3.28	0.95		
	Postgraduate	35	3	5	9	14	4	11.8	3.25	0.85		
Occupation	Student	112	8	27	34	28	15	37.7	3.15	0.94	0.091	0.065
	Government officer/Civil servant	66	6	11	19	16	14	22.2	3.28	0.94		
	Office worker	28	1	5	6	7	9	9.4	3.55	0.93		
	Freelance worker	66	6	11	17	19	13	22.2	3.35	0.97		
	Business owner	19	0	2	6	8	3	6.4	3.54	0.71		
	Homemaker	3	1	0	1	1	0	1.0	2.80	1.11		
	Architect	3	1	0	2	0	0	1.0	2.73	0.91		
Monthly income**	< 114.2 USD/month	100	2	19	30	30	19	33.7	3.41	0.85	-0.066	0.205
	114.2-266.6 USD/month	26	2	8	6	5	5	8.8	3.10	1.01		
	266.6-571.4 USD/month	97	8	19	26	26	18	32.7	3.26	0.98		
	> 571.4 USD/month	74	11	10	23	18	12	24.9	3.19	0.97		
Pet-keeping experience	< 6 months	48	3	11	10	16	8	16.2	3.31	1.00	-0.016	0.776
	6 months - 2 years	140	11	24	42	39	24	47.1	3.28	0.91		
	2-5 years	48	4	11	13	10	10	16.2	3.26	0.97		
	> 5 years	61	5	10	20	14	12	20.5	3.26	0.95		
Purpose of keeping pets	Companionship/Recreation	190	16	43	58	37	36	64.0	3.17^{a}	0.95	0.186	0.003*
	Guarding/Security	56	3	7	14	22	10	18.9	3.48^{ab}	0.90		
	Business	15	3	2	2	6	2	5.1	3.17^{a}	1.06		
	Other	36	1	4	11	14	6	12.1	3.59^{b}	0.78		
Attitudes of AW		297	23	56	85	79	54	100	3.28	0.94		

AW: Animal welfare. L1: Very low (1.00-1.80); L2: Low (1.81-2.60); L3: Moderate (2.61-3.40); L4: High (3.41-4.20); L5: Very high (4.21-5.00). $\overline{K}$: Mean score of animal welfare knowledge; SD: Standard deviation; γ: Gamma correlation coefficient. *$p < 0.05$ was considered statistically significant. **Monthly income was converted from VND to USD using an exchange rate of 1 USD: 26,265 VND. Different superscript letters ($^{a, b}$) within the same column indicate statistically significant differences between groups of the variable ($p < 0.05$).

Characteristics of pet owners and practices related to animal welfare

The level of animal welfare practices among pet owners was classified as moderate (L3), with a mean practice score of 3.25 ± 0.93 (Table 3). No statistically significant associations were identified between animal welfare practices and demographic characteristics, including gender, age, educational level, occupation, income, and duration of pet ownership ($p > 0.05$). In contrast, the primary purpose of pet ownership was significantly associated with practice levels ($p < 0.05$). Respondents who kept pets for guarding or security purposes reported higher engagement in structured care routines than those who kept pets mainly for companionship or commercial purposes. Qualitative interviews provided additional insight into these findings. Several participants acknowledged that although they had adequate knowledge of nutrition,

preventive healthcare, and environmental enrichment, consistent implementation was often constrained by contextual factors such as financial limitations, time availability, and competing household responsibilities. Emotional attachment and perceived responsibility toward the animal were frequently described as decisive factors shaping daily care behaviors.

Table 3. Correlation between pet owners' characteristics and practices toward animal welfare in Nghe An Province, Vietnam, 2025

Pet owners' characteristics		N	L1	L2	L3	L4	L5	%	$\bar{K}$	SD	γ	P value
Gender	Male	95	9	19	15	37	15	32.0	3.28	0.96	-0.057	0.451
	Female	202	15	44	52	64	27	68.0	3.23	0.92		
Age	< 18 years	15	1	4	5	5	0	5.1	3.09	0.76	0.010	0.853
	18-25 years	89	4	20	21	28	16	30.0	3.30	0.93		
	26-35 years	74	5	16	17	26	10	24.9	3.26	0.87		
	36-50 years	60	6	12	14	23	5	20.2	3.20	0.95		
	> 50 years	59	8	11	10	19	11	19.9	3.24	1.04		
Education level	Below high school	42	3	12	8	13	6	14.1	3.12	0.93	0.006	0.927
	High school graduate	5	1	1	1	1	1	1.7	3.10	1.40		
	Vocational/College	8	0	1	2	4	1	2.7	3.56	0.75		
	University	207	19	40	46	70	32	69.7	3.27	0.96		
	Postgraduate	35	1	9	10	13	2	11.8	3.21	0.72		
Occupation	Student	112	11	22	33	30	16	37.7	3.16	0.92	0.064	0.193
	Government officer/Civil servant	66	5	20	7	24	10	22.2	3.23	0.98		
	Office worker	28	1	4	7	9	7	9.4	3.51	0.89		
	Freelance worker	66	4	12	17	25	8	22.2	3.29	0.90		
	Business owner	19	3	3	2	10	1	6.4	3.25	1.04		
	Homemaker	3	0	1	0	2	0	1.0	3.20	0.96		
	Architect	3	0	1	1	1	0	1.0	3.30	0.85		
Monthly income**	< 114.2 USD/month	100	4	23	23	34	16	33.7	3.32	0.88	-0.031	0.556
	114.2-266.6 USD/month	26	5	4	7	6	4	8.8	3.02	1.09		
	266.6-571.4 USD/month	97	8	20	24	32	13	32.7	3.25	0.93		
	> 571.4 USD/month	74	7	16	13	29	9	24.9	3.22	0.95		
Pet-keeping experience	< 6 months	48	5	11	8	14	10	16.2	3.24	1.02	-0.034	0.552
	6 months - 2 years	140	8	30	29	53	20	47.1	3.32	0.89		
	2-5 years	48	5	12	15	14	2	16.2	2.99	0.87		
	> 5 years	61	6	10	15	20	10	20.5	3.30	0.97		
Purpose of keeping pets	Companionship/Recreation	190	19	49	35	60	27	64.0	3.16^{a}	0.99	0.121	0.042^{*}
	Guarding/Security	56	4	6	17	20	9	18.9	3.39^{ab}	0.88		
	Business	15	1	4	5	4	1	5.1	3.11^{a}	0.77		
	Other	36	0	4	10	17	5	12.1	3.53^{b}	0.69		
Practice of AW		297	24	63	67	101	42	100	3.25	0.93		

AW: Animal welfare. L1: Very low (1.00-1.80); L2: Low (1.81-2.60); L3: Moderate (2.61-3.40); L4: High (3.41-4.20); L5: Very high (4.21-5.00). $\bar{K}$: Mean score of animal welfare knowledge; SD: Standard deviation; γ: Gamma correlation coefficient. *p < 0.05 was considered statistically significant. **Monthly income was converted from VND to USD using an exchange rate of 1 USD: 26,265 VND. Different superscript letters ($^{a, b}$) within the same column indicate statistically significant differences between groups of the variable (p < 0.05).

Regression analysis and the mediating role of attitude

The results of the regression analyses are presented in Table 4. The results showed that knowledge had a positive and statistically significant effect on attitude ($p < 0.05$), accounting for 25.9% of the variance in attitude. Knowledge also exerted a significant direct effect on animal welfare practices ($p < 0.05$). Attitude demonstrated a strong positive influence on practices ($p < 0.05$). When both knowledge and attitude were included simultaneously in the model, attitude remained the strongest predictor of animal welfare practices ($p < 0.05$), while the direct effect of knowledge was attenuated but remained statistically significant ($p < 0.05$), indicating a potential mediating role of attitude.

The indirect effect of knowledge on practices through attitude was statistically significant ($p < 0.05$). These findings indicated that attitude partially mediates the relationship between knowledge and animal welfare practices among pet owners in the study area. Interview narratives reinforced this mediation mechanism. Many participants emphasized that understanding welfare principles did not automatically translate into consistent behavior. Instead, emotional attachment, perceived responsibility, and personal beliefs about animals' needs were described as decisive factors influencing daily care decisions. These qualitative insights align with the statistical evidence that attitudes function as a psychological mechanism linking knowledge to welfare-related practices.

Table 4. Regression and mediation analysis of the relationships among knowledge, attitude, and practice (n = 297) in Nghe An Province, Vietnam, 2025

Model	Dependent variable	Independent variable(s)	B	β	t	p-value	R^2	95% CI
(1)	Attitude (A)	Knowledge (K)	0.512	0.509**	10.162	< 0.001	0.259	[0.413; 0.611]
(2)	Practice (P)	Knowledge (K)	0.407	0.407**	7.658	< 0.001	0.166	[0.302; 0.512]
(3)	Practice (P)	Attitude (A)	0.641	0.645**	14.483	< 0.001	0.416	[0.554; 0.728]
(4)	Practice (P)	Attitude (A)	0.587	0.590**	11.479	< 0.001	0.424	[0.486; 0.688]
		Knowledge (K)	0.107	0.107*	2.072	0.039		[0.005; 0.208]
Indirect effect (a × b)	Practice (P)	K → A → P	0.301	0.038	–	–	–	[0.226; 0.378]

B: Unstandardized regression coefficient; β: Standardized regression coefficient; t: t-statistic used to test the significance of the regression coefficient; CI: 95% confidence interval. Mediation analysis was conducted using PROCESS Macro v4.2 (Model 4) with 5,000 bootstrap samples. The indirect effect was considered statistically significant when the 95% CI did not include zero. *Indicates significance at $p < 0.05$; **Indicates significance at $p < 0.01$ (two-tailed).

DISCUSSION

The present study provided empirical evidence regarding knowledge, attitudes, and practices related to animal welfare among pet owners in Nghe An Province, Vietnam. Rapid growth in companion animal ownership has occurred in Vietnam and several Southeast Asian countries, while companion animal veterinary services remain unevenly developed, particularly in peri-urban districts. Overall, knowledge, attitudes, and practices were found to be at a moderate level, indicating that awareness of animal welfare has been established but is not yet sufficiently strong to be consistently translated into optimal caregiving behaviors. Comparable patterns have been documented in Ethiopia and Indonesia, where a gap between awareness and actual welfare-related practices persists (Lemma et al., 2022; Wulandari et al., 2024).

Pet owners' knowledge of animal welfare was predominantly moderate, with a non-negligible proportion still demonstrating low or very low levels of understanding. Gender, age, educational level, occupation, and income were not significantly associated with knowledge levels. Similar observations have been reported in New Zealand and Turkey, suggesting that knowledge of animal welfare may no longer be strongly determined by traditional socio-economic characteristics. The widespread availability of social media and digital communication platforms may contribute to narrowing knowledge disparities across social groups (Forrest et al., 2023).

A noteworthy finding of this study is the inverse relationship between pet ownership experience and knowledge level. Respondents with shorter ownership duration (< 6 months) had higher knowledge scores than long-term owners (> 5 years). Qualitative interviews conducted with 15 participants provided contextual clarification for this pattern. Several recent owners described actively consulting veterinarians, online forums, and social media before or immediately after acquiring a pet. One participant stated, "Before bringing the dog home, I searched online about vaccination schedules and proper feeding". In contrast, long-term owners frequently emphasized reliance on accumulated experience, as reflected in the statement, "I have raised dogs for many years, so I follow what I have always done". Such narratives suggest that recent owners may be more exposed to updated welfare information, whereas experienced owners may rely on habitual practices that may not align with current standards. The finding aligned with the observations of Finka et al. (2022) in the United Kingdom, who reported that new pet owners tend to actively seek updated information from contemporary sources. In contrast, long-term owners often rely on personal experience that may not reflect current animal welfare standards. The result of the current study reinforced the notion that ownership experience does not necessarily equate to scientific knowledge of animal welfare, particularly in contexts where care standards are continually updated in accordance with the five freedoms framework (Finka et al., 2022).

Attitudes toward animal welfare among pet owners in Nghe An were generally moderate and varied significantly by the purpose of pet ownership. Individuals who kept pets for guarding or security purposes expressed more positive attitudes than those who kept pets primarily for companionship or leisure. This finding is consistent with previous studies demonstrating that humans' conceptualization of the role of animals within households or society strongly influences perceptions of welfare and caregiving responsibilities (Gillet et al., 2024). Interview data further clarified this quantitative pattern. Guard-dog owners frequently expressed a strong sense of obligation toward animals perceived as protectors of household property. One participant explained, "The dog protects my house, so I must take good care of it". Proper feeding, vaccination, and disease prevention were described as necessary to maintain the animal's alertness and effectiveness. Such perceptions may strengthen moral responsibility and reinforce positive welfare attitudes. In Vietnam, the coexistence of traditional pet-keeping practices and an emerging companion animal culture may lead to a moderate attitudinal stance (TGM StatBox, 2024). Ethical endorsement of humane treatment does not consistently translate into prioritized welfare decisions, particularly under economic constraints or limited veterinary accessibility. Similar

inconsistencies between attitudes and practices have been documented in China (Liang et al., 2024).

Animal welfare practices in this study were likewise predominantly moderate, mirroring the levels of knowledge and attitudes. The absence of significant associations between practices and demographic characteristics suggests that practical constraints have a more substantial influence on caregiving behaviors than personal attributes. In Nghe An, limited access to companion animal veterinary services, particularly preventive care, vaccination, and behavioral consultation, represents a significant barrier (Phuc et al., 2021), consistent with findings from rural and peri-urban areas in Southeast Asia (Wulandari et al., 2024). Financial cost is another critical factor, as many owners seek veterinary care only when animals exhibit overt clinical signs rather than engaging in preventive practices (Stull et al., 2018). This behavior aligned with evidence indicating that cost is a primary obstacle to comprehensive animal welfare practices, even among owners with adequate knowledge and positive attitudes (Philpotts et al., 2024). Qualitative responses supported this interpretation. Several participants reported financial limitations as a primary obstacle to preventive care. One interviewee stated, “If the dog looks healthy, I do not take it to the clinic because treatment costs are high”. Long travel distances to veterinary facilities were also mentioned. Financial capacity and service availability, therefore, represent key enabling conditions that shape the translation of knowledge and attitudes into practice.

The results of the current study further demonstrated that attitude plays a crucial bridging role between knowledge and practice. When attitude was included in the model, the direct effect of knowledge on behavior was substantially reduced, indicating that knowledge alone is insufficient to drive behavioral change. This finding supports a growing body of animal welfare studies highlighting the persistent knowledge-behavior gap, particularly in contexts where financial resources, accessibility of veterinary services, and availability of reliable animal welfare information remain limited (Alemayehu et al., 2022; Liang et al., 2024).

The evidence from the present analysis underscores the importance of community veterinary services as a key leverage point for improving companion animal welfare in Nghe An. Beyond providing clinical care and vaccination, community-based veterinary services can serve as trusted sources of education, offering behavioral counseling, welfare-oriented communication, and practical guidance tailored to local socio-economic conditions. Evidence from Vietnam and neighboring regions suggests that community veterinary models can help bridge the gap between knowledge and practice, particularly in contexts where formal companion animal veterinary systems are still in development (Mai et al., 2010). Overall, the present study demonstrated that while pet owners in Nghe An exhibit moderate level of knowledge, attitudes, and practices regarding animal welfare, attitudes mediate between knowledge and behavior. Strengthening community veterinary services through integrated education, communication, and basic veterinary care represents a practical and sustainable approach to translating awareness into improved animal welfare practices in the local context.

CONCLUSION

Overall, KAP levels were found to be moderate to relatively high, while most demographic characteristics showed no significant effects. In contrast, the experience of pet ownership and the primary purpose of keeping pets were associated with specific aspects of KAP. The results of the current study confirmed that knowledge influenced animal welfare practices both directly and indirectly through attitude, with attitude playing a pivotal mediating role. These findings highlight the need for integrated interventions that simultaneously enhance knowledge and shape positive attitudes, rather than approaches focusing solely on demographic characteristics.

DECLARATIONS

Funding
This study received no specific grant or funding.

Acknowledgments
The authors gratefully acknowledge all pet owners who participated in this study.

Availability of data and materials
The datasets generated and analyzed during the current study are available upon reasonable request from the corresponding author.

Authors’ contributions
Do Le Tuyet Minh contributed to data collection, data analysis, and manuscript writing. Nguyen Duc Dat participated in data collection and data analysis. Nguyen Thi Huong Giang contributed to data interpretation and manuscript revision. Tran Xuan Minh conceptualized the study, supervised the research, and finalized the manuscript. All authors have read and approved the final version of the manuscript before publication in the present journal.

Competing interests

The authors declare that they have no competing interests.

Ethical considerations

All ethical issues, including plagiarism, informed consent, misconduct, data fabrication or falsification, duplicate publication or submission, and redundancy, were carefully considered and addressed by the authors. Generative AI tools were not used to generate and prepare any scientific content of this study. AI assistance was limited to minor language editing using ChatGPT (OpenAI, GPT-5.3).

REFERENCES

Alemayehu G, Berhe T, Gelan E, Mokria M, Jaldessa J, Molu J, Wieland B, Knight-Jones T, and Doyle RE (2022). Animal welfare knowledge, attitudes, and practices among livestock holders in Ethiopia. Frontiers in Veterinary Science, 9: 1006505. DOI: https://www.doi.org/10.3389/fvets.2022.1006505

Alkharusi H (2022). A descriptive analysis and interpretation of data from Likert scales in educational and psychological research. Indian Journal of Psychology and Education, 12(2): 13-16. Available at: https://squ.elsevierpure.com/ws/portalfiles/portal/62602494/A_107_2022.pdf

Carnovale F, Jin X, Arney D, Descovich K, Guo W, Shi B, and Phillips CJC (2021). Chinese public attitudes towards, and knowledge of, animal welfare. Animals, 11(3): 855. DOI: https://www.doi.org/10.3390/ani11030855

Cochran WG (1977). Sampling techniques, 3rd Edition. John Wiley & Sons., New York, pp. 75-78. Available at: https://www.wiley.com/en-sg/Sampling+Techniques%2C+3rd+Edition-p-9780471162407

Farm animal welfare council (FAWC) (2009). Farm animal welfare in Great Britain: Past, present and future. Farm Animal Welfare Council., London, UK, pp. 1-2. Available at: https://assets.publishing.service.gov.uk/media/5a7d89fe40f0b64fe6c24508/Farm_Animal_Welfare_in_Great_Britain_-_Past__Present_and_Future.pdf

Finka LR, Ripari L, Quinlan L, Haywood C, Puzzo J, Jordan A, Tsui J, Foreman-Worsley R, Dixon L, and Brennan ML (2022). Investigation of humans individual differences as predictors of their animal interaction styles, focused on the domestic cat. Scientific Reports, 12: 12128. DOI: https://www.doi.org/10.1038/s41598-022-15194-7

Forrest R, Pearson M, and Awawdeh L (2023). Pet owners' attitudes and opinions towards cat and dog care practices in Aotearoa New Zealand. Veterinary Sciences, 10(10): 606. DOI: https://www.doi.org/10.3390/vetsci10100606

García Castro FE, Medrano-Galarza C, Cubides-Cárdenas JA, Zúñiga López A, and Ahumada-Beltrán DG (2022). Consumers perceptions about the welfare of farm animals in Colombia. Agronomía Mesoamericana, 34(1): 50817. DOI: https://www.doi.org/10.15517/am.v34i1.50817

Gillet L, Simon B, and Kubinyi E (2024). The role of dogs is associated with owner management practices and characteristics, but not with perceived canine behaviour problems. Scientific Reports, 14: 27548. DOI: https://www.doi.org/10.1038/s41598-024-77400-y

iPrice Group (2021). Southeast Asian pet search interest report. Available at: https://vnexpress.net/nguoi-viet-tang-tim-mua-cho-meo-4387003.html

Keeling L, Tunón H, Olmos Antillón G, Berg C, Jones M, Stuardo L, Swanson J, Wallenbeck A, Winckler C, and Blokhuis H (2019). Animal welfare and the United Nations Sustainable Development Goals. Frontiers in Veterinary Science, 6: 336. DOI: https://www.doi.org/10.3389/fvets.2019.00336

Lemma M, Doyle R, Alemayehu G, Mekonnen M, Kumbe A, and Wieland B (2022). Using community conversations to explore animal welfare perceptions and practices of rural households in Ethiopia. Frontiers in Veterinary Science, 9: 980192. DOI: https://www.doi.org/10.3389/fvets.2022.980192

Liang Y, Meng C, Chen R, Yang Y, and Zeng Y (2024). Pet ownership and its influence on animal welfare attitudes and consumption intentions among Chinese university students. Animals, 14(22): 3242. DOI: https://www.doi.org/10.3390/ani14223242

Mai LTP, Dung LP, Tho NT, Quyet NT, Than PD, Mai ND, Thuy NT, Lien NT, Dung NA, Dean A et al. (2010). Community knowledge, attitudes, and practices toward rabies prevention in North Vietnam. International Quarterly of Community Health Education, 31(1): 21-31. DOI: https://www.doi.org/10.2190/IQ.31.1.c

McKendree M, Croney C, and Widmar N (2014). Effects of demographic factors and information sources on United States consumer perceptions of animal welfare. Journal of animal science, 92(7): 3161-3173. DOI: https://www.doi.org/10.2527/jas.2014-6874

Minh N (2024). The pet industry has the potential to become a billion-dollar industry. Available at: https://www.vietnam.vn/en/tiem-nang-nganh-cong-nghiep-thu-cung-ty-do/

Philpotts I, Blackwell EJ, Dillon J, Tipton E, and Rooney NJ (2024). What do we know about dog owners? Exploring associations between pre-purchase behaviours, knowledge and understanding, ownership practices, and dog welfare. Animals, 14(3): 396. DOI: https://www.doi.org/10.3390/ani14030396

Phu DH, Thao T, Tieu M, Thuy D, Phuong T, Padungtod P, and Truong B (2025). Perceptions regarding rabies prevention and control in two different community settings in Vietnam using a Q-sorting approach. International Journal of One Health, 11(1): 128-138. DOI: https://www.doi.org/10.14202/IJOH.2025.128-138

Phuc D, Thang C, Hoan D, Dinh N, and Tram Q (2021). Knowledge, attitudes, and practices of the population regarding human toxocariasis (dog and cat roundworm larval infection) in Nghe An province, 2021. Journal of Community Medicine, 62(7): 220. DOI: https://www.doi.org/10.52163/yhc.v62i7.220

Stull J, Shelby J, Bonnett B, Block G, Budsberg S, Dean R, Dicks M, Forsgren B, Golab G, Hamil J et al. (2018). Barriers and next steps to providing a spectrum of effective health care to companion animals. Journal of the American Veterinary Medical Association, 253(11): 1386-1389. DOI: https://www.doi.org/10.2460/javma.253.11.1386

TGM Research (2025). Pet humanization insights 2024: Vietnam. Available at: https://tgmresearch.com/pet-humanization-report-vietnam.html

TGM StatBox (2024). Attitudes toward pets in Vietnam by age. Available at: https://tgmstatbox.com/stats/attitudes-toward-pets-in-vietnam-by-age/

Thrusfield M, Christley R, Brown H, Diggle PJ, French N, Howe K, Kelly L, O'Connor A, Sargeant J, and Wood H (2018). Surveys. Veterinary epidemiology, 4th Edition. Wiley-Blackwell, pp. 270-295. DOI: https://www.doi.org/10.1002/9781118280249.ch13

Truong BD, Nguyen DTT, Duong MT, To PTH, Ly SH, Vo MD, Tran LPB, Nguyen TTP, Le TQ, Nguyen LN et al. (2025). Classification of pet

owners based on knowledge attitude and practice about rabies and its vaccination in Duc Hue, Long An province during the period 2021-2023. The Journal of Agriculture and Development, 23(6): 24-37. DOI: https://www.doi.org/10.52997/jad.6.03.2024

Wulandari CR, Burhanuddin A, Faradina PL, Wibawati PA, and Abdramanov A (2024). Understanding the level of animal welfare and associated factors among cat owners in Banyuwangi, Indonesia. Veterinary World, 17(6): 1210-1215. DOI: https://www.doi.org/10.14202/vetworld.2024.1210-1215