



UNIVERSITI PUTRA MALAYSIA

**ASSESSMENT OF PET OWNERS' KNOWLEDGE, ATTITUDE AND
PERCEPTION TOWARDS ANTIMICROBIAL USE AND
ANTIMICROBIAL RESISTANCE IN
WILAYAH PERSEKUTUAN KUALA LUMPUR**

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The logo of Universiti Putra Malaysia (UPM) is a shield-shaped emblem. It features a red and white design with a central book and a stylized 'U' and 'M' shape. The letters 'UPM' are prominently displayed in a red box at the top left of the shield.

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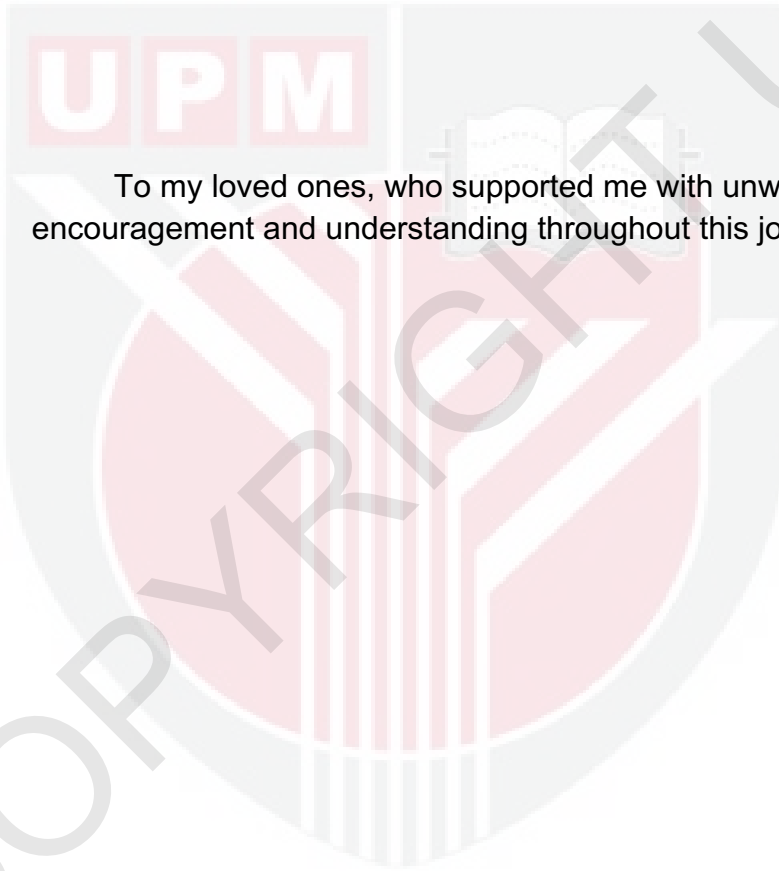
A project paper submitted to the Faculty of Veterinary Medicine, Universiti
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Serdang, Selangor Darul Ehsan.

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DEDICATION

To my loved ones, who supported me with unwavering encouragement and understanding throughout this journey.



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ABSTRAK

Abstrak daripada kertas projek yang dikemukakan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada keperluan kursus VPD 4999 -Projek.

**PENILAIAN TENTANG PENGETAHUAN, PERILAKU DAN
KEPERCAYAAN PEMILIK HAIWAN PELIHARAAN TENTANG
PENGUNAAN ANTIMIKROB DAN KETAHANAN ANTIMIKROB DI
WILAYAH PERSEKUTUAN KUALA LUMPUR**

Oleh

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2024

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Co-supervisor: Dr. Shanmugavelu M Sithambaram

Terdapat peningkatan dalam kejadian ketahanan antimikrob (AMR) terhadap pelbagai rawatan, menyebabkan peningkatan kesukaran dalam merawat jangkitan bakteria dalam haiwan dan manusia dalam beberapa tahun kebelakangan ini. Kerana ia boleh merebak di antara haiwan dan manusia yang tinggal dalam persekitaran yang sama, kebimbangan ini disokong oleh pandangan One Health. Dalam penjagaan kesihatan haiwan peliharaan, pemilik haiwan memainkan peranan penting dalam memberikan ubat-ubatan

yang ditetapkan oleh doktor haiwan. Oleh itu, satu kajian rentas sebahagian yang melibatkan pemilik haiwan peliharaan di Wilayah Persekutuan Kuala Lumpur telah dilakukan untuk menyiasat pengetahuan, sikap, dan persepsi pemilik haiwan peliharaan (KAP) terhadap penggunaan antimikrob (AMU) dan AMR, dengan itu menilai tahap kesedaran mereka tentang AMR. Satu soal selidik yang mengandungi bahagian maklumat demografi dan penilaian KAP berkaitan dengan AMU dan AMR telah diedarkan kepada sejumlah 250 pemilik haiwan peliharaan. Data dianalisis dengan menggunakan statistik deskriptif dan dibentangkan dalam bentuk frekuensi dan peratusan. Untuk membandingkan purata markah KAP dengan pembolehubah demografi terpilih, statistik inferensial digunakan. Kajian ini menunjukkan bahawa responden menunjukkan tahap pengetahuan yang rendah (56.3%) mengenai AMU dan AMR. Sebaliknya, responden menunjukkan sikap yang sangat baik (100%) dan persepsi yang sangat baik (100%) terhadap AMU dan AMR. Dapatan menunjukkan bahawa terdapat korelasi antara tahap pendidikan, jumlah haiwan peliharaan yang dimiliki, dan kesedaran AMR ($p < 0.05$) berkenaan dengan pemahaman pemilik haiwan peliharaan tentang AMU dan AMR. Walaupun pemilik haiwan menunjukkan tahap sikap dan persepsi yang sangat baik, adalah membimbangkan bahawa majoriti masih mempunyai pengetahuan yang tidak mencukupi tentang AMU. Oleh itu, disyorkan untuk melaksanakan program pendidikan dan kesedaran yang lebih komprehensif untuk mengurangkan kejadian AMR di kalangan haiwan peliharaan dan pemilik mereka. Selain itu, kajian tambahan diperlukan untuk meneroka

kaedah yang berkesan untuk melibatkan pemilik haiwan dalam intervensi pengurusan antimikrob (AMS).

Kata Kunci: *penggunaan antimikrob, ketahanan antimikrob, sikap, persepsi, pemilik haiwan peliharaan*



ABSTRACT

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfilment of the course VPD 4999- Project.

ASSESSMENT OF PET OWNERS' KNOWLEDGE, ATTITUDE AND PERCEPTION TOWARDS ANTIMICROBIAL USE AND ANTIMICROBIAL RESISTANCE IN WILAYAH PERSEKUTUAN KUALA LUMPUR

By

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There has been a rise in the occurrence of antimicrobial resistance (AMR) to multiple treatments, leading to increase difficulty in treating bacterial infections in both animals and humans in recent years. As it can spread across animals and people living in the same environment, this concern is supported by the One Health viewpoint. In companion animal healthcare, pet owners play a key role in administering the medications prescribed by the veterinarian. Therefore, a cross-sectional study involving pet owners in Wilayah Persekutuan Kuala Lumpur was carried out to investigate pet owners' knowledge, attitude, and perception (KAP) towards antimicrobial use (AMU)

and AMR, thus assessing their level of AMR awareness. A questionnaire comprised of sections covering demographic data and assessments of KAP related to AMU and AMR was distributed to a total of 250 pet owners. Data was analysed using descriptive statistics and presented as frequencies and percentages. To compare the mean KAP total score to selected demographic variables, inferential statistics were used. This study reveals that respondents displayed a poor level of knowledge (56.3%) regarding AMU and AMR. In contrast, respondents demonstrated an excellent attitude (100%) and a very good perception (100%) towards AMU and AMR. The findings indicate that there was a correlation between education level, number of pets owned and AMR awareness ($p < 0.05$) regarding pet owners' understanding of AMU and AMR. While pet owners demonstrated excellent attitude and perception levels, it is concerning that the majority still possess inadequate knowledge about AMU. Hence, it is recommended to implement more comprehensive educational and awareness programmes to mitigate the occurrence of AMR among pets and their owners. Furthermore, additional research is required to explore effective methods of involving pet owners in antimicrobial stewardship (AMS) interventions.

Keywords: *antimicrobial use, antimicrobial resistance, attitude, perception, pet owners*

1.0 INTRODUCTION

Over the years, there has been a significant increase in the use of antimicrobial drugs in veterinary medicine, including the treatment of companion animals. These include antibiotics, antifungals, and antiparasitic medications. The extensive use of antimicrobials in companion animals has created selection pressure on bacteria present in these animals. Bacterial populations that are exposed to antibiotics have the potential to develop resistance mechanisms over time. This can lead to the emergence of antimicrobial-resistant strains of bacteria in pets. Antimicrobial resistance (AMR) is a growing worldwide public health issue caused by antimicrobial use (AMU) in both humans and animals (Liliana *et al.*, 2014). As the negative effects of AMR become more apparent, more attention is being given to the various factors that promote AMR (Candellone *et al.*, 2023). Animals' shedding of drug-resistant microbes can result in human infections or colonization by commensal bacteria, either directly (through contact) or indirectly (Marshall and Levy, 2011). Studies have identified AMR in various bacterial pathogens that affect companion animals. According to Ewers *et al.* (2012), Extended-spectrum-Beta-Lactamases (ESBL) - producing bacteria in pets like dogs, cats, and horses were not paid much attention to in the past. Recently, we are seeing more of them, and they are becoming a concern. This phenomenon is a huge threat to the health and well-being of both humans and animals. Hence, to combat this in companion animals, pet owners play a vital role as the effective use of antibiotics depends on them.

Pet owners are responsible for monitoring their animals' health, seeking, and financing medical care as needed, and administering treatments as prescribed by the veterinarian (Taylor *et al.*, 2023). It has been demonstrated that pet owner attitudes influence prescribing practices and the administration of antimicrobial drugs, as they control the use of antimicrobials and other behaviours that can specifically predict the likelihood of AMR in their animals. Thus, pet owners' proper understanding of AMU and awareness of AMR are crucial to solving this problem.

Hence, it is essential to acquire an understanding of pet owners' knowledge, attitude and perception toward the use of antimicrobials before initiating any effective intervention (Jose *et al.*, 2013). To date, there is no study conducted on pet owners of Wilayah Persekutuan Kuala Lumpur regarding their current understanding of AMU and AMR in their companion animals. This study aims to investigate pet owners' knowledge, attitude and perception towards AMU and AMR, thus assessing their level of awareness regarding AMR. The study is restricted to pet owners in Wilayah Persekutuan Kuala Lumpur.

1.1 HYPOTHESIS

The null hypothesis (H_0) is pet owners do not have appropriate knowledge, attitude and perception towards antimicrobial use (AMU) and antimicrobial resistance (AMR).

The alternative hypothesis (H_a) is pet owners do have appropriate knowledge, attitude and perception towards antimicrobial use (AMU) and antimicrobial resistance (AMR).



2.0 LITERATURE REVIEW

2.1 ANTIMICROBIAL USE (AMU) IN PETS

Antimicrobials have ushered in transformative advancements in medical practice across a wide spectrum, ranging from everyday healthcare to critical care, shielding patients from the peril of bacterial infections. Antibiotics, a subset of antimicrobials, use chemicals derived from live organisms to inhibit bacterial growth. However, due to the diverse biological mechanisms, there is a growing spectrum of microorganisms exhibiting resistance to antimicrobial medications (Smith *et al.*, 2018). According to Adebowale *et al.* (2023), there were 5278 antimicrobial administrations, with 98.8% (5217) and 1.2% (61) occurring in cats and dogs, respectively. Furthermore, according to Horvat *et al.* (2022), it is anticipated that the decrease in the effectiveness of antimicrobials, as observed in human medicine, will also occur in the field of veterinary medicine. Thus, appropriate use of antimicrobials in companion animals is imperative to address and combat this growing antimicrobial resistance (AMR) problem.

2.2 ANTIMICROBIAL RESISTANCE (AMR) IN PETS

According to Dickson *et al.* (2019), the use of antibiotics in veterinary medicine is widely recognized as a significant contributor to the emergence of multi-drug-resistant organisms. Isolating resistant pathogens from small animals have become increasingly common lately (Jootsen *et al.*, 2020). Companion animal veterinarians are encountering a growing prevalence of antimicrobial-resistant bacterial infections among their patients (Frey, 2018). The strong emotional bond between pet owners and their animals creates a risk of AMR transmission from

pets to humans. This poses a significant threat to human health as pets have been recognised as a potential source of resistant organisms, particularly when infections are not adequately treated. Activities such as kissing, petting, and stroking pets that involve close physical contact and affectionate behaviours could facilitate the transmission of multidrug-resistant organisms between pets and their owners, potentially catalysing AMR spread (Dickson *et al.*, 2019; Smith *et al.*, 2018, Schmitt *et al.*, 2019).

2.3 PET OWNERS' UNDERSTANDING OF ANTIMICROBIAL USE (AMU)

The responsibility for maintaining the efficacy of current antimicrobial drugs against bacterial antimicrobial resistance (AMR) falls on all parties involved in their use, regardless of the species. This demands collective effort across all sectors. There is considerable an overlap between the antimicrobial drugs used in humans and companion animals (Scarborough *et al.*, 2021). Pet owners are responsible for monitoring the health of their animals and seeking veterinary care when necessary. This includes identifying when their pet is ill and recognizing the potential need for antimicrobials. They are also responsible for financing medical care and administering treatments as prescribed by the veterinarian, which requires a certain level of understanding of the treatment plan and medication administration (Taylor *et al.*, 2023). In a recent survey assessing the knowledge and attitudes of the population in western Saudi Arabia regarding the use of antibiotics in humans, it was observed that merely 38.2% of respondents recognized the importance of finishing a prescribed treatment course. Additionally, a varying percentage, ranging from 30% to 72% of participants, did not complete the full course of antimicrobial

treatment. The primary reasons cited for not adhering to the prescribed treatment were respondents' perception of improvement in their condition and the belief that the antibiotics they were using were ineffective (Alghamdi *et al.*, 2021).

2.4 PET OWNERS' AWARENESS ON ANTIMICROBIAL RESISTANCE (AMR)

Prudent utilization of antibiotics and adherence to prescribed treatments are crucial steps in mitigating the consequences of AMR in both animals and humans. Concerning companion animals, the proper administration of antibiotics hinges on the cooperation between pet owners and prescribing veterinarians. Enhancing pet owners' comprehension of the risks associated with AMR is essential for fostering improved adherence (Alessia *et al.*, 2023).

Poor understanding of the proper antibiotics use may result in pet owners mistakenly thinking that antibiotics can treat all diseases, including those caused by agents like viruses and fungi, which are beyond the scope of antibiotics' effectiveness. According to Smith *et al.* (2018), while most pet owners profess their unawareness of AMR in companion animals, the majority are conscious of the existence of "superbugs," which they tend to associate primarily with hospital-acquired infections. A survey conducted in 2019 revealed that pet owners generally strive to avoid antibiotic use for themselves but readily accept antibiotic treatment for their companion animals without objection (Dickson *et al.* 2019).

2.5 ANTIMICROBIAL STEWARDSHIP (AMS)

An efficient response to antimicrobial resistance (AMR) demands the adoption of a 'One-Health' approach to AMS aimed at safeguarding critical antibiotics for urgent medical requirements. Nevertheless, our comprehension of the factors that hinder or facilitate effective AMS practices within companion animal veterinary care remains relatively restricted at present (Smith et al., 2018). According to Dyar *et al.* (2017), antimicrobial stewardship revolves around responsible antimicrobial use (AMU). This entails advocating behaviours that strike an equilibrium between an individual's requirement for suitable treatment and the broader society's need to have effective treatments available in the long run. In animal health care, this can be achieved by advocating for the careful selection of the most suitable antimicrobial drug regimen, which comprises considerations like dosage, treatment duration, and administration method by veterinarians.

3.0 MATERIALS AND METHODS

3.1 RESEARCH DESIGN

This was a quantitative, cross-sectional, questionnaire-based research that aimed to determine pet owners' knowledge, attitude and perception towards AMU and AMR.

3.2 STUDY LOCATION

This research was conducted in Wilayah Persekutuan Kuala Lumpur. This location was chosen as it has a relatively high population of pet owners compared to other cities in Malaysia.

3.3 STUDY POPULATION

Respondents for this research were pet owners. Pet owners who fulfil the study criteria were invited to participate in this study voluntarily, without expecting any form of incentives. Respondents were then sorted based on inclusion and exclusion criteria.

3.3.1. INCLUSION CRITERIA

Pet owners who were living in Wilayah Persekutuan Kuala Lumpur. These pet owners were expected not to have any professional background in veterinary medicine and rely solely on their veterinarians for veterinary medical advice. Respondents consisted of any nationality or ethnicity, male or female, over the age of 18 years old. They were able to read and understand the English/Bahasa Malaysia language for comprehension of completion of the questionnaire.

3.3.2. EXCLUSION CRITERIA

Respondents who failed to meet the inclusion criteria refused to participate, or failed to complete the questionnaire were excluded from the study.

3.4 SAMPLE SIZE ESTIMATION

The sample size of the survey was $n=250$. This calculation considers a population proportion (\hat{p}) of 0.5, a 6.18% margin of error (E) and a 95% confidence level represented by a Z-score of 1.96. As the exact total number of pet owners in Wilayah Persekutuan Kuala Lumpur is unknown, an estimated population size of 20,000 is utilized for the sample size calculation. This estimation is considered appropriate as the sample size does not significantly change beyond this number.

3.5 SAMPLING METHOD AND DATA COLLECTION

The data collection period was three weeks. Respondents received a randomized link via email and social media platforms such as WhatsApp, Facebook, and Instagram. Once respondents clicked on the link, they were directed to declare their consent on the first page of the Google Form, before proceeding to answer the questionnaire in the following pages. The data collected was reported in an aggregate form, with no identifiable information about individual respondents. Therefore, all data including respondents' profiles and demographic backgrounds was kept confidential and will not be disclosed in any reports or publications.

3.6 RESEARCH TOOLS/ INSTRUMENTS

3.6.1. Online google form.

The questionnaire took approximately 10 minutes to complete and was designed to be self-administered.

The online Google Form consisted of five parts:

- Part A: Consent form
- Part B: Demographic data
- Part C: Knowledge regarding AMU and AMR (10 questions)
- Part D: Attitude towards AMU and AMR (7 questions)
- Part E: Perception towards AMU and AMR (7 questions)

Since the participants were not compelled to engage in this study, they were asked to provide their consent at the end of part A before advancing to the subsequent section. Participants were encouraged to carefully review the content within part A.

In part B, fundamental demographic details and information regarding pet ownership were collected. Participants were instructed to offer straightforward responses, such as "yes" or "no," or select the appropriate choice from multiple-choice questions. Starting from part C onwards, the questions were formulated based on findings from two prior studies: " Colorado pet owners' perceptions of and attitudes towards antimicrobial drug use and resistance " by Taylor *et al.* (2023) and "A study assessing public knowledge, belief, and behaviour of antibiotic use in an Omani population" by Jose *et al.* (2019).

In each part, respondents were tasked with recalling their knowledge, attitude, and perceptions regarding antimicrobial use and antimicrobial resistance respectively. To record their responses, a 5-point Likert scale was utilized, encompassing options such as "strongly disagree," "disagree," "neutral," "agree," and "strongly agree." The Likert scale, known for its ability to provide qualitative measurements and gauge differences in preferences, was chosen for its capacity to measure the extent of respondents' views.

Once the questionnaire was submitted, respondents had no opportunity to retract or alter their responses because they were limited to a single attempt. This approach was employed to minimize the likelihood of redundant information.

This study obtained approval from UPM's Ethical Committee for Research Involving Human Subjects. Additionally, a peer review involving 6 individuals from diverse demographic backgrounds was carried out to validate the suitability and thoroughness of the questionnaire. As respondents did not encounter significant difficulties in comprehending and responding to the questionnaire, it was employed consistently throughout the entire research, with only minor adjustments made.

3.7 DATA ANALYSIS

The data collected was tabulated in Microsoft Excel® 2016 (Microsoft Inc.). All statistical analyses were conducted through Cross Tabulation using Statistical Product and Service Solutions, Version 26.0 (IBM SPSS Inc., USA). Descriptive statistics were calculated, and data were presented in terms of frequencies and percentages.

From part C onwards, each section underwent a Cronbach Alpha analysis, and any questions that contributed to a low level of reliability were excluded from the study. To simplify the analysis, responses of "strongly agree" were combined with "agree," and "strongly disagree" was grouped with "disagree." Furthermore, questions in part C and beyond were evaluated using a scoring system adapted from a previous study by Jose *et al.* A score of 2 was assigned for a correct response, 1 for an unsure response, and 0 for an incorrect response. Consequently, the mean scores for knowledge, attitude, and perception were calculated, with a maximum possible score of 20, 14, and 14, respectively. For a quantitative representation, a score exceeding 80% of the maximum possible score was considered "good," while scores ranging from 60% to 80% were deemed "moderate," and scores below 60% were categorized as "poor" (Jose *et al.*, 2019).

The overall mean scores for knowledge, attitude, and perception were compared with education level, the number of pets own, and awareness of antimicrobial resistance (AMR). Inferential analysis was conducted using a non-parametric test, specifically the Kruskal-Wallis H test for continuous variables. Pairwise comparison tests were conducted to identify significant differences among the groups. Results were considered significant if the p-value was less than 0.05.

4.0 RESULTS

4.1 DEMOGRAPHIC DATA AND OTHER PARAMETERS

A total of 250 respondents who are pet owners living in Wilayah Persekutuan are included in this study. Table 1 outlines the demographic characteristics of these respondents. Notably, a substantial majority of the participants were Malay (86.8%), while Chinese and Indian respondents accounted for 3.6% and 7.6%, respectively. Additionally, the majority of respondents were female (67.2%), and a significant proportion fell within the 18-30 age group (79.2%).

For the distribution of education levels among pet owners, it illustrated that the majority, 73.2%, have obtained a bachelor's degree, while 22.8% have obtained a diploma and only 4.0% have obtained a master's degree or a higher academic qualification.

Most of the respondents (88.0%) claimed that they do not have any medical background. Within this group, the largest portion, 86.4%, were cat owners. Dog owners made up 6.4% of the total, while owners of other pet species comprised 4.8%. A smaller portion, 2.4%, are owners of both cats and dogs. Besides, most respondents have 2 number of pets (36.8%) and a small percentage of them have 4 number of pets (6.0%). In terms of AMR awareness, 76.4% stated that they were unaware of the occurrence of AMR.

Table 1: Respondents' demographic data and other parameters

Demographic data		Frequency	Percentage
Ethnicity	Malay	217	86.8%
	Chinese	9	3.6%
	Indian	19	7.6%
	Punjabi	2	0.8%
	Pakistani	1	0.4%
	Indonesian	1	0.4%
	Bumiputera	1	0.4%
Age group	18-30	198	79.2%
	31-45	36	14.4%
	>45	16	6.4%
Gender	Female	168	67.2%
	Male	82	32.8%
Education level	Diploma	57	22.8%
	Bachelor's Degree	183	73.2%
	Master's Degree or higher	10	4.0%
Do you have any medical background?	Yes	30	12.0%
	No	220	88.0%
Species of pets own	Cats	216	86.4%
	Dogs	16	6.4%
	Both cats and dogs	6	2.4%
	Others	12	4.8%
Number of pets own	1	74	29.6%
	2	92	36.8%
	3	40	16.0%
	4	15	6.0%
	>5	29	11.6%
Are you aware of the occurrence of antimicrobial resistance (AMR)?	Yes	59	23.6%
	No	191	76.4%

4.2 PET OWNERS' KNOWLEDGE TOWARDS ANTIMICROBIAL USE (AMU) AND ANTIMICROBIAL RESISTANCE (AMR)

For the knowledge subscale related to AMU and AMR, the responses have been summarized in Table 2. Primarily, the subscale displayed a low level of reliability, scoring $\alpha = 0.6$. Consequently, to raise the reliability level to 0.7, two questions, "Antibiotics are used for treating bacterial infection" and "Antibiotic-resistant bacteria can spread from animals to humans" were excluded from the study.

A mean score of 9 out of a maximum possible score of 16 suggests that respondents possessed a poor level of knowledge (56.3%) towards AMU and AMR. Notably, only 23.2% correctly disagreed with the statement that antibiotics are used to decrease pain. Furthermore, 59.2% agreed with the idea that antibiotics are useful against viral diseases. As much as 49.6% were unsure whether antibiotics are useful against fungal diseases or not and 48.8% were unsure about whether antibiotics are useful in resolving cold symptoms. On top of that, only 32.0% correctly agreed that antibiotics used in pets can produce antibiotic-resistant bacteria.

Nevertheless, a large percentage of respondents (68.8%) claimed that they are aware that failure to complete antibiotic prescription may lead to AMR and 17.6% correctly disagreed with the notion that AMR is uncommon in animals. In addition, most of the respondents (62.8%) agreed that the prescribing veterinarians have emphasised on the importance of completing the prescribed antibiotic courses.

Table 2: Respondents' knowledge of antimicrobial use (AMU) and antimicrobial resistance (AMR).

Cronbach Alpha (N=8) =0.7				
Statement	Scale			Score 2= correct 1= unsure 0= incorrect
	Disagree (%)	Neutral (%)	Agree (%)	
1. Antibiotics are used to decrease pain.	58 (23.2)	113 (45.2)	79 (31.6)	1
2. Antibiotics are useful against viral diseases	42 (16.8)	60 (24.0)	148 (59.2)	0
3. Antibiotics are useful against fungal diseases.	59 (23.6)	124 (49.6)	67 (26.8)	1
4. Antibiotics help to resolve cold symptoms.	35 (14.0)	122 (48.8)	93 (37.2)	1
5. Antibiotics used in pets can produce bacteria that are resistant to antibiotics.	9 (3.6)	161 (64.4)	80 (32.0)	1
6. Antimicrobial resistance in animals is uncommon.	44 (17.6)	147 (58.8)	59 (23.6)	1
7. I am aware that failure to complete antibiotic prescription may lead to antimicrobial resistance (AMR).	18 (7.2)	60 (24.0)	172 (68.8)	2
8. The prescribing veterinarians have emphasised on the importance of completing the prescribed antibiotic courses.	5 (2.0)	88 (35.2)	157 (62.8)	2
Total				9/ 16

4.3 PET OWNERS' ATTITUDE TOWARDS ANTIMICROBIAL USE (AMU) AND ANTIMICROBIAL RESISTANCE (AMR)

In terms of the attitude subscale related to AMU and AMR, the responses have been summarized in Table 3. Primarily, the subscale displayed a low level of reliability, scoring $\alpha = 0.6$. Thus, the question "Antibiotic is given to pets until the symptoms disappear" was removed to increase the reliability level to 0.7.

The mean score on this subscale was a perfect 12 out of 12, indicating that respondents hold an excellent attitude towards AMU and AMR. It is highlighted that a significant portion of them demonstrate responsible use of antibiotics with 74.0% completing the full course and 66.0% never missing a dose for their pets. Additionally, most of the respondents (73.6%) never shared antibiotics among pets with similar symptoms and (86.4%) agreed that an antibiotic should be given to pets until it finishes.

However, a small percentage (27.2%) would consider stopping the antibiotic course when their pets did not show signs of improvement and (24.8%) would do so when their pets seemed healthy, respectively.

Table 3: Respondents' attitude towards antimicrobial use (AMU) and antimicrobial resistance (AMR).

Cronbach Alpha (N=6) =0.7				
Statement	Scale			Score 2= correct 1= unsure 0= incorrect
	Disagree (%)	Neutral (%)	Agree (%)	
1. Antibiotic is given to pets until it finishes.	10 (4.0)	24 (9.6)	216 (86.4)	2
2. I will stop giving antibiotics when my pet's condition is not improving.	107 (42.8)	75 (30.0)	68 (27.2)	2
3. I will stop giving antibiotics when my pet seems healthy.	124 (49.6)	64 (25.6)	62 (24.8)	2
4. I always complete the antibiotic course prescribed by veterinarian.	12 (4.8)	53 (21.2)	185 (74.0)	2
5. I have never missed a dose while completing the course of antibiotics.	16 (6.4)	69 (27.6)	165 (66.0)	2
6. I have shared antibiotics with other pets that show similar symptoms without veterinarian's prescriptions.	184 (73.6)	28 (11.2)	38 (15.2)	2
Total				12/12

4.4 PET OWNERS' PERCEPTION TOWARDS ANTIMICROBIAL USE (AMU) AND ANTIMICROBIAL RESISTANCE (AMR)

For the perception subscale related to AMU and AMR, the responses have been summarized in Table 4. Primarily, the subscale displayed a low level of reliability, scoring $\alpha = 0.6$. Thus, the question "It is acceptable to ask for antibiotics from veterinarian even when the cause of a pet's illness is unknown" was removed to increase the reliability level to 0.7.

A mean score of 12 out of a maximum possible score of 12, suggests that respondents have a very good perception towards AMU and AMR. It is shown that 92.8% of them trust a veterinarian's advice on prescribing antibiotics and 90% agreed that it is important to give their pets antibiotics. Most of the respondents (66.8%) also displayed a great agreement on AMR can be a problem for them and their pets. Furthermore, a significant percentage (83.6%), agreed that frequent and improper use of antibiotics is harmful to their pets.

However, a small portion of the respondents (18.4%) agreed that it is legal to purchase antibiotics from a non-veterinarian retailer even though a huge portion (82.0%) agreed that only veterinarians can prescribe antibiotics for their pets.

Table 4: Respondents' perception towards antimicrobial use (AMU) and antimicrobial resistance (AMR).

Cronbach Alpha (N=6) =0.7				
Statement	Scale			Score 2= correct 1= unsure 0= incorrect
	Disagree (%)	Neutral (%)	Agree (%)	
1. I trust my veterinarian's advice as to whether my pet needs antibiotics.	6 (2.4)	12 (4.8)	232 (92.8)	2
2. It is important to give antibiotics to pets as directed by a veterinarian.	5 (2.0)	20 (8.0)	225 (90.0)	2
3. It is legal to purchase antibiotics from a non-veterinarian retailer.	161 (64.4)	43 (17.2)	46 (18.4)	2
4. Only veterinarians can prescribe antibiotics for my pets.	5 (2.0)	40 (16.0)	205 (82.0)	2
5. Antimicrobial resistance can be an issue for my pet & I.	13 (5.2)	70 (28.0)	167 (66.8)	2
6. Frequent and improper use of antibiotics are harmful to my pets.	10 (4.0)	31 (12.4)	209 (83.6)	2
Total				12/12

4.5 PET OWNERS' KNOWLEDGE, ATTITUDE AND PERCEPTION BASED ON DEMOGRAPHIC AND OTHER PARAMETERS

Table 5 summarises the relationship between respondents' demographic data and their total mean scores for knowledge, attitude and perception. The study found a low overall score for the knowledge level. Conversely, a high overall score was revealed for attitude and perception levels. Notably, significant differences were found based on education level ($p = 0.001$, $p = 0.000$, $p = 0.000$), the number of pets own ($p = 0.001$, $p = 0.001$, $p = 0.007$), and awareness of antimicrobial resistance (AMR) ($p = 0.000$, $p = 0.000$, $p = 0.000$).

Table 6 presents the results of the pairwise comparison among respondents' education levels. In terms of knowledge, overall analysis displayed a significant difference between education level and knowledge. However, through pairwise comparison, the difference is significant between a Diploma with a Bachelor's degree and a diploma with a Master's Degree or higher, respectively. For attitude, the only significant difference, as revealed through pairwise comparison, was between respondents with a Diploma and those with a Bachelor's Degree ($p = 0.000$). For perception, the only scenario where no significant difference was observed was between respondents with a Bachelor's Degree and those with a Master's Degree or higher. Significant differences were identified for the other two education levels.

Table 7 presents the results of pairwise comparisons among respondents based on the number of pets they own. In terms of knowledge, there were significant differences across various numbers of pets owned, except for the comparisons between 1 pet and 3 pets, 3 pets and 2 pets, 2 pets and 4 pets, and 4 pets and more than 5 pets. Meanwhile, for attitude, significant differences were observed in

comparisons between 1 pet and 2 pets up to 1 pet and more than 5 pets, while no significant differences were found in other cases. Regarding perception, significant differences were noted between respondents with 1 pet and 2 pets, respondents with 1 pet and 4 pets, as well as respondents with 1 pet and more than 5 pets.



Table 5: Mean total score of knowledge, attitude and perception towards antimicrobial use (AMU) and antimicrobial resistance (AMR) based on demographics and other parameters.

Demographic data	Knowledge (Total mean score)	p-value	Attitude (Total mean score)	p-value	Perception (Total mean score)	p-value
Education level						
Diploma	7.32	0.001	7.91	0.000	9.54	0.000
Bachelor's Degree	7.91		9.46		10.70	
Master's Degree or higher	9.90		9.30		11.10	
Number of pets own						
1	8.03	0.001	8.11	0.001	9.93	0.007
2	8.54		9.35		10.50	
3	8.48		9.15		10.47	
4	10.07		10.20		11.07	
>5	10.31		10.21		11.31	
AMR awareness						
Yes	11.61	0.000	10.31	0.000	11.07	0.000
No	7.77		8.73		10.27	

Table 6: Pairwise comparisons of respondents' education level

Education level	Knowledge (p-value)	Conclusion	Attitude (p-value)	Conclusion	Perception (p-value)	Conclusion
Diploma vs. Bachelor's Degree	0.000	Significant Difference	0.000	Significant Difference	0.000	Significant Difference
Diploma vs. Master's Degree or higher	0.024	Significant Difference	0.073	No significant Difference	0.026	Significant Difference

Bachelor's Degree vs. Master's Degree or higher	0.515	No significant Difference	0.922	No significant Difference	0.589	No significant Difference
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Table 7: Pairwise comparisons of respondents' number of pets own

Number of pets own	Knowledge (p-value)	Conclusion	Attitude (p-value)	Conclusion	Perception (p-value)	Conclusion
1 vs. 2	0.089	Significant Difference	0.005	Significant Difference	0.014	Significant Difference
1 vs. 3	0.402	No significant Difference	0.033	Significant Difference	0.146	No significant Difference
1 vs. 4	0.016	Significant Difference	0.002	Significant Difference	0.010	Significant Difference
1 vs. >5	0.000	Significant Difference	0.001	Significant Difference	0.002	Significant Difference
3 vs. 2	0.592	No significant Difference	0.922	No significant Difference	0.612	No significant Difference
3 vs. 4	0.086	Significant Difference	0.121	No significant Difference	0.146	No significant Difference
3 vs. >5	0.004	Significant Difference	0.166	No significant Difference	0.113	No significant Difference
2 vs. 4	0.133	No significant Difference	0.105	No significant Difference	0.217	No significant Difference
2 vs. >5	0.005	Significant Difference	0.134	No significant Difference	0.174	No significant Difference
4 vs. >5	0.572	No significant Difference	0.678	No significant Difference	0.865	No significant Difference

5.0 DISCUSSION

Pet ownership has experienced a substantial expansion in Malaysia, with over half of Malaysians either currently owning pets or expressing a desire to do so. The physical contact between these pets and their owners carries the risk of transmitting drug-resistant bacteria from pets to humans and vice versa. This highlights the importance of preventing antimicrobial resistance (AMR) through the responsible use of antimicrobial drugs in companion animal medicine. It becomes a priority for the well-being of both humans and animals. Pet owners play a crucial role in the process of prescribing antibiotics and are essential in ensuring that these drugs are used responsibly and appropriately for their pets. Our findings show that the majority of the respondents are Malay (86.8%), as it is the largest ethnic group in Malaysia. Most of the respondents were female (67.2%), predominantly in the 18-30 age group (79.2%). This implies that women aged 18-30 tend to spend more time on social media, as data collection was conducted through social media platforms. In line with this, a social study conducted by The Nielsen Company in 2016 reported that 78% of adults between the ages of 18-34 primarily used smartphones for their weekly social interactions. Moreover, it is alarming that only 23.6% stated that they were aware of the occurrence of AMR. Compared to another study in North America, around 29% recognised AMR in pets (Stein *et al.*, 2021).

Results showed that the pet owners possessed a poor level of knowledge with a total mean score of 56.3% towards AMU and AMR. This is because a significant number of respondents believed that antibiotics are effective against viruses (59.2%). Another study revealed similar data that overall, the general knowledge about antibiotics was poor, as many pet owners did not comprehend the purpose of

antibiotics and their inability to combat viruses effectively (Taylor *et al.*, 2023). In addition, only 32.0% correctly agreed that antibiotics used in pets can produce antibiotic-resistant bacteria while the majority were unsure. Meanwhile, in another study, 61.8% of respondents claimed they know antibiotics used in their pets can result in bacteria that are resistant to antibiotics (Taylor *et al.*, 2023). Thus, the findings suggest poor AMR awareness and it is supported by the fact that 76.4% of the respondents were unaware of the occurrence of AMR. Therefore, given the crucial role that veterinarians play as communicators with pet owners, veterinarians must continuously educate them regarding proper and improper use of antibiotics as a component of more extensive Antimicrobial Stewardship (AMS) initiatives.

A perfect mean score of 100% for attitude suggests the pet owners displayed an excellent attitude towards AMU and AMR. There is a strong inclination toward adhering to antibiotic prescriptions. As evidence, the majority of the respondents agreed to always give antibiotics to their pets until finished, always completing the full course of antibiotics, never missing a dose nor sharing antibiotics with other pets sharing similar symptoms. This indicates that despite having a poor level of knowledge about AMU and AMR, pet owners consistently follow their veterinarian's prescribed antibiotic treatment regimen. However, according to Taylor *et al.* (2023), although pet owners claim to fully understand the significance of following their veterinarian's advice regarding AMU, their actual compliance may vary. Additionally, it is discouraging that a small percentage would consider stopping the antibiotic course when there are no signs of improvement and when their pets seem healthy. Thus, veterinarians must emphasise the importance of accurate dosage, administration method, frequency, and duration when prescribing antibiotics. Further exploration is

needed to understand the potential of the veterinarian-client relationship and how it can be harnessed to enhance the use of antimicrobials in companion animal medicine.

Moreover, the majority of pet owners have a very good perception of AMU and AMR. Results reveal a high level of trust among pet owners in their veterinarians' antibiotic prescription advice (92.8%). Similarly, in another study in Colorado, most pet owners expressed a strong level of trust in their veterinarian's judgment regarding the necessity of antibiotics (Taylor *et al.*, 2023). Additionally, a significant majority (90%) of pet owners believe in the importance of administering antibiotics to their pets when needed. This reflects a positive attitude toward veterinary care and antibiotic usage among the respondents. Further study is needed to understand the potential of the veterinarian-client relationship and how it can be optimally utilized to enhance the responsible AMU in companion animal medicine. On top of that, it is shown that the majority of pet owners are aware that AMR can be an issue for them and their pets and that frequent and improper use of antibiotics is harmful to their pets. Similar results were found in a prior study, which showed that most respondents knew that giving their pets medicines too often or improperly could be harmful to them (Horvat *et al.*, 2022). These findings indicate a noteworthy level of awareness among pet owners regarding the potential threat of antimicrobial resistance (AMR) to both themselves and their pets. It suggests that pet owners are willing to engage in practices that promote the well-being of their pets and reduce the risk of AMR. Nevertheless, it is concerning that a small portion of the pet owners were unaware that only licensed veterinarians have the authority to prescribe and dispense antibiotics. This finding is similar to a previous study in Colorado (Taylor *et al.*, 2023). A study conducted among the dog owners of Italy found that 21% of pet owners stated they had obtained antibiotics without a prescription, (Candellone *et al.*, 2023). Moreover, in February

2020, Bernama News reported that the rate of online sales of veterinary drugs by non-veterinarian retailers is concerning. Therefore, addressing this issue is crucial from a public health perspective, as unregulated AMU can contribute to the development of AMR and compromised treatment effectiveness. It emphasizes the need for robust education and awareness campaigns about the responsible use of antibiotics and the importance of obtaining them only through licensed veterinarians.

In this study, it demonstrates low overall mean scores for knowledge level, but high overall mean scores for attitude and perception levels. Significant differences ($p < 0.05$) were revealed based on education levels, number of pets own and AMR awareness. In contrast, no significant difference ($p = 0.2$) was found between knowledge and level of education in another study conducted in Italy (Candellone *et al.*, 2023). The significant difference observed in terms of educational levels suggests that educational interventions might be the most effective approach to enhance and advocate for the rational use of antibiotics. Similar to another study where higher levels of education were linked to a higher chance of perceiving AMR (Stein *et al.*, 2021). Meanwhile, for the number of pets own, these differences could stem from several factors. For instance, individuals with more pets might have more exposure to various health conditions among their animals, which could affect their perceptions of when antibiotics are necessary. Additionally, those with multiple pets may have more interactions with veterinarians, leading to a better understanding of responsible AMU. Understanding these variations based on the number of pets owned can help tailor educational and awareness programs more effectively. It allows for targeted interventions to address the specific needs and perceptions of different pet owner groups. Overall, it highlights the importance of considering the diversity within the pet owner population and the potential impact of these variations on AMU practices.

Besides, this finding highlights the importance of raising awareness about AMR among pet owners. Those who are more aware of the risks associated with AMR may be more inclined to use antibiotics responsibly and as prescribed by veterinarians. On the other hand, individuals with lower AMR awareness may require targeted educational efforts to improve their understanding of the issue and promote responsible AMU. Effective communication and educational strategies should take into account these differences in AMR awareness to ensure that pet owners have the necessary information to make informed decisions about AMU for their animals. Ultimately, this awareness can contribute to the reduction of unnecessary AMU, which is a key factor in combating AMR and preserving the effectiveness of antibiotics.

Besides, the findings indicated a significant difference in knowledge levels across different education levels. When pairwise comparisons were conducted, it was found that the most significant differences in knowledge were observed between respondents with a Diploma and those with either a Bachelor's degree or a Master's Degree or higher. This implies that while there is an overall difference in knowledge based on education, the most substantial distinctions exist between these specific education levels. Similarly in another study, it was observed that a greater level of education had a positive impact on the aspects of medication knowledge under examination ($p < 0.05$) (Alkatheri *et al.*, 2013). In terms of attitudes, results revealed that the only significant difference occurred between respondents holding a Diploma and those with a Bachelor's Degree ($p = 0.000$). Meanwhile, for perception, it was found that there was no significant difference in perception between respondents with a Bachelor's Degree and those with a Master's Degree or higher, meaning these two groups are quite similar in terms of perception. However, significant differences were identified for the other two education levels. These differences could be due to

individuals holding advanced degrees, such as a Master's Degree or higher, typically undergoing more advanced education and specialized training. This heightened level of knowledge and expertise can result in variations in how they perceive and react to specific subjects.

Furthermore, results for pairwise comparison among pet owners based on the number of pets owned, there were significant differences in knowledge across various numbers of pets own. In particular, pet owners with more than 5 pets are strongly associated with significantly higher knowledge levels than pet owners with just 1 pet ($p = 0.000$). For attitude, there were significant differences between pet owners who have 1 pet those who have 2 pets and those with 1 pet and those with more than 5 pets. This suggests that certain numbers of pets can cause significant changes in attitudes. For instance, going from 1 pet to 2 pets can change attitudes, likely because of increased responsibilities and interactions. Similarly, having more than 5 pets can create distinctive attitudes due to a strong commitment to pet care. Regarding perception, significant differences were found between respondents with 1 pet and 2 pets, respondents with 1 pet and 4 pets, and respondents with 1 pet and more than 5 pets. This suggests that owning more than 1 pet causes individuals to perceive AMU and AMR better. This could be due to having more exposure to various pet behaviours and needs can help pet owners understand your pets' feelings and behaviour.

6.0 CONCLUSION

This study reveals that pet owners in Wilayah Persekutuan Kuala Lumpur demonstrate poor knowledge (56.3%), excellent attitude (100%) and very good perception (100%) towards antimicrobial usage (AMU) and antimicrobial resistance (AMR). Nevertheless, it was discouraging to note that 76.4% stated that they were unaware of the occurrence of AMR. Thus, this emphasises the significance of increasing awareness about AMR among pet owners, aiming to encourage the responsible use of antibiotics. Additionally, they underscore the role of veterinarians in educating pet owners regarding appropriate antibiotic use within the broader framework of Antimicrobial Stewardship (AMS) efforts.

7.0 RECOMMENDATIONS

Based on the findings of the study, it is recommended to implement the following interventions to address the impact of behavioural interventions and assess the long-term effectiveness of educational programs and awareness campaigns on responsible Antimicrobial Use (AMU). Conduct longitudinal studies to evaluate the sustained effectiveness of educational programs and awareness campaigns. These studies should assess knowledge retention and behaviour change among pet owners over an extended period, such as one year or more. This will provide valuable insights into the long-term impact of these interventions on responsible AMU. Besides, it is recommended to implement behavioural interventions, such as reminders and feedback systems, to reinforce responsible AMU practices among pet owners. Utilize technology, such as mobile apps or email reminders, to prompt pet owners to adhere to prescribed medication regimens and provide feedback on their adherence. These interventions can serve as ongoing support and reminders for responsible AMU. Furthermore, strengthens the collaboration between veterinarians and pet owners. Veterinarians play a pivotal role in educating pet owners about responsible AMU. Enhance communication between pet owners and veterinarians, and ensure that veterinarians provide clear and concise instructions for medication use, emphasizing the importance of completing the full course of treatment. By implementing these recommendations, we can contribute to a more informed and responsible pet owner community regarding AMU and AMR, ultimately helping to reduce the prevalence of AMR in both animals and humans.

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9.0 APPENDICES



FACULTY OF VETERINARY MEDICINE UNIVERSITI PUTRA MALAYSIA

Fakulti Perubatan Veterinar

Universiti Putra Malaysia

QUESTIONNAIRE

*Borang Soal Selidik
(Strictly confidential/ Sulit)*

ASSESSMENT OF PET OWNERS' KNOWLEDGE, ATTITUDE AND PERCEPTION TOWARDS ANTIMICROBIAL USE AND ANTIMICROBIAL RESISTANCE IN WILAYAH PERSEKUTUAN KUALA LUMPUR.

PENILAIAN TENTANG PENGETAHUAN, PERILAKU DAN KEPERCAYAAN PEMILIK HAIWAN PELIHARAAN TERHADAP PENGGUNAAN ANTIMIKROB DAN KETAHANAN ANTIMIKROB DI WILAYAH PERSEKUTUAN KUALA LUMPUR.

Researcher / Penyelidik : Nurin Batrisyia Binti Ahmad Fuad

Researcher supervisor / Penyelia : AP Dr. Arifah Binti Abdul Kadir

Researcher co-supervisor / Penyelia bersama : Dr Shanmugavelu Sithambaram

All information given will be strictly kept confidential and will not be disclosed to any third party. It will be used for academic purposed and research only. The success of this research completely depends on your honesty and co-operation in answering all the questions. Your co-operation and participation will be very much appreciated. Thank you. *Semua maklumat yang diberikan akan disimpan secara rahsia dan tidak akan didedahkan kepada mana-mana pihak ketiga. Ia akan digunakan untuk tujuan akademik dan penyelidikan sahaja. Kejayaan kajian ini sepenuhnya bergantung kepada kejujuran dan kerjasama anda dalam menjawab semua soalan. Kerjasama dan penyertaan anda akan sangat dihargai.*

PART A: Consent Form*Bahagian A: Data Demografi***Please tick (✓) ONE appropriate answer to the relevant questions.***Sila tandakan (✓) SATU jawapan sesuai untuk soalan berkaitan dan isikan tempat kosong bila diperlukan.*

1. **Do you agree to participate in this survey?** / Adakah anda bersetuju untuk menyertai survei ini?

Yes/ Ya

No/ Tidak

2. **Name.** / Nama.

3. **Address.** / Alamat rumah.

PART B: Demographic data*Bahagian B: Data Demografi***Please tick (✓) ONE appropriate answer to the relevant questions.***Sila tandakan (✓) SATU jawapan sesuai untuk soalan berkaitan dan isikan tempat kosong bila diperlukan.*

1. **Ethnicity.** / Bangsa

Malay/ Melayu

Chinese/ Cina

Indian/ India

Other/ Lain-lain:

2. **Age group.** / Lingkungan usia.

18-30

31-45

>45

3. **Gender./ Jantina.**

- Male/ *Lelaki*
- Female/ *Perempuan*

4. **Education level./ Tahap Pendidikan.**

- Diploma/ *Diploma*
- Bachelor's Degree/ *Ijazah Sarjana*
- Master's Degree or higher / *Ijazah Sarjana Muda atau lebih tinggi*

5. **Do you have any medical background?/ Adakah anda mempunyai latar belakang dalam bidang perubatan?**

- Yes/ *Ya*
- No/ *Tidak*

6. **Species of pets own./ Spesies haiwan peliharaan.**

- Cats/ *Kucing*
- Dogs/ *Anjing*
- Both cats & dogs/ *Kucing & anjing*
- Others/ *Lain-lain*

7. **Number of pets own./ Bilangan haiwan peliharaan.**

- 1
- 2
- 3
- 4
- >5

8. **Are you aware on the occurrence of Antimicrobial Resistance (AMR)?/**
Adakah anda sedar akan berlakunya Ketahanan Antimikrob(AMR)?

Yes/ Ya

No/ Tidak



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PART C: Knowledge regarding antimicrobial use (AMU) & antimicrobial resistance (AMR).

Bahagian C: Pengetahuan terhadap penggunaan antimikrob (AMU) & ketahanan antimikrob (AMR).

Using the scales provided below, please choose your level of agreement.

Sila bulatkan tahap persetujuan mengikut skala yang diberikan di bawah.

STRONGLY DISAGREE <i>Sangat Tidak bersetuju</i>	DISAGREE <i>Tidak bersetuju</i>	NEUTRAL <i>Neutral</i>	AGREE <i>Bersetuju</i>	STRONGLY AGREE <i>Sangat Bersetuju</i>
1	2	3	4	5

No.	Statement/ Pernyataan	Scale/ Skala				
		1	2	3	4	5
1.	Antibiotics are used for treating bacterial infections. <i>Antibiotik digunakan untuk merawat jangkitan bakteria.</i>	1	2	3	4	5
2.	Antibiotics are used to decrease pain. <i>Antibiotik digunakan untuk mengurangkan kesakitan.</i>	1	2	3	4	5
3.	Antibiotics are useful against viral diseases. <i>Antibiotik berguna untuk melawan jangkitan virus.</i>	1	2	3	4	5
4.	Antibiotics are useful against fungal diseases. <i>Antibiotik berguna untuk melawan jangkitan kulat.</i>	1	2	3	4	5
5.	Antibiotics help to resolve cold symptoms. <i>Antibiotik bantu untuk menghilangkan gejala selsema.</i>	1	2	3	4	5
6.	Antibiotics used in pets can produce bacteria that are resistant to antibiotics. <i>Penggunaan antibiotik dalam haiwan peliharaan dapat menghasilkan bakteria yang tahan akan antibiotik.</i>	1	2	3	4	5
7.	Antibiotic-resistant bacteria can spread from animals to humans. <i>Bakteria tahan akan antibiotik boleh sebar dari haiwan ke manusia.</i>	1	2	3	4	5
8.	Antimicrobial resistance in animals is uncommon <i>Kerintangan antimikrob dalam haiwan adalah tidak biasa.</i>	1	2	3	4	5
9.	I am aware that failure to complete antibiotic prescription may lead to antimicrobial resistance (AMR). <i>Saya sedar bahawa kegagalan menyempurnakan preskripsi antibiotik boleh menyebabkan Ketahanan Antimikrob(AMR)</i>	1	2	3	4	5

10.	The prescribing veterinarians have emphasized on the importance of completing the prescribed antibiotic courses. <i>Dokter haiwan telah menekankan pentingnya menyempurnakan kursus antibiotik yang ditetapkan.</i>	1	2	3	4	5
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PART D: Attitudes towards antimicrobial use (AMU) & antimicrobial resistance (AMR).

Bahagian D: Perilaku terhadap penggunaan antimikrob (AMU) & kerintangan antimikrob (AMR).

Using the scales provided below, please choose your level of agreement.

Sila bulatkan tahap persetujuan mengikut skala yang diberikan di bawah.

STRONGLY DISAGREE <i>Sangat Tidak bersetuju</i>	DISAGREE <i>Tidak bersetuju</i>	NEUTRAL <i>Neutral</i>	AGREE <i>Bersetuju</i>	STRONGLY AGREE <i>Sangat Bersetuju</i>
1	2	3	4	5

No.	Statement / <i>Penyataan</i>	Scale/ <i>Skala</i>				
1.	Antibiotic is given to pets until the symptoms disappear. <i>Antibiotik diberi kepada haiwan peliharaan sehingga gejala hilang.</i>	1	2	3	4	5
2.	Antibiotic is given to pets until it finishes. <i>Antibiotik diberi kepada haiwan peliharaan sehingga ia habis.</i>	1	2	3	4	5
3.	I will stop giving antibiotics when my pet's condition is not improving. <i>Saya akan menghentikan kursus antibiotik jika keadaan haiwan peliharaan saya tidak bertambah baik.</i>	1	2	3	4	5
4.	I will stop giving antibiotics when my pet seems healthy. <i>Saya akan menghentikan kursus antibiotic jika keadaan haiwan peliharaan saya kelihatan semakin baik.</i>	1	2	3	4	5
5.	I always complete the antibiotic course prescribed by veterinarian. <i>Saya sentiasa menyempurnakan kursus antibiotik yang ditetapkan oleh doktor haiwan.</i>	1	2	3	4	5
6.	I have never missed a dose while completing the course of antibiotics. <i>Saya tidak pernah melangkaui dos dalam masa penyempurnaan kursus antibiotik.</i>	1	2	3	4	5
7.	I have shared antibiotics with other pets who show similar symptoms without veterinarian's prescriptions. <i>Saya pernah berkongsi antibiotik dengan haiwan peliharaan lain yang menunjukkan simptom yang sama tanpa preskripsi doktor haiwan.</i>	1	2	3	4	5

PART E: Perception towards antimicrobial use (AMU) & antimicrobial resistance (AMR).

Bahagian E: Kepercayaan terhadap penggunaan antimikrob (AMU) & ketahanan antimikrob (AMR).

Using the scales provided below, please choose your level of agreement.

Sila bulatkan tahap persetujuan mengikut skala yang diberikan di bawah.

STRONGLY DISAGREE <i>Sangat Tidak bersetuju</i>	DISAGREE <i>Tidak bersetuju</i>	NEUTRAL <i>Neutral</i>	AGREE <i>Bersetuju</i>	STRONGLY AGREE <i>Sangat Bersetuju</i>
1	2	3	4	5

No.	Statement / <i>Penyataan</i>	Scale/ <i>Skala</i>				
1.	I trust my veterinarian's advice as to whether my pet needs antibiotics. <i>Saya percaya kata doktor haiwan sama ada haiwan peliharaan saya perlukan antibiotik atau tidak.</i>	1	2	3	4	5
2.	It is acceptable to ask for antibiotics from veterinarian even when the cause of a pet's illness is unknown. <i>Saya boleh minta antibiotik daripada doktor haiwan walaupun punca sakit haiwan peliharaan tidak diketahui.</i>	1	2	3	4	5
3.	It is important to give antibiotics to pets as directed by a veterinarian. <i>Penting untuk memberi antibiotic kepada haiwan peliharaan sebagaimana yang ditetapkan oleh doctor haiwan.</i>	1	2	3	4	5
4.	It is legal to purchase antibiotics from a non-veterinarian retailer. <i>Adalah sah untuk membeli antibiotik dari pihak luar yang tidak mempunyai lesen veterinar.</i>	1	2	3	4	5
5.	Only veterinarians can prescribe antibiotics for my pets. <i>Hanya doktor haiwan boleh memberi preskripsi antibiotik untuk haiwan peliharaan saya.</i>	1	2	3	4	5
6.	Antimicrobial resistance can be an issue for my pet & I. <i>Ketahanan antimikrob boleh menjadi masalah kepada haiwan peliharaan dan saya.</i>	1	2	3	4	5
7.	Frequent and improper use of antibiotics are harmful to my pets.	1	2	3	4	5

Penggunaan antibiotik yang kerap dan tidak wajar adalah berbahaya terhadap haiwan peliharaan.

Thank you for your cooperation! Terima kasih atas kerjasama anda.

Non- Parametric Test

Test Statistics^{a,b}

	Knowledge	Attitude	Perception
Kruskal-Wallis H	14.921	18.311	16.029
df	2	2	2
Asymp. Sig.	.001	.000	.000

a. Kruskal Wallis Test
b. Grouping Variable: Education level

Test Statistics^{a,b}

	Knowledge	Attitude	Perception
Kruskal-Wallis H	60.658	20.979	14.127
df	1	1	1
Asymp. Sig.	.000	.000	.000

a. Kruskal Wallis Test
b. Grouping Variable: Are you aware on the occurrence of Antimicrobial Resistance (AMR)?



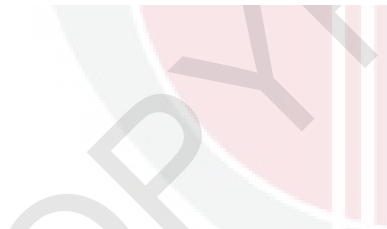
Test Statistics^{a,b}

	Knowledge	Attitude	Perception
Kruskal-Wallis H	18.653	18.938	13.991
df	4	4	4
Asymp. Sig.	.001	.001	.007

a. Kruskal Wallis Test
b. Grouping Variable: Number of pets own

Report

Education level		Knowledge	Attitude	Perception
Diploma/	Mean	7.32	7.91	9.54
	N	57	57	57
	Std. Deviation	2.377	2.309	2.253
Bachelor's Degree	Mean	9.03	9.46	10.70
	N	183	183	183
	Std. Deviation	2.957	2.522	1.846
Master's Degree or higher	Mean	9.90	9.30	11.10
	N	10	10	10
	Std. Deviation	3.247	2.830	1.370
Total	Mean	8.68	9.10	10.46
	N	250	250	250
	Std. Deviation	2.936	2.561	1.988



Report

Are you aware on the occurrence of Antimicrobial Resistance (AMR)?		Knowledge	Attitude	Perception
Yes	Mean	11.61	10.31	11.07
	N	59	59	59
	Std. Deviation	2.983	2.343	1.964
No	Mean	7.77	8.73	10.27
	N	191	191	191
	Std. Deviation	2.255	2.515	1.962
Total	Mean	8.68	9.10	10.46
	N	250	250	250
	Std. Deviation	2.936	2.561	1.988

Report

Number of pets own		Knowledge	Attitude	Perception
1	Mean	8.03	8.11	9.93
	N	74	74	74
	Std. Deviation	2.956	2.697	2.056
2	Mean	8.54	9.35	10.50
	N	92	92	92
	Std. Deviation	2.591	2.411	2.161
3	Mean	8.48	9.15	10.47
	N	40	40	40
	Std. Deviation	3.218	2.547	1.826
4	Mean	10.07	10.20	11.07
	N	15	15	15
	Std. Deviation	3.432	2.678	1.831
>5	Mean	10.31	10.21	11.31
	N	29	29	29
	Std. Deviation	2.593	1.760	.967
Total	Mean	8.68	9.10	10.46
	N	250	250	250
	Std. Deviation	2.936	2.561	1.988