

KNOWLEDGE, ATTITUDE AND PRACTICE  
TOWARDS CANINE VACCINATION AMONG  
PET OWNERS IN PENANG

THUM CAN DEE

DOCTOR OF VETERINARY MEDICINE

UNIVERSITI

MALAYSIA

KELANTAN

2023



**Knowledge, Attitude and Practice Towards Canine Vaccination  
Among Pet Owners In Penang**

**By**

**Thum Can Dee**

**A research project submitted to the Universiti Malaysia Kelantan  
in partial fulfilment of the requirements for the degree of Doctor  
of Veterinary Medicine**

**Faculty of Veterinary Medicine  
UNIVERSITI MALAYSIA KELANTAN**

**2023**

## ORIGINAL LITERARY WORK DECLARATION

I hereby certify that the work embodied in this thesis is the result of the original research and has not been submitted for a higher degree to any other University or Institution.

- OPEN ACCESS** I agree that my thesis is to be made immediately available as hardcopy or online open access (full text).
- EMBARGOES** I agree that my thesis is to be made available as hardcopy or online (full text) for a period approved by the Post Graduate Committee. Dated from \_\_\_\_\_ until \_\_\_\_\_.
- CONFIDENTIAL** (Contains confidential information under the Official Secret Act 1972)\*
- RESTRICTED** (Contains restricted information as specified by the organisation where research was done)\*

I acknowledge that Universiti Malaysia Kelantan reserves the right as follows.

1. The thesis is the property of Universiti Malaysia Kelantan
2. The library of Universiti Malaysia Kelantan has the right to make copies for the purpose of research only.
3. The library has the right to make copies of the thesis for academic exchange.

\_\_\_\_\_

SIGNATURE OF CANDIDATE

\_\_\_\_\_

SIGNATURE OF SUPERVISOR

\_\_\_\_\_

NRIC/PASSPORT NO.  
DATE:

NAME OF SUPERVISOR  
DATE:

\_\_\_\_\_

# KNOWLEDGE, ATTITUDE AND PRACTICE TOWARDS CANINE VACCINATION AMONG PET OWNERS IN PENANG

## ABSTRACT

Canine vaccines are developed to control fatal infectious diseases, where vaccines can be classified into core and non-core vaccines. A cross-sectional study was conducted to evaluate the level of knowledge, attitude and practice toward canine vaccination among pet owners in Penang by using a self-administered online questionnaire. A total of 100 pet owners had participated in this study. All of the surveyed pet owners were aware of canine vaccination (100%,  $n=100$ ). All pet owners (100%,  $n=100$ ) were aware of canine vaccination, with majority (73%,  $n=73$ ) have good knowledge regarding canine vaccination. However, only 67% ( $n=67$ ) of the pet owners knew that canine vaccination includes protection against Leptospirosis, an important zoonotic disease. In terms of attitude and practice, majority of the respondents (79%,  $n=79$ ) have a fair attitude, with an average score and standard deviation of  $53.1 \pm 6.5$ . Additionally, the average score and standard deviation for the practice section revealed a value of  $25.3 \pm 5.6$  indicating good level of practice, (66%,  $n=66$ ) in canine vaccination among pet owners. There is an association between the level of knowledge and gender ( $p<0.001$ ), and level of practice and gender ( $p=0.004$ ). Furthermore, household monthly income also appeared to be associated with pet owners' attitude on canine vaccination ( $p=0.037$ ). Meanwhile, there was a positive correlation between knowledge, attitude ( $r=0.251$ ,  $p=0.012$ ), and practice ( $r=0.433$ ,  $p<0.001$ ). Likewise, there is a significant positive correlation ( $r=0.429$ ,  $p<0.001$ ) between total attitude and practice scores. In conclusion, pet owners who participated in this study demonstrated good knowledge, had fair levels of attitude and practice towards canine vaccination. This study's findings will benefit various parties, such as the Department of Veterinary Services (DVS) in Penang, in efforts to determine the need for intervention efforts such as organizing a talk or campaigns regarding the awareness and importance of canine vaccination.

**Keywords: KAP, Canine Vaccination, Pet Owner, Leptospirosis, Awareness**

**PENGETAHUAN, SIKAP DAN AMALAN TERHADAP VAKSINASI  
ANJING DALAM KALANGAN PEMILIK HAIWAN DI PULAU PINANG**

**ABSTRAK**

Vaksin anjing dibangunkan untuk mengawal penyakit maut berjangkit, di mana vaksin boleh dikelaskan kepada vaksin teras dan bukan teras. Sebuah kajian keratan rentas telah dijalankan untuk menilai pengetahuan, sikap dan amalan terhadap vaksinasi anjing dalam kalangan pemilik haiwan peliharaan di Pulau Pinang melalui *Google Form*. Beberapa statistik digunakan dalam kajian ini seperti 'Kruskal Wallis' atau 'Mann-Whitney', dan 'Spearman's rho Correlation' dengan menggunakan IBM SPSS Statistics versi 27. 'Kruskal Wallis' atau 'Mann-Whitney' digunakan untuk mengenal pasti hubungan antara pengetahuan, sikap dan amalan mengenai vaksinasi anjing dengan ciri-ciri sosiodemografi pemilik haiwan peliharaan di Pulau Pinang. Seterusnya, 'Spearman's rho Correlation' digunakan untuk menentukan hubungan antara skor total pengetahuan, sikap dan amalan. Seramai 100 pemilik haiwan peliharaan telah mengambil bahagian dalam kajian ini. Ditemukan bahawa pengetahuan pemilik haiwan peliharaan adalah baik (73%,  $n=73$ ), yang mengejutkan adalah semua pemilik haiwan peliharaan yang ditinjau menyedari tentang vaksinasi anjing (100%,  $n=100$ ). Antara pemilik haiwan peliharaan, hanya 67% ( $n=67$ ) tahu bahawa vaksinasi anjing termasuk perlindungan terhadap penyakit Leptospirosis. Tambahan pula, kebanyakan responden yang mengambil bahagian dalam kaji selidik ini mempunyai tahap sikap yang adil (79%,  $n=79$ ), dengan skor purata 53.1 dan sisihan piawai  $\pm 6.5$ . Lanjutan daripada itu, skor purata untuk bahagian amalan mendedahkan nilai 25.3 dengan sisihan piawai  $\pm 5.6$  telah menunjukkan tahap amalan yang baik (66%,  $n=66$ ) dalam vaksinasi anjing di kalangan pemilik haiwan peliharaan. Analisis mendedahkan hubungan antara tahap pengetahuan dan jantung ( $p=0.000$ ), selain mendedahkan satu lagi perkaitan antara tahap amalan dan jantung ( $p=0.004$ ). Selain itu, pendapatan bulanan isi rumah juga kelihatan dikaitkan dengan sikap pemilik haiwan peliharaan terhadap vaksinasi anjing ( $p=0.037$ ). Sementara itu, terdapat korelasi positif antara jumlah skor pengetahuan dan sikap ( $r=0.251$ ,  $p=0.012$ ), manakala jumlah skor pengetahuan juga dikaitkan dengan jumlah skor amalan ( $r=0.433$ ,  $p<0.001$ ). Begitu juga, korelasi positif yang ketara ( $r=0.429$ ,  $p<0.001$ ) diperhatikan dengan hubungan antara jumlah skor sikap dan amalan. Kesimpulannya, pemilik haiwan peliharaan yang mengambil bahagian dalam kajian ini menunjukkan pengetahuan yang baik, mempunyai tahap sikap dan amalan yang adil terhadap vaksinasi anjing. Dapatan kajian ini akan memberi manfaat kepada pelbagai pihak seperti Jabatan Perkhidmatan Veterinar (DVS) Pulau Pinang dalam usaha menentukan keperluan usaha intervensi seperti menganjurkan ceramah atau kempen mengenai kesedaran dan kepentingan vaksinasi anjing.

**Kata kunci: KAP, Vaksinasi Anjing, Pemilik Haiwan Peliharaan, Kencing Tikus, JPV**

## ACKNOWLEDGEMENT

An utmost gratitude goes to my supervisor, Dr. Norhidayah Noordin, with her guidance, I can finally complete my research project. Her commitment, time and support throughout my research are always inspiring. Besides, I would also like to express my sincerest gratitude to my co-supervisor, Dr. Atikah Hashim for her great support. Last but not least, my precious gratitude goes to my beloved family and friends for their boundless support and trust throughout this journey. Without them, my project would have never been possible.



UNIVERSITI  
MALAYSIA  
KELANTAN

## TABLE OF CONTENTS

	<b>PAGE</b>
<b>ORIGINAL LITERARY WORK DECLARATION</b>	<b>i</b>
<b>ABSTRACT</b>	<b>ii</b>
<b>ACKNOWLEDGEMENTS</b>	<b>iv</b>
<b>CHAPTER 1 INTRODUCTION</b>	
1.1 Research Background	1
1.2 Research Problem	2
1.3 Research Question	2
1.4 Research Objectives	2
1.5 Research Hypothesis	2-3
1.6 Significance of the Study	3
<b>CHAPTER 2 LITERATURE REVIEW</b>	
2.1 Canine Vaccines	4
2.2 Core and Non-Core Vaccines	4-5
2.3 Types of Vaccines	5-6
2.4 Commonly Used Vaccines in Dogs	6
2.5 Vaccine Protocol	6-7
2.6 Canine Vaccine Preventable Diseases	7-9
2.7 Knowledge, Attitude and Practice Towards Canine Vaccination Among Pet Owners	9-11
<b>CHAPTER 3 RESEARCH METHODOLOGY</b>	

3.1	Study Design and Target Population	12
3.2	Sample size	12
3.3	Development of the Questionnaire	12-13
3.4	Statistical Analysis of Data	13-14
<b>CHAPTER 4 FINDINGS OR FINDINGS AND DISCUSSION</b>		
4.1	Sociodemographic Characteristics of Respondents	15-16
4.2	Knowledge on Canine Vaccination	16-17
4.3	Attitude towards Canine Vaccination	17-20
4.4	Practice in Canine Vaccination	20-21
4.5	Respondent's Level of Knowledge, Attitude and Practice	21-22
4.6	Association between Sociodemographic Characteristics and Total Score for KAP	22-23
4.7	Correlation between Total Knowledge, Attitude and Practice Mean Score	23-24
<b>CHAPTER 5 DISCUSSION</b>		25-31
<b>CHAPTER 6 CONCLUSION</b>		32
<b>REFERENCES</b>		33-36



## LIST OF TABLES

NO.		PAGE
2.4	Types of vaccine combinations commonly used in Malaysia.	6
4.1	Sociodemographics of the surveyed respondents ( $n=100$ )	14-15
4.2	Frequency ( $n$ ) and percentage (%) of responses from respondents ( $n=100$ ) regarding the knowledge on canine vaccination	15-16
4.3	Frequency ( $n$ ) and percentage (%) of responses from respondents ( $n=100$ ) regarding the attitude towards canine vaccination	17-19
4.4	Frequency ( $n$ ) and percentage (%) of responses from respondents ( $n=100$ ) regarding the practice in canine vaccination	20
4.5	Total scores for knowledge, attitude and practice of respondents ( $n=100$ ) towards canine vaccination	21
4.1.5	Association between knowledge, attitude and practice with sociodemographic characteristics of dog owners towards canine vaccination	22
4.1.6	Spearman's rho correlation between total for knowledge, attitude and practice scores of the respondents ( $n=100$ ) towards canine vaccination	23

## LIST OF FIGURES

NO.		PAGE
2.4	Canine Vaccination Protocols (Source: Canine Journal)	7

## LIST OF ABBREVIATIONS

KAP	Knowledge, Attitude and Practice
DVS	Department of Veterinary Services
CDV	Canine Distemper Virus
CAdV	Canine Adenovirus
CPV	Canine Parvovirus
CPIV	Canine Parainfluenza Virus
CCoV	Canine Coronavirus
CIV	Canine Immunodeficiency Virus
CIRDC	Canine Infectious Respiratory Disease Complex
ICH	Infectious Canine Hepatitis
MLV	Modified Live Virus
DOI	Duration of Immunity
VGG	Vaccination Guideline Group
SPSS	Statistical Package for the Social Sciences

## LIST OF SYMBOLS

$\%$	Percentage
$<$	Less than
$>$	More than
$\leq$	Less than or equal to
$\geq$	More than or equal to
$=$	Equal
$n$	Number
$p$	Significance level
$r$	Correlation coefficient

# CHAPTER 1

## INTRODUCTION

### 1.1 Research Background

Vaccination is the act of introducing a vaccine into the body to elicit an immune response that can provide protection from a specific disease (CDC, 2021). Hence, canine vaccination should be encouraged as it is important in preventive healthcare for pet dogs, and it is one of the most economical ways to improve animals' health, longevity and quality of their lives. By vaccinating pet dogs, this action serves as a crucial public health function through formation of barriers against several zoonotic diseases (AAHA, 2023). With vaccinations, some diseases are preventable such as Canine Distemper, Canine Parvovirus, Leptospirosis, Canine Influenza and Rabies (AVMA, 2023). Canine vaccines are classified into core and non-core vaccines. In Malaysia, the core vaccines are vaccines against Canine Distemper Virus (CDV), Canine Adenovirus (CA<sub>d</sub>V), Canine Parvovirus (CPV) and Leptospirosis, caused by *Leptospira canicola*, *L. grippotyphosa* and *L. icterohaemorrhagiae*. On the other hand, non-core vaccines included against rabies, Canine Parainfluenza Virus (CPIV), Kennel Cough (*Bordetella bronchiseptica*), Canine Coronavirus infection (CCoV) and Canine Influenza Virus (CIV).

Unfortunately, in Penang, there was no research done to determine the perception towards canine vaccination. Hence, this study aimed to assess the awareness, knowledge and willingness of dog owners to vaccinate their dogs against high prevalence canine diseases in Malaysia.

## **1.2 Research Problem Statement**

The level of knowledge, attitude and practice among dog owners regarding canine vaccination in Penang is unknown. Besides, the association of sociodemographic factors with the level of knowledge, attitude and practice among dog owners regarding canine vaccination in Penang is also unknown.

## **1.3 Research Questions**

- What is the level of knowledge regarding canine vaccination among Penang dog owners?
- What is the level of attitude towards common canine vaccination among Penang dog owners?
- What is the level of practice in canine vaccination among Penang dog owners?
- Is there association between sociodemographic factors with the level of knowledge, attitude and practice among dog owners regarding canine vaccination?

## **1.4 Research Objectives**

- To investigate the level of knowledge, attitude and practice of dog owners regarding canine vaccination.
- To determine the sociodemographic factors associated with the level of knowledge, attitude and practice of dog owners regarding canine vaccination.

## **1.5 Research Hypothesis**

### **Null Hypothesis**

- Dogs owners have good knowledge regarding canine vaccination.
- Dogs owners have good attitudes towards canine vaccination.
- Dogs owners have good practices in controlling and preventing canine infectious diseases.
- There is association between sociodemographic factors with the level of knowledge, attitude and practice among dog owners regarding canine vaccination.

#### **Alternative Hypothesis**

- Dogs owners have poor knowledge regarding canine vaccination.
- Dogs owners have poor attitudes towards canine vaccination.
- Dogs owners have poor practices in controlling and preventing canine infectious diseases.
- There is no association between sociodemographic factors with the level of knowledge, attitude and practice among dog owners regarding canine vaccination.

#### **1.6 Significance of the Study**

This research is important in determining the knowledge, attitude and practice towards canine vaccination among pet owners in Penang, Malaysia. With this, appropriate approaches and protocols can be used to advise the owner in preventing common canine infectious diseases. This study's findings will benefit various parties, such as the Department of Veterinary Services (DVS) in Penang, in efforts to determine the need for intervention efforts such as organizing a talk or campaigns regarding the awareness and importance of canine vaccination.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Canine Vaccines

In the 1800s, the first vaccine for dogs was the rabies vaccine, which was then used on dogs before trying it on humans (Appel *et al.*, 1999). The purpose for developing canine vaccines is to control fatal infectious diseases such as canine distemper, infectious canine hepatitis, canine parvovirus infections, or leptospirosis (Appel, 2007). Modified live virus (MLV) vaccines will be the vaccine choice to control fatal virus infections in dogs as they can induce rapid and longer duration of immunity (DOI) after a single inoculation in susceptible dogs (Appel, 2007). Vaccination is important in canine preventive healthcare and it is one of the most cost-effective ways to maintain a dog's health, longevity and quality of their lives (Ellis, *et al.*, 2022). On the other hand, canine vaccination also plays a major role in ensuring public health by forming a barrier against zoonotic disease affecting dogs and human population (AAHA, 2022).

#### 2.2 Core and Non-Core Vaccines

Vaccines can be classified into core and non-core vaccines. Core vaccination is performed in all dogs regardless of their geographical locations and protects the animals from severe and life-threatening diseases that have global distribution (Day, 2016). Core vaccines include protection against Canine Parvovirus (CPV), Canine Distemper Virus (CDV), Canine Adenovirus (CAv) and Leptospirosis caused by *Leptospira canicola*,

*L. grippotyphosa* and *L. icterohaemorrhagiae* infection. On the other hand, non-core vaccination is required by animals at risk of contracting specific infectious diseases due to the geographical location, local environment or lifestyle of the animals (Day, 2016). Non-core vaccines protect the dog against rabies, Canine Parainfluenza Virus (CPIV) infection, Kennel Cough (*Bordetella bronchiseptica*), Canine Coronavirus infection (CCoV) and Canine Influenza Virus (CIV) infection. Rabies vaccination is considered as non-core in Penang due to rabies cases being ceased in 2015.

### 2.3 Types of Vaccines

Vaccines may be considered as infectious or non-infectious in nature. Most infectious types of vaccine used in dogs contain attenuated organisms to reduce virulence, example of infectious vaccine would be ‘modified live virus’. The attenuated organisms in the vaccine are still intact and viable, which means they are able to induce immunity by causing low-level infection. Infectious vaccines do not produce significant tissue pathology or clinical signs resulting from infectious disease. These types of vaccines will have advantages of inducing immunity at relevant anatomical sites when they are administered subcutaneously, and these vaccines will most likely induce cell-mediated and humoral immune responses. On the other hand, non-infectious vaccines (killed or inactivated vaccines) contain inactivated but antigenically intact organisms or viruses, or may consist of natural or synthetic antigens derived from those organisms or viruses. Furthermore, non-infectious vaccines are unable to infect, replicate or even induce pathological changes or clinical signs. These types of vaccines require multiple doses to elicit protection against diseases, which they will need an adjuvant to increase vaccine potency. Additionally, non-infectious vaccines generally induce a shorter duration of immunity compared to infectious vaccines, as both



cell-mediated and humoral immunities are less likely to be induced by the vaccines (Day, M., 2016).

## 2.4 Commonly Used Vaccines in Dogs

Table 2.4: Types of vaccine combinations commonly used in Malaysia.

Types of Vaccines	Infectious Diseases
<b>6 in 1</b>	Canine Distemper, Acute Upper Respiratory Disease (Adenovirus Type-2), Coronaviral enteritis, Parainfluenza and Parvoviral infection
<b>7 in 1</b>	Canine Distemper, Acute Upper Respiratory Disease (Adenovirus Type-2), Coronaviral enteritis, Parainfluenza, Parvovirus infection and Leptospirosis ( <i>Leptospira. canicola</i> , <i>L. icterohaemorrhagiae</i> )
<b>8 in 1</b>	Canine Distemper, Hepatitis (Adenovirus Type-1) and Acute Upper Respiratory Disease (Adenovirus Type-2), Parainfluenza, Parvoviral infection, Leptospirosis ( <i>Leptospira. canicola</i> , <i>L. icterohaemorrhagiae</i> ) and Coronaviral enteritis
<b>9 in 1</b>	Canine Distemper, Acute Upper Respiratory Disease (Adenovirus Type-1) and Hepatitis (Adenovirus Type-2), Parainfluenza, Parvoviral infection, Leptospirosis (4 strains caused by <i>L. pomona</i> , <i>L. Canicola</i> , <i>L. Icterohaemorrhagiae</i> and <i>L. Grippotyphosa</i> )
<b>10 in 1</b>	Canine Distemper, Acute Upper Respiratory Disease (Adenovirus Type-1) and Hepatitis (Adenovirus Type-2), Coronaviral enteritis, Parainfluenza Virus, Parvoviral infection and Leptospirosis (4 strains caused by <i>L. pomona</i> , <i>L. Canicola</i> , <i>L. Icterohaemorrhagiae</i> and <i>L. Grippotyphosa</i> )

## 2.5 Vaccine Protocol

The vaccine protocol for dogs starts when the puppy is at 6 to 8 weeks old. However, the puppy might still have maternal antibodies which the vaccine administered will get neutralized. Hence, the puppy will need 3 doses of vaccines to make sure it is protected against the common infectious and non-infectious diseases. Moving on, the puppy will still need a second dose after 4 weeks and the third dose after

another 4 weeks, which means the third dose will be delivered at 16 weeks of age or above. Booster vaccines are administered at 6 or 12 months of age.

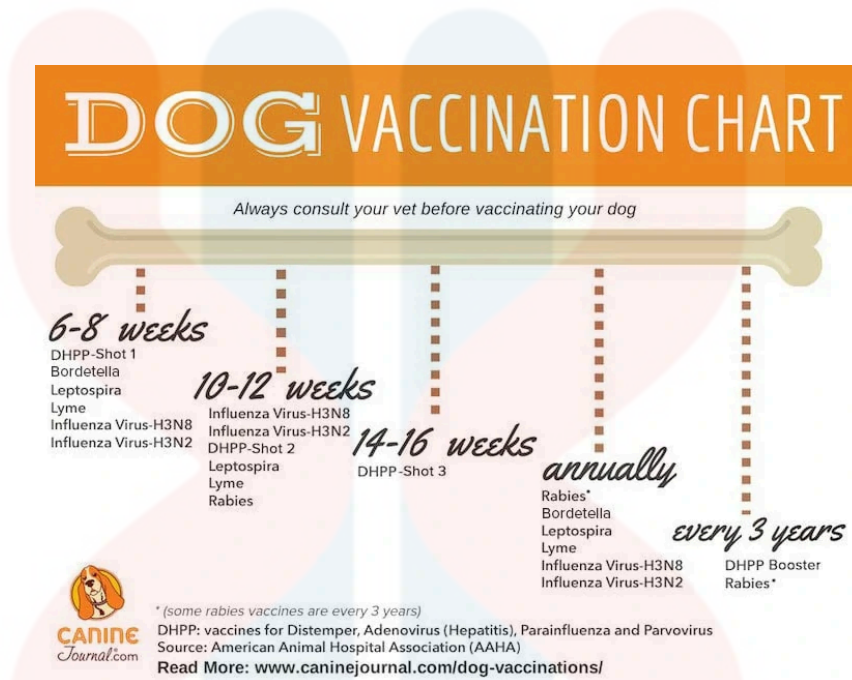


Figure 2.5: Canine Vaccine Protocol

According to the World Small Animal Veterinary Association’s Vaccination Guideline Group (VGG), the effect of core vaccines can last up to 3 years, hence, it is not needed to be given annually as the duration of immunity induced can last up to 3 years (Day, 2016). Non-core vaccines should be administered annually, as the duration of immunity for these vaccines is generally one year. In addition, non-core vaccines are only required by those animals whose geographical location, local environment or lifestyle put them at risk of contracting specific infections from the surroundings (Day, 2016).

## 2.6 Canine Vaccine Preventable Diseases

Fatal virus infections such as Canine Parvoviral infection, is ranked number one viral cause of enteritis and mortality in puppies (Kapel, 1995; Shabbir *et al.*, 2009). Vaccination for this disease is recommended beginning 6 weeks of age, where passive

immunity of puppies will be waned to allow active immunization (Day *et al.*, 2016). CAV, CIV, CDV and CPIV among the causative agents for Canine Infectious Respiratory Disease Complex (CIRDC), which have high morbidity (Timurkan, 2020). The clinical signs would range from asymptomatic infection, mild illness to severe respiratory illness. Prevalence of these diseases in Malaysia is unknown. However, in Thailand from 2008 to 2009, CAV, CDV and CPIV had prevalences of 0%, 2.94% and 0.98% respectively in healthy dogs, whereas the prevalence of these virus found in dogs with respiratory diseases was 9.17%, 2.75% and 11.93% respectively (Posuwan, *et al.*, 2018). For Canine Coronavirus, it is usually restricted to the enteric tract and may cause mild or asymptomatic forms of enteritis in dogs. Additionally, CCoV has two genotypes, which is CCoV-1 and CCoV-2 (Alfano *et al.*, 2020). Furthermore, canine adenovirus-1 (CAV-1) which causes infectious canine hepatitis (ICH), is a classic disease in unvaccinated dogs causing severe illness in them (De Jonge, & Van Brantegem, & Chiers, 2020). The clinical signs could be convulsions and blindness with spontaneous death, when CAV-1 is concomitant with other fatal virus causing the illness (Headley, *et al.*, 2013).

On the other hand, Leptospirosis in companion animals, especially dogs, is increasingly neglected in Malaysia (Lau, *et al.*, 2016). Dogs have become the choice of pets in recent years and they may potentially act as risk factors for human leptospiral infection, since humans and dogs share the same environment (Lau, *et al.*, 2016). Clinical signs of leptospirosis in dogs may be associated with acute multi-systemic febrile illness (fever), anorexia, coagulopathies, renal and hepatic disease (Lau, *et al.*, 2016). Severity of Leptospirosis varies with the infecting serovar and also the affected animal species (Ellis, W., 2014). However, there are many common aspects that we can observe across the species (Ellis, W., 2014). For example, the acute phase of infection is most likely to be subclinical and shows no clinical signs whereas the chronic stage of

infection will cause greater economic losses where there is reproductive wastage (Ellis, W., 2014). Prevalence of leptospirosis was 7% in a study conducted in Klang Valley, Malaysia (Lau, *et al.*, 2016). Environmental factors, especially floods (Lau *et al.*, 2010), is a natural phenomenon in Malaysia during Monsoon season, hence increasingly exposing animals to leptospirosis. Therefore, the study emphasized the evidence that dogs in Malaysia are exposed to leptospirosis and are sub- or clinically infected by pathogenic strains of leptospirosis (Lau, *et al.*, 2016) such as *Leptospira canicola* and *L. icterohaemorrhagiae*.

Another fatal disease that affects both canine and human is rabies. Malaysia has lost its rabies free status in 2015 with the presence of rabies cases occurring in Perlis, Kedah and Penang. Kedah with the most vaccination in dogs appeared to only have 1 case of rabies (Bamaiyi P. H, 2015). Mortality reaches 100% after onset of clinical signs (Sparkes *et al.*, 2014; Lankester *et al.*, 2014; Bamaiyi, 2015; Taylor & Nel, 2015). To control rabies outbreak, vaccination, culling of strays, public awareness, movement control, quarantine, containment of infected zones, proper disposal of carcasses and surveillance are important disease control measures (Navanithakumar *et al.*, 2019).

## **2.7 Knowledge, Attitude and Practice Towards Canine Vaccination Among Pet Owners**

A KAP study has been conducted associated with rabies in villages with different dog vaccination status in Cambodia with a total of 310 respondents. The results showed that more than 90% ( $n=209$ ) recognized rabies as a fatal disease which can be prevented through vaccination. Higher KAP scores were obtained from the participants from dog rabies vaccinated villages. However, results still showed that the overall level of KAP towards rabies were poor among 30% of the respondents ( $n=93$ ) (Ung, B., Kamyngkird, K., & Phimpraphai, W., 2021).

Furthermore, there was also another KAP survey of rabies done in a community in Sri Lanka with a total sample population of 1570. Results showed that the majority of the respondents (89.6%,  $n=1406$ ) was aware that dogs are the main reservoir for rabies. They believed that rabies is fatal and could be prevented by vaccination. The high level of awareness towards rabies was contributed by respondents from the rural areas. However, poor attitude towards rabies control and prevention can be seen when there was less than 50% ( $n<785$ ) of the respondents who were able to prove that their dogs have been vaccinated against rabies. Pet care practices towards rabies should be improved as only less than half of the respondents ( $<50\%$ ,  $n<785$ ), particularly in the rural area, would keep their dogs in cage or in the house to prevent dogs from roaming freely which may facilitate the spread of rabies infection in animal as well as posing a continuing zoonotic threat to humans (Matibag, G. C. *et al.*, 2007).

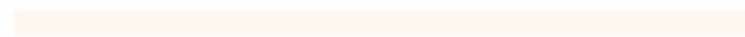
Moreover, a KAP study regarding rabies associated with its prevention and control among bite victims by suspected rabid animals has been conducted in China. Rabies is considered as a major public health concern in China as the incidence of suspected rabid animal bites remains high. The final results of this study showed that the level of KAP towards rabies were suboptimal or insignificant among bite victims. More than half of the bite victims experienced some knowledge gaps towards rabies, especially the severity caused by this disease, as well as the respondents having insufficient practices against prevention and controlling of rabies. However, the results still showed that most respondents had a positive attitude towards rabies. This study concluded that the low vaccination coverage of dogs was mainly due to the insufficient knowledge of rabies and poor economic status in the rural areas of China (Li, D. *et al.*, 2021).

Many countries in Asia had conducted studies to assess the knowledge, attitude and practice regarding rabies, its prevention and control associated with vaccinations.

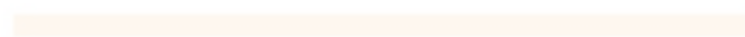
However, studies to evaluate the level of knowledge, attitude and practice in canine vaccination in Malaysia is still lacking.



UNIVERSITI



MALAYSIA



KELANTAN

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.1 Study Design and Target Population

This cross-sectional study was conducted among dog owners in Penang, Malaysia. The inclusion criteria of the targeted respondents were i) Malaysians living in Penang, ii) Aged 18 years and above, iii) Currently owned one or more dogs. The exclusion criteria for respondents include, i) Malaysians residing outside Penang, ii) Penang dog owners aged less than 18 years old, iii) Currently not owning any dogs (e.g. owning dog(s) in the past).

#### 3.2 Sample size

The study population was approximately 1.74 million, including Chinese, Indians and others in Penang (Liew J.X., 2022). A total of 100 individuals were sampled in this study to gain a 95% confidence level, with a maximum allowable difference of 0.05 in detecting the KAP proportions in the population. The individuals were selected by a simple random sampling method. The data was collected via self-administered online questionnaire using Google Forms. The Google forms were blasted through Messenger in Facebook.

#### 3.3 Development of the Questionnaire

The questionnaire comprises 4 sections. The first part covers the respondent's demographics, which enquires on age, gender, household monthly income and

education level of the respondent. Next, the second section was regarding the knowledge of canine vaccination which consisted of 8 questions using a dichotomous answer: Yes or No. Each appropriate answer will be given 1 point, while the incorrect answer will be given 0 points. The points for each question were totalled for each respondent, which were then assessed into poor, fair or good level of knowledge using a scoring system. Respondents who scored 1 to 3 points will be considered poor, 4 to 6 points as fair and 7 to 8 points as having a good knowledge level.

The attitude section consisted of 13 questions using a Likert scale. Scores were assigned to each response where strongly disagree = 1, disagree = 2, not sure = 3, agree = 4 and strongly agree = 5, with scores of “1 to 5”. This section is assessed through the total scores scored by each respondent. Respondents with 13 to 35 points were considered as poor, 36 to 58 points as fair and 59 to 65 points as good.

The practice section consisted of 6 questions, which were also assessed using a scoring system. The scoring system as such was: Never = 1, Seldom = 2, Frequent = 3, Always = 4 and Everytime = 5. This section is also assessed via the total practice scores, which is the sum of six attitude questions ranging from 6 to 30. If the respondent scored 6 to 15 points, they were considered having poor practice, 16 to 24 points as fair and 25 to 30 points as having good level of practice.

### **3.4 Statistical Analysis of Data**

A pilot study was conducted ( $n=20$ ) and the data was then imported into SPSS. Cronbach alpha was used to measure the internal consistency, which the value of  $\geq 0.7$  is considered acceptable (Hair *et al.*, 2010). A few questions were then added into the attitude section as the



value measured during the first attempt was not acceptable. After the second attempt of pilot study, the value was tested to be acceptable. Hence, improvements were made for the questionnaires before distributing them. The collected data was imported into Microsoft Excel and analyzed using IBM® SPSS® Version 27. The categorical variables were illustrated using descriptive statistics for frequency and percentage, while continuous variables are presented in mean  $\pm$  standard deviation (SD). Kruskal Wallis and Mann-Whitney tests were used to determine the association between the sociodemographic characteristics and KAP scores. Spearman's rho correlations were performed to measure the correlation between the total score for knowledge, mean score for attitude and practice. A  $p$ -value of  $\leq 0.05$  was considered statistically significant.

## CHAPTER 4

### FINDINGS

A total of 103 individuals participated in this study and the study lasted for 4 days, from October 20 to October 24, 2023. However, only 100 responses were included in the final analysis.

#### 4.1 Sociodemographic Characteristics of Respondents

As shown in Table 4.1, most of the respondents ( $n=75$ ) were from the age group between 20 to 29. On the other hand, there were only 1 respondent aged between 40 to 49 years. Furthermore, female respondents constituted a higher percentage in this study (71%) compared to males (29%). Most of the respondents ( $n=59$ ) had an income less than RM4850, whereas 11% ( $n=11$ ) of them earned more than RM10960. And also, the majority of the respondents (85%) had undergone tertiary education while only 1 of them had no formal education.

Table 4.1: Sociodemographics of the surveyed respondents ( $n=100$ ).

Sociodemographic characteristic	Total ( $n=100$ )	
	<i>n</i>	%
<b>Age</b>		
18 - 19	5	5
20 - 29	75	75
30 - 39	4	4
40 - 49	1	1
50 - 59	12	12
60 and above	3	3
<b>Gender</b>		

Female	71	71
Male	29	29

Table 4.1 (continued): Sociodemographics of the surveyed respondents ( $n=100$ ).

Sociodemographic characteristic	Total ( $n=100$ )	
	<i>n</i>	%
<b>Household Monthly Income</b>		
< RM4850	59	59
RM4850 - RM7099	17	17
RM7100 - RM10960	13	13
> RM10960	11	11
<b>Educational Level</b>		
No formal education	1	1
Secondary	14	14
Tertiary (University)	85	85

#### 4.2 Knowledge on Canine Vaccination

Out of the 100 respondents, all of them (100%,  $n=100$ ) were aware that there are vaccinations available for dogs. However, not all of them (18%,  $n=18$ ) knew vaccines are compulsory for dog licensing in Malaysia. Majority of the owners (84%,  $n=84$ ) were aware of the two vaccine categories in dogs which are core (basic) and non-core (optional) vaccines. Moreover, 88% of the respondents were conscious that the vaccine is administered underneath the skin layer of the dog. Besides, pet owners were mindful that canine vaccinations can begin as early as 6 weeks old in puppies (88%,  $n=88$ ). Additionally, 88% ( $n=88$ ) of the respondents also believed that booster vaccination in dogs aged more than 1 year old is done annually. Pet owners were also aware that their dogs might still be infected with the disease even if their dogs had been vaccinated (91%,  $n=91$ ). In the context of protection given by a vaccine, only 67% ( $n=67$ ) of respondents were able to point out that canine vaccination includes protection against Leptospirosis.

Table 4.2: Frequency (*n*) and percentage (%) of responses from respondents (*n*=100) regarding the knowledge on canine vaccination.

Table 4.2 (continued): Frequency (*n*) and percentage (%) of responses from respondents (*n*=100) regarding the knowledge on canine vaccination.

Items	Correct		Incorrect	
	<i>n</i>	%	<i>n</i>	%
There are vaccinations available for dogs.	100	100	0	0
Vaccines are compulsory for dog licensing in Malaysia.	82	82	18	18
There are two vaccine categories in dogs which are core (basic) and non-core (optional) vaccines.	84	84	16	16
Vaccine is administered underneath the skin layer of the dog.	88	88	12	12
Vaccinations can begin as early as 6 weeks old in puppies.	88	88	12	12
Booster vaccination in dogs aged > 1 year old is done annually.	88	88	12	12
Dogs can still be infected with the disease even with vaccination.	91	91	9	9
Canine vaccination includes protection against Leptospirosis ( <i>kencing tikus</i> ) disease	67	67	33	33

### 4.3 Attitude Towards Canine Vaccination

High number of respondents (*n*=82) strongly agreed that having pet dogs vaccinated is important. Additionally, most of the respondents (83%, *n*=83) believed that vaccination is a part of responsible dog ownership. However, only 33% (*n*=33) of

respondents strongly disagreed that vaccination is important only if the dog is living semi-indoor or outdoor. Furthermore, half of the respondents (51%,  $n=51$ ) strongly disagreed that vaccination is important only in multi-dog household. Out of 100 respondents, only 43% ( $n=43$ ) were aware that their dogs are exposed to vaccine preventable diseases from its surrounding. More than half of the total respondents (67% ,  $n=67$ ) chose to vaccinate their dogs on time because they believe vaccination can give their pets a better quality of life. Most of the respondents (70%,  $n=70$ ) also strongly agreed that, by vaccinating their dogs, it will give them protection against common infectious diseases. Around half of the respondents, 33% ( $n=33$ ) and 27% ( $n=27$ ) of them, strongly disagreed and disagreed, respectively regarding old age dogs does not require annual vaccine booster shots. There were 33% ( $n=33$ ) of the respondents disagreed that the vaccine adverse effect outweighs the benefit of vaccination to the dog’s health, but 28% ( $n=28$ ) of the respondents showed uncertainty in this statement. Many of the respondents (69%,  $n=69$ ) strongly agreed with vaccinating their dogs if they understand its benefit. 56% ( $n=56$ ) of the respondents strongly agreed that vaccination may be helpful in avoiding larger medical expenses in future. Unexpectedly, only 30% ( $n=30$ ) of the respondents disagreed that good nutrition and hygiene can replace vaccination for protection against vaccine preventable disease. However, in this case, 27% ( $n=27$ ) of the respondents showed uncertainty. Lastly, most of the respondents (29%,  $n=29$ ) were uncertain about the statement where immune-system improving supplements can replace vaccination for protection against vaccine preventable diseases.

Table 4.3: Frequency ( $n$ ) and percentage (%) of responses from respondents ( $n=100$ ) regarding the attitude towards canine vaccination.

Items	Strongly disagree		Disagree		Not Sure		Agree		Strongly Agree	
	$n$	%	$n$	%	$n$	%	$n$	%	$n$	%

Having pet dogs vaccinated is	2	2	0	0	2	2	14	14	82	82
-------------------------------	---	---	---	---	---	---	----	----	----	----

Table 4.3 (continued): Frequency (*n*) and percentage (%) of responses from respondents (*n*=100) regarding the attitude towards canine vaccination.

Items	Strongly disagree		Disagree		Not Sure		Agree		Strongly Agree	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
important.										
Vaccination is a part of responsible dog ownership.	2	2	0	0	3	3	12	12	83	83
Vaccination is important only if the dog is living semi-indoor or outdoor.	33	33	27	27	12	12	10	10	18	18
Vaccination is important only in multi-dog household.	51	51	25	25	11	11	4	4	9	9
My dog(s) are exposed to vaccine preventable diseases from its surrounding.	7	7	5	5	26	26	19	19	43	43
Vaccinating my dog(s) on time will give them a better quality of life.	2	2	1	1	4	4	26	26	67	67
Vaccinating my dog(s) will give them protection against common infectious diseases.	1	1	2	2	3	3	24	24	70	70
Old age dogs does not require annual vaccine booster shots.	30	30	33	33	22	22	6	6	9	9
Vaccine adverse effect outweighs the benefit of vaccination to the dog(s) health.	21	21	33	33	28	28	8	8	10	10
I agree with vaccination if I	1	1	3	3	3	3	24	24	69	69

understand its benefit.

Vaccination may be 2 2 1 1 8 8 33 33 56 56

Table 4.3 (continued): Frequency (*n*) and percentage (%) of responses from respondents (*n*=100) regarding the attitude towards canine vaccination.

Items	Strongly disagree		Disagree		Not Sure		Agree		Strongly Agree	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
helpful in avoiding larger medical expenses in future.										
Good nutrition and hygiene can replace vaccination for protection against vaccine preventable disease.	24	24	30	30	27	27	12	12	7	7
Immune-system improving supplements can replace vaccination for protection against vaccine preventable diseases.	22	22	27	27	29	29	14	14	8	8

#### 4.4 Practice in Canine Vaccination

Out of the 100 respondents, 40 (40%, *n*=40) of them will set a reminder for their dogs' vaccination appointments everytime. Most of the respondents (65%, *n*=65) will bring their dogs for vaccination everytime. Besides, 66% of the respondents also brought their dogs for vaccination everytime even if they live indoor or within the house compound most of the time.

Half of the respondents (53%, *n*=53) will enquire their veterinarians on the type of vaccine used on their dogs on every vaccination visit. Additionally, 50% (*n*=50) of the respondents will also enquire on the diseases that the vaccine protects against

everytime. Lastly, most of the respondents (61%,  $n=61$ ) will abide to veterinarian's advice for post-vaccination care everytime.

Table 4.4: Frequency ( $n$ ) and percentage (%) of responses from respondents ( $n=100$ ) regarding the practice in canine vaccination.

Practice	Never		Seldom		Frequent		Always		Everytime	
	$n$	%	$n$	%	$n$	%	$n$	%	$n$	%
I set a reminder for my dog's vaccination appointments.	9	9	9	9	19	19	23	23	40	40
I vaccinate my dog(s).	3	3	0	0	8	8	24	24	65	65
I vaccinate my dogs even if they live indoor/within the house compound most of the time.	4	4	2	2	7	7	21	21	66	66
I enquire my veterinarians on the type of vaccine used on my dog(s).	6	6	4	4	13	13	24	24	53	53
I enquire my veterinarian on the diseases that the vaccine protects against.	6	6	5	5	11	11	27	27	51	51
I abide to veterinarian's advice for post-vaccination care.	4	4	2	2	4	4	29	29	61	61

#### 4.5 Respondent's Level of Knowledge, Attitude and Practice

Based on Table 4.5, 73% ( $n=73$ ) of the respondents had good levels of knowledge, whereas 4% ( $n=4$ ) and 23% ( $n=23$ ) of respondents showed poor and fair knowledge levels respectively. Additionally, out of the 100 respondents, 20 of them (20%,  $n=20$ ) showed a good attitude towards canine vaccination, while the other 1 (1%,  $n=1$ ) and 79



(79%,  $n=79$ ) of the respondents showed poor and fair levels of attitude respectively. While for practice, 27% ( $n=27$ ) and 66% ( $n=66$ ) of respondents showed fair and good practices towards canine vaccination respectively. Only 7% ( $n=7$ ) of the respondents showed poor practice towards canine vaccination.

Table 4.1.4: Total scores for knowledge, attitude and practice of respondents ( $n=100$ ) towards canine vaccination.

Variable	Level	Score	Frequency (%)
<b>Knowledge</b>	Poor	1-3	4(4)
	Fair	4-6	23(23)
	Good	7-8	73(73)
<b>Attitude</b>	Poor	13-35	1(1)
	Fair	36-58	79(79)
	Good	59-65	20(20)
<b>Practice</b>	Poor	6-14	7(7)
	Fair	15-24	27(27)
	Good	25-30	66(66)

#### 4.6 Association Between Sociodemographic Characteristics and Total Score of KAP

From Table 4.6, different genders had an impact on the knowledge and practice in canine vaccination. In addition, respondents with different amounts of household monthly income also significantly influences the level of attitude on canine vaccination.

Table 4.1.5: Association between knowledge, attitude and practice with sociodemographic characteristics of dog owners towards canine vaccination.

Socio-demographic Characteristic	Kruskal-Wallis								
	Knowledge			Attitude			Practice		
	H	df	<i>p</i>	H	df	<i>p</i>	H	df	<i>p</i>

<b>Age</b>	4.953	5	0.422	5.954	5	0.311	6.125	5	0.294
<b>Household Monthly</b>	3.588	3	0.310	8.471	3	0.037*	7.516	3	0.057

Table 4.6 (continued): Association between knowledge, attitude and practice with sociodemographic characteristics of dog owners towards canine vaccination.

Socio-demographic Characteristic	Kruskal-Wallis								
	Knowledge			Attitude			Practice		
	H	df	<i>p</i>	H	df	<i>p</i>	H	df	<i>p</i>
<b>income.</b>									
<b>Education Level</b>	2.396	2	0.302	2.002	2	0.367	1.543	2	0.462

	Mann-Whitney					
	U		<i>p</i>		<i>p</i>	
	U	<i>p</i>	U	<i>p</i>	U	<i>p</i>
<b>Gender</b>	647.000	0.000*	902.500	0.334	681.000	0.004*

#### 4.7 Correlation Between Total Knowledge, Attitude and Practice Scores

Based on Spearman's rho correlation test, the correlation between total knowledge, attitude mean and practice mean score was done. Table 4.7 showed a significant positive correlation between total knowledge and attitude score ( $r=0.251$ ). Besides, there was also a significant positive correlation between total knowledge and practice score ( $r=0.433$ ). In addition, the total attitude score also showed a significant positive correlation with the total practice score ( $r=0.429$ ).

Table 4.7: Spearman's rho correlation between total knowledge, attitude and practice scores of the respondents ( $n=100$ ) towards canine vaccination.

Spearman's rho Correlations	TKS		TAS		TPS	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>

<b>TKS</b>	1.000	-	0.251*	0.012	0.433*	0.000
<b>AMS</b>	0.251*	0.012	1.000	-	0.429*	0.000
Table 4.7 (continued): Spearman's rho correlation between total knowledge, attitude and practice scores of the respondents ( $n=100$ ) towards canine vaccination.						
<b>Spearman's rho Correlations</b>	<b>TKS</b>		<b>TAS</b>		<b>TPS</b>	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
<b>PMS</b>	0.433*	0.000	0.429*	0.000	1.000	-

TKS: Total Knowledge Score, TAS: Total Attitude Score, TPS: Total Practice Score  
 \* $p \leq 0.05$

## CHAPTER 5

### DISCUSSION

This study was done to investigate pet owners' knowledge, attitude and practice (KAP) regarding canine vaccination. The data on knowledge indicated that pet owners had a good level of knowledge regarding vaccination in dogs, scoring between 7 to 8 points in the knowledge section, which includes vaccination availability, dog licensing, vaccine categories, route of vaccination, vaccination schedule involving puppies and booster vaccine, risks and Leptospirosis protection. Awuni *et al.* (2019) found that educational level was associated with good knowledge in dog vaccination as education plays an important tool for appropriate health decision-making for their pet dogs (Kazadi *et al.*, 2017). However, more than a quarter of the respondents answered the question on Leptospirosis wrongly. According to a study done in Chile, Leptospirosis is often neglected due to lack of awareness in the human population, besides the disease being under-diagnosed and under-reported (Lélu, M *et al.*, 2015). In addition, a few of the respondents had poor knowledge on canine vaccination. A study performed in Ethiopia showed that there was a relation between dog owners' intention to vaccinate their dogs and their level of knowledge. This may be due to the perceived barriers such as the distance from residence to veterinary clinic and ease of dog transportation (Beyene, A. S. *et al.*, 2018). There may also be lack of information about canine vaccination in owners in urban areas of Peru as well as the lack of information about the

vaccination campaigns, which may contribute to insufficient knowledge (Castillo-Neyra, R. *et al.* 2017).

Concerning attitude towards canine vaccination, most of the respondents appeared to have a fair attitude, scoring between 36 to 58 points in the attitude section. This may be due to other factors like psychological factors and amount of time allocated (Beyene, A. S. *et al.*, 2018). Majority of the dog owners intended to get their dogs vaccinated if the government would provide free canine vaccines (Wera, E. *et al.*, 2016). Most pet owners agreed that having pet dogs vaccinated is important as vaccination can prevent illness, zoonotic diseases and to avoid costly treatments for preventable infectious diseases (AVMA, 2023). Besides, unvaccinated pet dogs are at risk of contracting life-threatening diseases such as rabies and distemper which the viruses are found in wildlife (AVMA, 2023). However, some respondents believed that vaccination is important only if the dog is living semi-indoor or outdoor. Possible reasons would be owners' complacency as they think vaccinations are not necessary because their dog is staying indoor and has limited exposure to potential pathogens, so the risk of contracting certain diseases is significantly lower. Additionally, some dog owners have cost considerations, hence they might prioritize other healthcare aspects of their dog, which make them feel that vaccines are less essential for an indoor dog. There were also respondents who agreed that vaccination is only important in multi-dog households. It is understandable due to increased risk factors, in other words, it means there is a higher chance of disease transmission due to close contact and interaction between dogs. Some infectious diseases are highly contagious like kennel cough or canine influenza which can easily spread in multi-dog household environments due to the dogs living in close proximity. More than half of respondents agreed that vaccinating their dogs can provide better quality of life and protection against common infectious diseases respectively, because the pet owners may be aware of the consequences and severity of the diseases.

Severity of future diseases can be prevented or lessened through vaccination (AVMA, 2023). Most of the respondents strongly disagreed and disagreed that old age dogs do not require annual vaccine booster shots. The respondents might think that it is impossible to induce better immunity by administering repeated vaccinations to their animals (Day, 2016). An amount of 28 respondents were uncertain whether vaccine adverse effects outweigh the benefits of vaccination to dogs' health. Exaggerated fear of the negative side effects towards vaccination has discouraged owners from getting their pet dogs vaccinated (Tizard, I. R., 2021). Another possible reason would be the spreading of misinformation and rumors through social media by those who oppose vaccination (Tizard, I. R., 2021). Hence, dog owners might question the necessity and safety of vaccinating their dogs without assessing reliable and accurate information. Furthermore, many of them strongly agreed to bring their dogs for vaccination if they understand its benefits. Research mentioned that establishing a good relationship with veterinary surgeons had appeared to be motivators for owners to vaccinate their pet dogs (Belshaw, Z. *et al.*, 2018). Dog owners will trust their veterinary surgeons to advise them on preventative medicine products compared to other alternative information sources (Belshaw, Z. *et al.*, 2018). Another important finding was that half of the pet owners believed that they can avoid spending larger medical expenses in future if they get their pet dogs vaccinated. Vaccination serves as a preventive healthcare where it prevents dogs from contracting specific infectious diseases. If the dogs are not vaccinated, it could potentially lead to infection which results in costly medical treatment. Vaccination could also reduce the risk of serious illnesses such as Parvovirus infection, Distemper, etc as these illnesses are expensive to treat and may require intensive care, hospitalization and also medications, which significantly increases the medical expenses. Fortunately, more than half of the respondents did not believe that good nutrition and hygiene can replace vaccination for protection against vaccine

preventable disease. Owners may believe that vaccination can stimulate specific immune responses against particular diseases but good nutrition and hygiene can only contribute to the overall health and immune function in the animal. Although the animal is having good nutrition and hygiene, both of them cannot specifically target and protect the dog against certain pathogens that cause vaccine-preventable diseases. However, it is important that effective vaccination should be accompanied by other disease prevention measures such as good nutrition and hygiene as vaccination is only a part of a broader comprehensive health care plan for each animal (Day, M., 2016). Therefore, vaccination in combination with good nutrition and a clean environment can further minimize the risk of contracting common infectious diseases (Singapore Veterinary Association, 2020). Lastly, some pet owners were uncertain whether immune-system improving supplements can replace vaccination for protection against vaccine preventable diseases. This might be due to the arising studies showing that supplement dogs are likely to have a better resilience to infection through the strengthening of their immune system, for example, studies regarding dogs fed with *Spirulina* (Satyaraj *et al.*, 2021).

This study's pet owners had demonstrated a fair to good level of practice, scoring 15 to 24 and 25 to 30 points respectively. Fair to good level of practice in canine vaccination among owners may be due extensive education and information provided by their veterinarians, reliable sources and also campaigns held. This leads to their awareness on the importance of vaccinations for their pet dogs. Besides, some owners show love and concern for their pets' well-being, where they truly care for their health, well-being and welfare. Additionally, dog owners may be influenced by the practices of other responsible dog owners in their community or social groups. The practice of vaccinating dogs can be reinforced when these dog owners observe others vaccinating their dog regularly. More than half of the respondents will vaccinate their dogs

everytime, but there are still a few pet owners who have never vaccinated their dogs. Pet owners who do not vaccinate their dogs may think that canine vaccines are unsafe, ineffective and not necessary (Singler, E., 2023). In addition, they might have financial constraints, or they believe in natural immunity where they think that their dogs can develop sufficient immunity against the diseases through exposure or by having a strong immune system. Most of the dog owners set a reminder for their dog's vaccination appointments everytime. Setting reminders helps in ensuring that dogs receive these booster shots on time in order to maintain continuous protection against infectious diseases. Moreover, dog owners set reminders hoping to adhere to veterinary recommended schedules for optimal protection. Other reasons could be they are aware of the significance of vaccinating their dogs and a missed of subsequent vaccination dose may affect the effectiveness of the vaccine. Moving on, majority of the respondents will vaccinate their indoor dogs everytime, maybe because they are aware that diseases can be transmitted by human or inanimate objects as vectors. In other words, disease-causing agents can be brought indoors accidentally by humans on clothing, shoes, etc. On top of that, although the dog is living indoors, it might occasionally go for a walk outdoors, have a trip to the vet or even encounter other animals in a shared space, hence, there is increased risk of exposure to infectious diseases like parvovirus infection or leptospirosis. Moreover, a moderate number of respondents will enquire about the types of vaccines and diseases that the vaccine protects against. By enquiring with the veterinarian, owners can understand the specific diseases that each vaccine prevents, and this will facilitate decision making after discussing with their veterinarian. Not to mention owners may seek the information to tailor their pets' vaccination plans based on the individual needs, lifestyle and potential exposure risks of their dogs as not all vaccinations might be necessary for every dog. Furthermore, almost all of the respondents chose to abide by the veterinarian's advice



for post-vaccination care in order to ensure that their pets receive the best possible care post-vaccination. Most of them trust their veterinarian's advice and expertise to provide the best post-vaccination care to ensure well-being and welfare of their dogs.

Statistical analysis proved a correlation between gender and both levels of knowledge and practice in canine vaccination. Variations in the level of knowledge and practices of pet owners may be attributable to differences in gender group. According to the study done by Hagos, W.G. *et al.* (2020), it was found that females were 1.5 times more likely to have good knowledge towards rabies, which is one of the infectious diseases that vaccines can protect against, compared to male respondents. Besides, females have been reported to have higher levels of empathy towards animals, hence be more interested in health-related topics and possess primary responsibility to prioritize the well-being of their pet dogs, including vaccination. Another study revealed that males had lower practice scores ( $p=0.038$ ) towards rabies (Iddi, S. *et al.*, 2023). Another significant result had indicated a correlation between pet owners' household monthly income and attitude towards canine vaccination. In this case, the correlation demonstrates that a person's level of attitude increases in proportion to their monthly income, meaning that the higher their monthly income, they will have a better attitude towards their dogs' vaccination. A study in Uganda revealed that all dogs in higher income villages were reportedly vaccinated against rabies (Wallace, R.M. *et al.*, 2017). On the other hand, dog owners who earned more will have a better attitude towards canine vaccination because money is not an issue, so the owner can bring their dogs for annual vaccines without concern for the lack of money to do so.

There was a positive correlation between total knowledge and attitude scores. Research revealed dog owners' knowledge about infectious diseases, which is rabies, was found to be positively associated with the intention to vaccinate their dogs (Beyene, A.S. *et al.*, 2018b). From this, we can conclude that the dog owners' attitude towards

canine vaccination are influenced by their level of knowledge regarding dog vaccines and common infectious canine diseases in Penang. Besides, there was also a significant positive association between total knowledge and practice scores. A study suggested that respondents with better knowledge are more likely to seek medical treatment for their pets and also post-exposure prophylaxis (Premashthira, S. *et al.*, 2021). Therefore, we can conclude that the dog owners' practice in preventing and controlling common infectious diseases in dogs are influenced by their level of knowledge regarding significance of canine vaccination. Lastly, positive correlation did exist between total attitude and practice scores. A study was done in Burkina Faso to assess the factors associated with pet dogs' vaccination against rabies. The owners who bought their dogs may pay more attention to their healthcare including rabies vaccinations, hence, their dogs will be more likely to be vaccinated. On top of that, these owners were mostly professionals. Thus, this study concluded that the attitude of these dog owners would explain why the dogs bought by them were more likely to be vaccinated ( $p < 0.05$ ) (Savado, M. *et al.*, 2021). This indicates that a certain level of attitude towards canine vaccination may aid in carrying out good practice to maximize well-being and health of their dogs.

## CHAPTER 6

### CONCLUSION

Most pet owners in Penang showed good levels of knowledge, fair levels of attitude and fair levels of practice towards canine vaccination in order to control and prevent common infectious diseases in dogs. This study benefits various parties in determining how well pet owners perceive canine vaccination. However, there is still a knowledge gap among pet owners regarding the types of vaccines and the types of disease protection given by a vaccine. Therefore, additional efforts should be made to educate the public on the significance of vaccination in dogs as well as the basic knowledge relating to vaccines as mentioned above.

For recommendations, a larger sample size should be considered to better represent the whole population in Penang. Additionally, an equal number of responses should be collected from each part of Penang, which includes the island and mainland. Secondly, it is important to reduce participants' bias as some of them might not answer the questions based on what they think or according to research. Moreover, the questionnaire should include more questions in the knowledge and practice sections to give a more accurate assessment on the levels of knowledge and practice towards vaccination in dogs. Lastly, the questionnaire should also include more sociodemographic characteristics such as occupational background, marital status, etc while involving larger amounts of targeted responses in order to achieve better analysis results in assessing the knowledge, attitude and practice towards canine vaccination among pet owners in Penang.

## REFERENCES

- Alfano, F., Fusco, G., Mari, V., Occhiogrosso, L., Miletti, G., Brunetti, R., Galiero, G., Desario, C., Cirilli, M., & Decaro, N. (2020). Circulation of pantropic canine coronavirus in autochthonous and imported dogs, Italy. *Transboundary and Emerging Diseases*. <https://doi.org/10.1111/tbed.13542>
- Appel M. J. (1999). Forty years of canine vaccination. *Advances in veterinary medicine*, 41, 309–324. [https://doi.org/10.1016/s0065-3519\(99\)80023-8](https://doi.org/10.1016/s0065-3519(99)80023-8)
- Awuni, B., Tarkang, E. E., Manu, E., Amu, H., Ayanore, M. A., Aku, F. Y., Zieme, S. A., Bosoka, S. A., Adjuik, M., & Kweku, M. (2019). Dog Owners' Knowledge about Rabies and Other Factors That Influence Canine Anti-Rabies Vaccination in the Upper East Region of Ghana. *Tropical Medicine and Infectious Disease*, 4(3), 115. <https://doi.org/10.3390/tropicalmed4030115>
- Bamaiyi P. H. (2015). 2015 outbreak of canine rabies in Malaysia: review, analysis and perspectives. *Journal of Veterinary Advances* 5(12):1. DOI: 10.5455/jva.19691231040000  
[https://www.researchgate.net/profile/Pwaveno-Bamaiyi/publication/288021974\\_2015\\_Outbreak\\_of\\_Canine\\_Rabies\\_in\\_Malaysia\\_Review\\_Analysis\\_and\\_Perspectives/links/56922ac708aed0aed8161163/2015-Outbreak-of-Canine-Rabies-in-Malaysia-Review-Analysis-and-Perspectives.pdf?\\_sg%5B0%5D=started\\_experiment\\_milestone&origin=journalDetail](https://www.researchgate.net/profile/Pwaveno-Bamaiyi/publication/288021974_2015_Outbreak_of_Canine_Rabies_in_Malaysia_Review_Analysis_and_Perspectives/links/56922ac708aed0aed8161163/2015-Outbreak-of-Canine-Rabies-in-Malaysia-Review-Analysis-and-Perspectives.pdf?_sg%5B0%5D=started_experiment_milestone&origin=journalDetail)
- Beyene, A. S., Mindaye, B., Leta, S., Cernicchiaro, N., & Revie, C. W. (2018). Understanding factors influencing dog owners' intention to vaccinate against rabies evaluated using health belief model constructs. *Frontiers in Veterinary Science*, 5. <https://doi.org/10.3389/fvets.2018.00159>
- Castillo-Neyra, R., Brown, J., Borrini, K., Arevalo, C., Levy, M. Z., Bittenheim, A., Hunter, G. C., Becerra, V., Behrman, J., & Paz-Soldan, V. A. (2017). Barriers to dog rabies vaccination during an urban rabies outbreak: Qualitative findings from Arequipa, Peru. *PLoS neglected tropical diseases*, 11(3), e0005460. <https://doi.org/10.1371/journal.pntd.0005460>
- Cs, C., Dlc, N., Wj, C., Yz, T., Sindeh, W., Ibrahim, M. A., Sf, B. S., & Sb, T. (2022). Knowledge, attitude, and practices among the general population during the later stage of the COVID-19 pandemic in Malaysia: a Cross-Sectional study. *Risk Management and Healthcare Policy*, Volume 15, 389–401. <https://doi.org/10.2147/rmhp.s349798>
- Day, M. J., Horzinek, M. C., Schultz, R. D., Squires, R. A., & Vaccination Guidelines Group (VGG) of the World Small Animal Veterinary Association (WSAVA) (2016). WSAVA Guidelines for the vaccination of dogs and cats. *The Journal of small animal practice*, 57(1), E1–E45. [https://doi.org/10.1111/jsap.2\\_12431](https://doi.org/10.1111/jsap.2_12431)

- Ellis, J., Marziani, E., Aziz, C., Brown, C., Cohn, L. A., Lea, C., Moore, G. E., & Taneja, N. (2022). 2022 AAHA Canine vaccination guidelines. *Journal of the American Animal Hospital Association*, 58(5), 213–230. <https://doi.org/10.5326/jaaha-ms-canine-vaccination-guidelines>
- Ellis, W. (2014). Animal leptospirosis. In *Current Topics in Microbiology and Immunology* (pp. 99–137). [https://doi.org/10.1007/978-3-662-45059-8\\_6](https://doi.org/10.1007/978-3-662-45059-8_6)
- Hagos, W. G., Muchie, K. F., Gebru, G. G., Mezgebe, G. G., Reda, K. A., & Dachew, B. A. (2020). Assessment of knowledge, attitude and practice towards rabies and associated factors among household heads in Mekelle city, Ethiopia. *BMC public health*, 20(1), 57. <https://doi.org/10.1186/s12889-020-8145-7>
- Hair, J. F., Black, W. C., Babin, B. J. & Anderson, R. E. (2010). *Multivariate Data Analysis*, 7th ed.; Prentice Hall: Upper Saddle River, NJ, USA.
- Headley S.A., Alfieri A.A., Fritzen J.T.T., Garcia J.L., Weissenböck H., Silva A.P., Bodnar L., Okano W., Alfieri A.F. (2013). Concomitant canine distemper, infectious canine hepatitis, canine parvoviral enteritis, canine infectious tracheobronchitis, and toxoplasmosis in a puppy. *Journal of Veterinary Diagnostic Investigation*. 25(1), 129–135. <https://doi.org/10.1177/1040638712471344>
- Iddi, S., Mlenga, F., Hamasaki, K., Mwita, S., & Konje, E. (2023). Assessment of knowledge, attitude, and practice of dog owners to rabies disease in Kahama town council, Shinyanga region, Tanzania. *PLOS Neglected Tropical Diseases*, 17(9), e0011580. <https://doi.org/10.1371/journal.pntd.0011580>
- Lau, S. F., Low, K. N., Khor, K. H., Roslan, M. A., Bejo, S. K., Radzi, R., & Bahaman, A. R. (2016). Prevalence of leptospirosis in healthy dogs and dogs with kidney disease in Klang Valley, Malaysia. *Tropical biomedicine*, 33(3), 469–475. <https://pubmed.ncbi.nlm.nih.gov/33579118/>
- Lelu, M., Muñoz-Zanzi, C., Higgins, B. et al. Seroepidemiology of leptospirosis in dogs from rural and slum communities of Los Rios Region, Chile. *BMC Vet Res* 11, 31 (2015). <https://doi.org/10.1186/s12917-015-0341-9>
- Li, D., Liu, Q., Fan, C., Jiang, Q., Wang, T., Yin, X., Lu, Z., & Cao, S. (2021). Knowledge, attitudes, and practices regarding rabies and its prevention and control among bite victims by suspected rabid animals in China. *One Health*, 13, 100264. <https://doi.org/10.1016/j.onehlt.2021.100264>
- Matibag, G. C., Kamigaki, T., Kumarasiri, P. V. R., Wijewardana, T., Kalupahana, A. W., Dissanayake, D. R. A., De Silva, D. D. N., De S Gunawardena, G. S. P., Obayashi, Y., Kanda, K., & Tamashiro, H. (2007). Knowledge, attitudes, and practices survey of rabies in a community in Sri Lanka. *Environmental Health and Preventive Medicine*, 12(2), 84–89. <https://doi.org/10.1007/bf02898154>
- M. J. Day, M. C. Horzinek, R. D. Schultz and R. A. Squires. (2016). Guidelines for the

- vaccination of dogs and cats. *Journal of Small Animal Practice*. 57. <https://wsava.org/wp-content/uploads/2020/01/WSAVA-Vaccination-Guidelines-2015.pdf>
- Navanithakumar B., Sohayati A.R., Rohaiza Y., Sarah Dagang A., Mariani H., Leonora T.M., & Dorothy K.S. (2019). An overview of rabies outbreaks in Malaysia, ordinances and laws. *Malaysian Journal of Veterinary Research*. 10, 148-158. [https://www.dvs.gov.my/dvs/resources/user\\_16/MJVR%20Vol.10%20No.2%20\(2019\)/MJVR-V10N2-p148-158.pdf](https://www.dvs.gov.my/dvs/resources/user_16/MJVR%20Vol.10%20No.2%20(2019)/MJVR-V10N2-p148-158.pdf)
- Posuwan, N., Payungporn, S., Thontiravong, A., Kitikoon, P., Amonsin, A. & Poovorawan, Y. (2010). Prevalence of respiratory viruses isolated from dogs in Thailand during 2008-2009. *Asian Biomedicine*, 4(4) 563-569. <https://doi.org/10.2478/abm-2010-0071>
- Premashtira, S., Suwanpakdee, S., Thanapongtharm, W., Sagarasaeranee, O., Thichumpa, W., Sararat, C., & Wiratsudakul, A. (2021). The impact of socioeconomic factors on knowledge, attitudes, and practices of dog owners on dog rabies control in Thailand. *Frontiers in Veterinary Science*, 8. <https://doi.org/10.3389/fvets.2021.699352>
- Satyaraj, E., Reynolds, A., Engler, R., Labuda, J., & Sun, P. (2021). Supplementation of Diets With Spirulina Influences Immune and Gut Function in Dogs. *Frontiers in nutrition*, 8, 667072. <https://doi.org/10.3389/fnut.2021.667072>
- Savadogo, M., Tialla, D., Ouattara, B., Dahourou, L. D., Ossebi, W., Ilboudo, S. G., Combari, A. H. B., Tarnagda, Z., & Alambédji, R. B. (2021). Factors associated with owned-dogs' vaccination against rabies: A household survey in Bobo Dioulasso, Burkina Faso. *Veterinary Medicine and Science*, 7(4), 1096–1106. <https://doi.org/10.1002/vms3.468>
- Singapore Vaccination Guidelines For Dogs and Cats 2020 (n.d.). [https://sva.org.sg/wp-content/uploads/2020/11/Singapore-Vax-Guidelines-version-final\\_FINAL.pdf](https://sva.org.sg/wp-content/uploads/2020/11/Singapore-Vax-Guidelines-version-final_FINAL.pdf)
- Singler, E. (2023, September 9). *New study explores vaccine hesitancy in dog owners*. AAHA. <https://www.aaha.org/publications/newstat/articles/2023-09/new-study-explores-vaccine-hesitancy-in-dog-owners/#:~:text=The%20researchers%20documented%20that%2C%20among,least%20one%20of%20these%20positions.>
- Timurkan, M.O., Aydin, H., Dincer, E. et al. Molecular characterization of canine coronaviruses: an enteric and pantropic approach. *Arch Virol* 166, 35–42 (2021). <https://doi.org/10.1007/s00705-020-04826-w>
- Tizard, I. R. (2021). Adverse consequences of vaccination. In *Elsevier eBooks* (pp. 115-130.e1). <https://doi.org/10.1016/b978-0-323-68299-2.00019-8>
- Ung, B., Kamyngkird, K., & Phimpraphai, W. (2021). Knowledge, attitude, and practices associated with rabies in villages with different dog vaccination statuses in Cambodia. *Veterinary World*, 2178–2186. <https://doi.org/10.14202/vetworld.2021.2178-2186>

- Wallace, R.M., Mehal, J., Nakazawa, Y. et al. The impact of poverty on dog ownership and access to canine rabies vaccination: results from a knowledge, attitudes and practices survey, Uganda 2013. *Infect Dis Poverty* 6, 97 (2017). <https://doi.org/10.1186/s40249-017-0306-2>
- Wera, E., Mourits, M., & Hogeveen, H. (2016). Intention of dog owners to participate in rabies control measures in Flores Island, Indonesia. *Preventive Veterinary Medicine*, 126, 138–150. <https://doi.org/10.1016/j.prevetmed.2016.01.029>
- 2021, September 1. Immunization Basics. *Centers for Disease Control and Prevention*. <https://www.cdc.gov/vaccines/vac-gen/imz-basics.htm>
2017. Get vaccination as a precaution, pet owners told. *The Star*. <https://www.thestar.com.my/news/nation/2017/07/19/get-vaccination-as-a-precaution-pet-owners-told>