

**KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARD CANINE
CARDIAC DISEASE AMONG DOG OWNERS IN MALAYSIA**

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CERTIFICATION

This is to certify that we have read this research paper entitled '**Knowledge, Attitude and Practice Towards Canine Cardiac Disease Among Dog Owners in Malaysia**' by Zulfah Alawiah Binti Mohd Abbas, and in our opinion, It is satisfactory in terms of scope, quality, and presentation as partial fulfilment of the requirement for the course DVT 5436 – Research Project.



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Thank You

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DEDICATION

I dedicate my dissertation work to my family and my friends. A special feeling of gratitude to my dearest parents Dr. Mohd Abbas Bin Abdul Razak and Zarina Iqbal for always being there for me, believing in me, and supporting me. Also, my little brother Ahmad Ziyaad.

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ABSTRACT

An abstract of the research paper presented to the Faculty of Veterinary Medicine, University Malaysia Kelantan, in partial requirement on the course DVT 5436 – Research Project.

Canine cardiac disease is a very common disease occurring worldwide. This study was conducted to determine the knowledge, attitude, and practice (KAP) of dog owners in Malaysia toward canine heart diseases. A self-administered online based questionnaire was distributed to dog owners and data was able to be collected from a total of 156 respondents. The questionnaire inquired about the owner's ability to identify the clinical signs, risk factors, types of canine cardiac disease and also dog owner's attitude and practice towards canine cardiac disease. Data collected was entered and analysed using the Statistical Package for Social Sciences (SPSS) version 28. Numerical data was presented in the form of standard deviations and means. Categorical data was presented in the form of percentages. The total knowledge, attitude and practice score was then computed.

Overall, dog owners in Malaysia have a good knowledge, moderate attitude and good practice toward canine heart disease. These findings could aid veterinarians in conducting a more thorough and detailed consults and client education in improving the knowledge, attitude and practice among dog owners in Malaysia towards canine cardiac disease.

Key words: *Canine, Cardiac disease, Knowledge, Attitude and practice*

ABSTRAK

Abstrak daripada kertas penyelidikan dikemukakan kepada Fakulti Perubatan Veterinar, Universiti Malaysia Kelantan untuk memenuhi sebahagian daripada keperluan kursus DVT 5436 – Projek Penyelidikan.

Penyakit jantung dalam anjing merupakan satu penyakit yang biasa dialami oleh anjing di seluruh dunia. Penyelidikan ini dijalankan untuk mengetahui aras pengetahuan, sikap dan tindakan para pemelihara anjing di Malaysia terhadap penyakit jantung dalam anjing. Satu borang soal selidik telah dihebahkan secara atas talian dan sebanyak 156 orang responden telah berjaya diperoleh. Soal selidik yang disediakan merangkumi soalan-soalan berkaitan dengan kebolehan pemelihara anjing untuk mengenal pasti tanda-tanda klinikal penyakit jantung dalam anjing, faktor yang meningkatkan risiko untuk mendapatkan penyakit jantung dalam anjing, jenis-jenis penyakit jantung di dalam anjing, dan sikap serta tindakan pemilik anjing terhadap penyakit jantung dalam anjing. Data yang diperoleh telah dikumpulkan, direko dan dianalisa menggunakan “Statistical Package for Social Science”(SPSS) versi 28. Data numerikal direkodkan dalam bentuk sisihan piawai dan purata. Data kategorikal direkod dalam bentuk peratusan. Daripada data yang direkodkan, aras pengetahuan, sikap, dan tindakan para pemelihara anjing di Malaysia terhadap penyakit jantung anjing telah dihitung. Secara keseluruhan, pemelihara anjing di Malaysia mempunyai pengetahuan yang baik, sikap yang sederhana dan tindakan yang baik terhadap penyakit jantung dalam anjing. Data dan dapatan yang diperoleh akan dapat membantu para doktor veterinar dalam menjalankan konsultasi yang lebih terperinci dan menyeluruh kepada pelanggan dalam meningkatkan tahap pengetahuan, sikap dan tindakan para pemelihara anjing Malaysia terhadap penyakit jantung dalam anjing.

Kata kunci: Anjing, penyakit jantung, pengetahuan, sikap, tindakan

1.0 INTRODUCTION

Canine heart disease is defined as any functional, structural, or electrical abnormalities of the heart (Kittleson, 2016). An estimated 10% of dogs presented to veterinary practices have heart disease (Atkins et al, 2019).

Canine heart disease can be caused by congenital, infectious, genetic, or acquired aetiologies (Kittleson, 2016). Common congenital heart diseases in dogs are patent ductus arteriosus, pulmonic stenosis, aortic stenosis, persistent right aortic arch and ventricular septal defect. It is mostly seen in pure breed dogs such as Boxer, German Shepherd and French Bulldog (Brambilla, 2020).

For acquired canine heart disease, myxomatous mitral valve disease (MMVD) is common and commonly occurs in middle to old aged small breed dogs (Sin, 2021). The most common genetic related canine heart disease would be dilated cardiomyopathy (DCM) in large breeds dog (Sin, 2021). Next, a common parasitic cause of canine heart disease is canine heartworm disease due to *Dirofilaria immitis* (Noack, 2021). Dogs becomes infected when an infected mosquito bites a naïve dog and allows the entry of the microfilariae into the circulatory system eventually the adult worms infiltrate in the right ventricle leading to right sided heart failure (Noack, 2021). The infectious causes of canine cardiac disease is usually due to valvular endocarditis which may be caused by bacteraemia from distant infections within the body leading to the endocardial surface of the valve being infected directly by the blood passing over it (Brusch, 2021). Commonly isolated agents causing valvular endocarditis are *Staphylococcus* spp, *Streptococcus* spp, *Escherichia coli* and *Corynebacterium* spp (Murphy, 2018). Common clinical presentations of canine cardiac disease are weakness, exercise intolerance, haemoptysis, syncope, cachexia, coughing, dyspnoea and ascites (Sin, 2021).

This study aims to determine the knowledge, attitude and practice of dog owners in Malaysia towards canine heart disease. The data collected would be vital in recognising what dog owners know or do not about canine heart disease. This data will help veterinarians in providing a more detailed and thorough client education and awareness among clients with regards to canine cardiac disease. This way, veterinarians can strategize or improvise in client education and help improve dog owners awareness and attitude towards canine cardiac diseases. This would help in the ability of owners to associate certain clinical signs to cardiac disease and their dogs can be brought in to be screened and checked hence, early medical intervention can be made that increases the prognosis of the patient.

2.0 RESEARCH PROBLEM

Canine cardiac disease is a very common disease occurring worldwide. The increase in dog ownership in Malaysia, brings about an increase in the occurrence rate of canine cardiac diseases. Hence, prompt identification of cardiac diseases clinical signs by owners is crucial for treating the disease. This study was conducted to determine the knowledge, attitude and practice of dog owners in Malaysia towards canine heart diseases

3.0 RESEARCH QUESTIONS

- 3.1** What is the level of knowledge of dog owners in Malaysia towards canine cardiac disease?
- 3.2** What are the attitudes of dog owners in Malaysia towards canine cardiac disease?
- 3.3** What are the practices among dog owners in Malaysia in dealing with canine heart d'

4.0 RESEARCH HYPOTHESIS

- 4.1** Dog owners in Malaysia have appreciable knowledge of canine cardiac disease.
- 4.2** Dog owners in Malaysia have good attitude towards canine cardiac disease.
- 4.3** Dog owners in Malaysia have acceptable practices towards canine cardiac disease.

5.0 OBJECTIVES

5.1 To determine the level of knowledge among dog owners in Malaysia about canine cardiac disease.

5.2 To assess the attitude of dog owners in Malaysia towards canine cardiac disease.

5.3 To determine the practices among dog owners in Malaysia in dealing with canine cardiac disease.



6.0 LITERATURE REVIEW

6.1 DOG POPULATION AND OWNERSHIP IN MALAYSIA

The total canine population in Malaysia including stray dogs is 402,500 as of 2018 (The Star, 2019). From the total population of 32.7 million Malaysians in 2021 (Mahidin,2021), the number of dog owners in Malaysia is still undocumented.

6.2 PREVALENCE OF CANINE CARDIAC DISEASE IN MALAYSIA

From a study that involved data from 264 dogs, the most prevalent canine cardiac disease in Malaysia was MMVD accounting for 65.68% followed by DCM (Sin, 2021). MMVD commonly occurs in small breed dogs that are 7 years and above. It was also found out that male dogs were more prevalent at developing MMVD with 54.3% of the dogs from the same study (Sin, 2021).MMVD involves progressive degeneration of the left atrioventricular valve (Qinhong et al, 2019). The most greatly affected breed is the King Charles Cocker Spaniel. Male dogs are also 1.5 times more commonly affected by MMVD compared to female dogs. MMVD seems to be an age-related disease with 85% of dogs seeming to be showing valvular lesion by the age of 13 (Atkins et al 2019).

As for DCM, the second most prevalent canine heart disease in Malaysia, the overall prevalence of DCM in the general canine population is 0.5-1.1%. This cardiomyopathy represents 11% of all cardiac diseases in dogs. The prevalence of this disease is 5 times greater in pure-bred dogs (0.65%), than in mixed-breed dogs (Sin, 2021). For canine heartworm disease in Malaysia, it has a prevalence of 3.85% with 93% of cases involving dogs that are not on vigorous heartworm protection plan (Chelliah,2019).

6.3 CLINICAL PRESENTATION OF CANINE CARDIAC DISEASE

Most clinical case of canine cardiac disease were presented with a history of nocturnal coughing (2.55%), exercise intolerance (1.82%), abdominal distension (1.45%), partial or complete anorexia (1.82%), dullness and depression (0.72%) and cachexia (0.72%) were the most common (Devi, 2009).

Dyspnoea is the most commonly seen sign in canine cardiac disease. Dyspnoea means difficult, laboured or painful breathing that is usually preceded by tachypnoea. Cardiac disease patients will become dyspnoeic during or after activity or exercise and owners also will complain that their dog may be exercise intolerant (Troxel, 2013). Other than that, dogs with cardiac disease usually will have coughing as one of their clinical signs. Coughing is defined as a sudden, forced expiration and is a normal and expected mechanism to clear debris from the tracheobronchial tree. A cardiac cough is usually caused by left sided heart failure which leads to development of pulmonary oedema and the oedema fluid accumulates in the airways. The cough is also characterised as soft and moist and may produce blood tinged sputum (Ferasin, 2019).

Other related clinical signs exhibited by cardiac patients develop syncope which is characterised by a sudden, momentary loss of consciousness with loss of postural tone (Baldwin, 2022). Syncope should not be confused with seizures, dogs undergoing syncope are quick to recover and would not have facial fits, tonic/clonic motion, prodromal aura and neurological deficits. Syncope occurs when there is decreased cerebral perfusion related to reduced cardiac output in cardiac patients (Dutton, 2016).

6.4 DIAGNOSTIC METHODS FOR CANINE CARDIAC DISEASE

6.4.1 THORACIC RADIOGRAPHY

Thoracic radiography helps identify incidences of pulmonary oedema associated with congestive heart failure and also helps in assessment of the cardiac size and shape (Alvarez et al, 2016). Cardiac size can be evaluated using the vertebral heart score (VHS). VHS is calculated by measuring the long axis of the heart from the carina to the apex and measuring the short axis which is at the widest part of the heart which is perpendicular to the long axis, these measurements will then be transferred to the cranial edge of the fourth thoracic vertebrae and then the number of vertebrae that falls within the short and long axis will be counted (Buchanan, 2017). Normal VHS values in dogs is around 9.2-10.5 and values above 10.5 is considered cardiomegaly in dogs. However, thoracic radiographs should not be used as a sole diagnostic method for canine heart disease (Lamb, 2002).

6.4.2 ECHOCARDIOGRAPHY

Echocardiography is the most valuable diagnostic tool when it comes to diagnosing the different types of cardiac diseases in dogs as it helps to assess cardiac chamber size, normal heart functions, motion and assess speed of blood flow of the heart (Jacqueline, 2020). With echocardiography also, the doppler mode is used to estimate the velocity and direction of blood flow or myocardial motion (Sin, 2021). Echocardiography is also a vital tool in monitoring progression of the disease in dogs with cardiac disease (Jacqueline, 2020).

6.4.3. ELECTROCARDIOGRAPHY (ECG)

An electrocardiogram is a voltage time graph of the electrical activities of the heart and it is a non-invasive tool to monitor the heart rate, cardiac rhythm and conductivity of the heart (Klabunde, 2019). The repolarisation and depolarisation of the myocardium creates

specific waveforms may be able to give a clue on occurrence of cardiac disease in patients particularly when arrhythmias are picked up during the physical examination (Jacqueline, 2020). In cases of transient arrhythmias, long-term ECG monitoring needs to be done using a Holter monitor which is more accurate as it provides an all day, 24 hours long, at home monitoring of the dogs heart rhythm and will not be affected by hospital settings and environment (Hoque, 2019).

6.4.4 CARDIAC BIOMARKERS

Cardiac biomarkers can be used as a marker for pathological activities taking place in the heart and the two most used cardiac biomarkers in the veterinary field are the B-type natriuretic peptide (BNP) and also cardiac troponins (Andrei,2016). BNP is a hormone that is produced by the myocytes, in cases where the heart is stretched as is the case for most canine heart cardiac disease, the hormone is released into the blood. Low concentrations of BNP circulates at all time but in the presence of an underlying heart disease the circulating value of cardiac BNP will be elevated (Fries, 2019). Cardiac troponins are proteins in cardiomyocytes and will be elevated in cases where there is myocardial damage. Although they are expressed in the skeletal muscle as well, the cardiac troponin released by the heart has specific amino acid making its detection specifically indicating myocardial damage (Fries, 2019).

6.5 TREATMENT FOR CANINE CARDIAC DISEASE

Treatment aims to manage the progress of the clinical signs as there is no cure for canine cardiac disease (Oyama, 2009). Cardiac disease patients can be started on diuretics like furosemide to help reduce and control the pulmonary oedema (Cunningham, 2020). These dogs can be started on Angiotensin Converting Enzyme (ACE) inhibitors like enalapril or benazepril which helps to prevent the conversion of angiotensin I to angiotensin II which helps create vasodilation as angiotensin II has vasoconstriction properties which causes the narrowing of the vessels and leads to hypertension (Oyama, 2009).

Next, the dog would be supplemented with positive inotropic drugs such as pimobendan that can help to increase the cardiomyocytes contractility by promoting binding of calcium to troponin C within the heart (Cunningham, 2020). Prescription with beta-blockers such as atenolol to increase cardiac contractility is recommended in cardiac patients (Swift, 2018).

7.0 MATERIALS AND METHODS

7.1 RESEARCH DESIGN

A cross sectional study was done that targeted dog owners in Malaysia. The study period was conducted from 1st of February till 30th March 2022 .

7.2 SELECTION CRITERIA

Respondents were dog owners from Malaysia, who were willing to participate in the questionnaire. The respondents also are required to have access to smartphones or computers and also have a history of dog ownership.

7.3 SAMPLING PROCEDURE

A self-administered online based questionnaire was done where the questionnaire was emailed to dog owners in Malaysia. Different social media platforms were also used to distribute the questionnaire such as in Facebook and also WhatsApp. On Facebook, several animal lovers Facebook page as well as dog shelter societies across Malaysia were contacted to help distribute the questionnaire. A total of 156 dog owners from all over Malaysia participated in the study. Sampling was done using a convenience sampling method.

7.4 MEASUREMENT TOOL

A self-administered questionnaire was adapted from a study entitled ‘Assessment of Knowledge, attitude and practice on livestock traceability among cattle farmers and cattle traders in peninsular Malaysia and its impact on disease control’ by A.B. Salina. The questionnaire was written in English. The questionnaire was then distributed to 10 respondents as a pilot study and for validation.

The questionnaire consisted of 4 parts. Part 1 consisted of questions with regards to respondents' socio-demographic information. Part 2 asked questions with regards to respondents' knowledge on canine cardiac disease. A total of 7 questions were asked under the knowledge section pertaining to occurrence, clinical signs and associated risk factors of canine heart disease. Part 3 consisted of 6 questions inquiring on respondents' attitude towards canine cardiac disease. Lastly, part 4 consisted of questions regarding respondents' level of practice towards canine cardiac disease.

Respondents were given yes or no choices for questions to gauge the knowledge of the owners' whereby a 'no' answer was considered as 0 points and a 'yes' answer, 1 point. The total knowledge score with more than 60% is said to be of good knowledge and below

that is poor knowledge. Next, for the attitude question, respondents were to select between agree, disagree, neither, strongly disagree or strongly agree. Each response will be given 1 to 5 points respectively. A total attitude score above 80% indicated a good attitude, 60%-79% indicates moderate attitude and less than 59% is unacceptable attitude score. Lastly, pertaining to the questions about the practice, respondents will choose between always, never, seldom which will be given 1 – 3 marks respectively. With regards to the practice, a total practice score above 80% is considered as acceptable practice and anything less than 80% considered unacceptable practice towards canine cardiac disease.

7.5 DATA ANALYSIS

Data collected was entered and analysed using the Statistical Package for Social Sciences (SPSS) Version 28. Numerical data was presented in the form of standard deviations and means. Categorical data was presented in the form of percentages. To assess the level of KAP, each variable was assigned respective scores and the total scores were tabulated to obtain the total KAP score. Chi square test was used to assess the association between socio-demographic data and the level of KAP where ($p < 0.05$) indicates significant association between the two data. Other than that, in order to describe the strength and direction of the relationship among knowledge, attitude and practice, Pearson correlation coefficient was used. The following criteria was used to assess the level of correlation between the variables, 0–0.25 = weak correlation, 0.25–0.5 = fair correlation, 0.5–0.75 = good correlation and greater than 0.75 = excellent correlation

8.0 RESULTS

The ages of the respondents ranged from 18-74 years old. Ages of the respondent's dogs were divided into five age classes with dogs aged five months and below being categorised as puppy, six months to 12 months categorised as juvenile, one years to six years categorised as adult, seven years to eleven years categorised as senior, twelve years and above considered as geriatric. The result obtained was that 44.2% of the dogs are adult dogs which makes up the majority of the age class. Other than, most of the respondents are female which makes up about 83.9% of the total number of the respondents. As for the respondent's dog, 49.4% of the dogs owned by the respondents were female dogs followed by 50.6% of the dogs owned were male dog.

Furthermore, the majority is a single-dog household, 54.8%. Highest number of respondents are from Selangor, 36.5% of total respondents, followed by Pulau Pinang at 16.7%. Other than that, 71.8% of the respondents' level of education is at the bachelor's level 14.7% of them possess a master degree 1.3 % of total respondents with doctorate. The monthly household income for most respondents is between RM1200 to RM 5000. As for years of experience taking care of dog(s), 32.1 % of respondents have more than 10 years of experience of taking care of dog(s). Lastly, most of the respondents keep their dogs as pets 68.6%, stray dog/rescue with 23.1 % and only 8.3 % as guard dogs.

Table 8.1: tabulation of socio-demographic data

Variables	Mean (SD)	Frequency (%)
Age of respondents	33.34 (10.724)	
Age of dog		
Puppy		19 (12.2)
Adult		69 (44.2)
Senior		52 (33.3)
Geriatric		16 (10.3)
Respondents gender		
Female		
Male		130 (83.9)
		25 (16.1)
Dog's gender		
Female		77 (49.4)
Male		79 (50.6)
Number of dog's owned by respondent's		
Single dog household		85 (54.8)
Multi-dog household		70 (45.2)
State of origin		
Selangor		57 (36.5)
Kedah		10 (6.4)
Pahang		2 (1.3)
Kelantan		2 (1.3)
Terengganu		2 (1.3)
Pulau Pinang		26 (16.7)
Melaka		4 (2.6)
Negeri Sembilan		15 (9.6)
Johor		16 (10.3)
Sarawak		8 (5.1)

Perak	14 (9.0)
Level of education	
Secondary	19 (12.2)
Bachelors	112 (71.8)
Masters	23 (14.7)
Doctorate	2 (1.3)
Monthly household income	
<RM1200	19 (12.2)
RM1200-RM5000	69 (44.2)
RM5000-RM10,000	37 (23.7)
>RM10,000	31 (19.9)
Years of experiencing in keeping dog(s)	
Less than 1 years	48 (30.8)
2-5 years	41 (26.3)
6-10 years	50 (32.1)
More than 10 years	
Main reason for keeping dog(s)	
Pet	107 (68.6)
Guard dog	13 (8.3)
Stray dog/rescue	36 (23.1)

Out of 156 respondents, a total of 110 (83.3%) of the respondents exhibited good knowledge and 22 (16.7%) of the respondents had poor total knowledge. The median and interquartile range of the total knowledge score of the respondents' at 24.00 (5). Most of the respondents have good knowledge regarding the occurrences of heart disease in dogs, its clinical signs, associated risk factors and methods of prevention of heart disease in dogs. However, 67 (42.9%) of the respondents have never been told about heart disease in dogs by their veterinarian. More than half of total respondents have been informed regarding heart disease in dogs by their veterinarian, however the number of respondents who have

never been informed still raises a concern. For knowledge aspects related to signs of heart disease in dogs, most respondents are able to recognize signs of heart disease in dogs. However, for the clinical signs of bulging eyes in heart disease in dogs, the majority of dog owners, 55.1%, n= 86, fail to identify that as one of the clinical signs associated with heart disease. As for the different types of heart disease in dogs, most respondents have good knowledge on the different forms of heart diseases in dogs.

Besides that, for the risk factors associated with heart disease in dogs, most respondents have a good understanding of the risk factors that can increase or lead to occurrences of heart disease in dogs. Majority of the respondents, 98.1%, n=152, would bring their dog to be treated by the vet in the event of occurrence of heart disease in their dog and only 3 (1.9%) from the total respondent chose not to. Next, 123 (88.8%) of the respondents also expect their dogs to get better with treatment and 17 (11.2%) of the respondents who do not expect their dogs to get better with treatment in case of heart disease in dogs. Furthermore, for knowledge related with prevention of occurrence of heart disease in dogs, majority 101 (67.3%) of total respondents believe that vaccinations are able to prevent the occurrence of heart disease in dogs. Lastly, the majority of dog owners 87 (55.8%) are not aware that administration of herbal medications to their dogs cannot help prevent heart disease in dogs.

Table 8.2: Tabulation of knowledge based question and the percentages of responses

Questions	Response n (%)	
	Yes	No
K1 Are you aware that dogs can develop heart disease	143(91.7)	13(8.3)
K2 Have you ever been told of heart disease in dogs by your veterinarian	89(57.1)	67(42.9)
K3 Signs of heart disease in dogs are :		
a. Coughing	115(73.7)	41(26.3)
b. Exhaustion	142(91.0)	14(9.0)
c. Fainting	123(78.8)	33(21.1)
d. Weakness	146(93.6)	10(6.4)
e. Loss of blood	55(35.3)	101(64.7)
f. Abdominal swelling	102(65.4)	54(34.6)
g. Weight loss	112(71.8)	44(28.2)
h. Bulging eyes	70(44.9)	86(55.1)
K4 The following are types of heart diseases in dogs		
a. Heart failure	140(89.7)	16(10.3)
b. Heartworm disease	137(87.8)	19(12.2)
c. Valvular disease	118(75.6)	38(24.4)
d. Congenital heart disease	131(84.0)	25(16.0)
e. Hereditary	110(70.5)	46(29.5)
K5 Which of the following can increase the risk of heart disease in dogs?		
a. Medium breed dogs	85(54.5)	71(45.4)
b. Small breed dogs	84(53.8)	72(46.2)
c. Middle aged dogs	133(85.3)	23(14.7)

d. Diet			
K6 In the event of the occurrence of heart disease in dog(s)			
a.	I would take my dog to be treated by the vet	152(98.3)	3(1.9)
b.	I expect my dog to get better with treatment	135(88.7)	17(11.2)
I.	Coughing	120(84.4)	22(15.5)
II.	Fainting	120(86.4)	19(13.7)
III.	Exhaustion	125(89.3)	14(10.1)
IV.	Having difficulties in breathing	131(92.1)	11(7.7)
V.	Abdominal swelling	115(83.1)	22(16.1)
K7 Can heart disease in dogs be prevented by			
a.	Vaccinations	101(67.3)	49(32.7)
b.	Regular exercise	134(88.7)	17(11.3)
c.	Giving medications to your dog	132(86.8)	20(13.2)
d.	Giving herbal medications to your dog	62(41.6)	87(58.4)

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For the attitude scoring, majority of the respondents only have a moderate (45.5%) attitude towards heart disease in dogs with 50 (32.1%) of respondents having a good attitude and 35 (22.45%) of the remaining respondents having unacceptable attitude towards heart disease in dogs. Majority of respondents 137 (87.8%) strongly agree on the importance of knowing their dog's medical history. Other than that, 113 (72.4%) of respondents also strongly agree on the importance of bringing their dog to the veterinarian for screening of heart disease. Furthermore, 124 (79.5%) of respondents also strongly agree on the importance of administration of heartworm medication in their dogs with only 2 (1.3%) respondents disagreeing on the importance of administration of heartworm medications to dogs. A small minority 16(10.3%) of the respondents believe that dog's with heart disease will recover without treatment and most respondents strongly disagree 75(48.1%) with the ability of dog's with heart disease to recover without treatment. Lastly, with regards to the attitude of owners towards dietary causes leading to heart disease in dogs , the majority of owners agrees that fatty meat diet 102 (65.4%) and raw meat diet 53 (34.0%) would increase the risk of occurrence of heart disease in dogs.

Table 8.3: Tabulation of attitude based question and the percentages of responses

Questions	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
1. It is important to know your dog's medical history	137(87.8)	15(9.6)	3(1.9)	0(0.0)	1(0.6)
2. It is important for me to bring my dogs for screening for heart disease at the vet	113(72.4)	27(17.3)	13(8.3)	3(1.9)	0(0.0)
3. It is important for me to give my dog heartworm medication	124(79.5)	27(17.3)	3(1.9)	2(1.3)	0(0.0)
4. Feeding a fatty diet will causes heart disease in my dog	102(65.4)	32(20.5)	19(12)	2(1.3)	1(0.6)
5. Dog with heart disease will recover without treatment	16(10.3)	11(7.1)	28(17.9)	26(16.7)	75(48.1)
6. Feeding raw meat diet is risky for dogs heart	53(34.0)	28(17.9)	53(34.0)	15(9.6)	7(4.5)

For practice scoring, the majority of respondents have good practice 60 (38.5%), 58 (37.2%) of respondents scored moderate and 38 (24.4%) of the total respondents' has unacceptable practice towards heart disease in dogs. Majority of respondents 94 (60.3%) always bring their dog to the vet when they notice their dog being more tired than usual. Majority of respondents 110 (70.5%) also regularly exercise their dogs with only 3 (1.9%) from the total respondent that do not regularly exercise their dog. Lastly, most of the respondents 105 (67.3%) practice giving their dog heartworm prevention medication every month and 15 (9.6%) of the total respondents do not practice giving their dog monthly heartworm prevention drug.

Table 8.4: Tabulation of practice based question and the percentages of responses

Questions	Always	Seldom	Never
1. I take my dog to the vet when I notice tiredness in my dog	94(60.3)	53(34.0)	9(5.8)
2. I purchase drugs for my dog when it easily becomes tired/weak	34(21.8)	73(46.8)	49(31.4)
3. I take my dog to the vet if my dog continuously coughs	134(85.9)	16(10.3)	6(3.8)

4. I regularly exercise my dog	110(70.5)	43(27.6)	3(1.9)
5. I give my dog heartworm prevention medication every month	105(67.3)	36(23.1)	15(9.6)

8.1 ASSOCIATION BETWEEN DEMOGRAPHIC CHARACTERISTIC AND MEAN KAP SCORE

The relationship between demographic characteristic and mean KAP scores of the participants were measured using Chi Square technique where the result is no significant association between demographic variables with the total KAP scores as all variables had ($p>0.05$).

8.2 CORRELATION BETWEEN KAP SCORE

There is no significant correlation between knowledge and attitude with the ($r=0.087, p=0.319$). Knowledge and practice too shows a non-significant correlation with ($r=-0.088, p=0.316$). However, there is a significant weak correlation between attitude and practice with ($r=0.282, p=<0.0001$).

9.0 DISCUSSION

When it comes to treating cardiac disease in dogs, Malaysian veterinary care has come a long way in providing the best treatment and care. Many clinics are now able to diagnose heart disease efficiently and treat patients with cardiac disease. However, the prognosis of patients with cardiac disease mostly depends on severity or the progression of the clinical signs. If owners are able to bring their dogs in for treatment much earlier this would slow down progression of clinical signs and also give the patients a better prognosis (Nordin, 2022). By assessing the level of KAP of dog owners in Malaysia towards canine cardiac disease, veterinarians in Malaysia can be made aware on the level of KAP among dog owners and a more targeted consult and client education can be made in aiding the client on recognising the onset and clinical signs of cardiac disease in dogs.

From the KAP study conducted. It was found out that most of the respondents have good knowledge regarding the occurrences of heart disease in dogs, its clinical signs, associated risk factors and methods of prevention of heart disease in dogs. Most respondents are aware of the occurrence of cardiac disease in dogs and are able to associate clinical signs such as coughing, exhaustion, fainting, weakness, abdominal swelling and weight loss to cardiac disease. Next, most respondents were able to pick out that loss of blood is not one of the clinical signs associated with cardiac disease. They were also aware of the different types of cardiac disease that occurs in dogs and risk factors of canine cardiac disease. Most dog owners also agree that they would bring their dog to be treated by the vet in case of occurrence of cardiac disease in their dogs. From the result, there is no significant association between the level of education and also total knowledge score. This can be attributed due to the fact that veterinary knowledge is available to everyone irrespective of their background. Main source of information regarding canine cardiac disease comes from

online sources, followed by veterinarians and also printed articles (Kogan et al, 2012). Good knowledge among respondent's also reflects on effectiveness of the client education and ability of veterinarians to introduce to dog owners and raise awareness on canine cardiac disease (Nordin,2022).

In general, the majority of the respondents only have a moderate 71(45.5%) attitude towards heart disease in dogs with 50(32.1%) of respondents having a good attitude and 35(22,45) of the remaining respondents having unacceptable attitude towards heart disease in dogs. Despite having a good level of knowledge most respondents have a moderate attitude towards canine heart disease. This can be attributed to a few factors such as cost of veterinary care, time constraints of dog owners and much more. The cost of seeking long term treatment remains a major concern among pet owners worldwide (Park et al, 2012). This situation may arise due to rising cost of living and declining of the national household income level. Recently the concept of pet insurance is introduced and is gaining attention of Malaysian pet owners. Veterinary clinics may promote this as a method to alleviate financial burdens of pet owners (Nordin, 2022).

The attitude can also be increased by scheduling client with dogs that are above five years to be screened for cardiac disease. Veterinary clinics need to check for cardiac biomarkers level in dogs above five years every six months and they need to play an active role in reminding clients for their dogs check-ups may improve the owners attitude towards canine cardiac disease (Nordin , 2022). Attitude can also be increased by guiding and teaching dog owners on how to care for dogs with cardiac disease such as teaching them how to pill the dog hence they would be more willing and consistent in administering the drugs to their dog affected by canine cardiac disease (Tremont et al, 2005).

Concerning the practice, the majority of respondents have good practice 60(38.5%),58(37.2%) of respondents scored moderate and 38(24.4%) of the total respondent's has unacceptable practice towards heart disease in dogs. All the demographic variables showed no significant association with the total practice score. This shows despite of gender, educational background and income most owners have good practice towards canine cardiac disease. Good practice indicates that dog owners are willing to commit in prevention of canine cardiac disease such as by administering heartworm prevention and bringing their dog for regular exercise as well good intention to treat and care for their dogs in case they have been diagnosed with canine cardiac disease.

10.0 CONCLUSION

Overall, respondents showed a good knowledge, moderate levels of attitude and good practice towards canine cardiac disease. These findings could aid veterinarians in conducting a more thorough and detailed consultation and client education in improving the knowledge, attitude and practice among dog owners in Malaysia towards canine cardiac disease. With the increase in dog owner's KAP towards canine cardiac disease in Malaysia, hopefully more dogs can be screened and diagnosed for canine cardiac disease much earlier.

11.0 RECOMMENDATIONS AND FUTURE WORK

Several limitations were noted in this study, such as the limited number of respondents and the respondents were not widely scattered throughout Malaysia. The response form was randomly distributed and disseminated hence the KAP level of dog owners in each state specifically cannot be determined.

For future study, an increase in sample size is essential, as well as adding more questions that delve deeper on dog owners KAP. By increasing the sample size a more thorough and deeper assessment of the KAP values can be made. Secondly, the study can be improved by having more respondents from all over Malaysia, this way the KAP level of dog owners towards canine cardiac disease can be made for each state and a more targeted approach can be made at tackling or handling states with poor KAP levels. Study can also be improved by asking questions regarding the constraints that dog owners face in bringing their dog to be screened and treated for canine cardiac disease. This way we can gain a better understanding as to the constraints that is faced by dog owners and came up with strategies that can aid and make dog owners life easier so they can bring their dog to be screened and treated for canine cardiac disease.

12.0 APPENDIX

		TKS category			Cumulative Percent
		Frequency	Percent	Valid Percent	
Valid	Poor	22	14.1	16.7	16.7
	Good	110	70.5	83.3	100.0
	Total	132	84.6	100.0	
Missing	System	24	15.4		
Total		156	100.0		

Appendix A.1: Tabulation of the total knowledge score

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		TAS CATEGORY			Cumulative Percent
		Frequency	Percent	Valid Percent	
Valid	UNACCEPTABLE	35	22.4	22.4	22.4
	MODERATE	71	45.5	45.5	67.9
	GOOD	50	32.1	32.1	100.0
Total		156	100.0	100.0	

Appendix A.2: Tabulation of the total attitude score

		TPS CATEGORY			Cumulative Percent
		Frequency	Percent	Valid Percent	
Valid	UNACCEPTABLE	115	73.7	73.7	73.7
	ACCEPTABLE	41	26.3	26.3	100.0
Total		156	100.0	100.0	

Appendix A.3: Tabulation of total practice score

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.388 ^a	1	.534		
Continuity Correction ^b	.103	1	.749		
Likelihood Ratio	.412	1	.521		
Fisher's Exact Test				.764	.390
Linear-by-Linear Association	.385	1	.535		
N of Valid Cases	131				

Appendix A.5: Chi-square test for association between TKS and gender**Chi-Square Tests**

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	.639 ^a	2	.726
Likelihood Ratio	.676	2	.713
Linear-by-Linear Association	.522	1	.470
N of Valid Cases	155		

Appendix A.6: Chi-square test for association between TAS and gender**Chi-Square Tests**

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.418 ^a	2	.299
Likelihood Ratio	2.246	2	.325
Linear-by-Linear Association	1.741	1	.187
N of Valid Cases	155		

Appendix A.7: Chi-square test for association between TPS and gender

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.191 ^a	3	.363
Likelihood Ratio	2.797	3	.424
Linear-by-Linear Association	.362	1	.547
N of Valid Cases	132		

Appendix A.8: Chi-square test for association between TKS and level of education

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.339 ^a	6	.386
Likelihood Ratio	7.020	6	.319
Linear-by-Linear Association	.287	1	.592
N of Valid Cases	156		

Appendix A.9: Chi-square test for association between TAS and level of education

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.585 ^a	6	.270
Likelihood Ratio	8.671	6	.193
Linear-by-Linear Association	2.176	1	.140
N of Valid Cases	156		

Appendix A.10: Chi-square test for association between TPS and level of education

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.821 ^a	6	.567
Likelihood Ratio	5.088	6	.533
Linear-by-Linear Association	3.116	1	.078
N of Valid Cases	156		

Appendix A.11: Chi-square test for association between TKS and monthly household income

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.188 ^a	6	.083
Likelihood Ratio	11.649	6	.070
Linear-by-Linear Association	.097	1	.756
N of Valid Cases	156		

Appendix A.12: Chi-square test for association between TAS and monthly household income

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.821 ^a	6	.567
Likelihood Ratio	5.088	6	.533
Linear-by-Linear Association	3.116	1	.078
N of Valid Cases	156		

Appendix A.13: Chi-square test for association between TAS and monthly household income

Correlations

		TKS category	TAS CATEGORY	TPS CATEGORY
TKS category	Pearson Correlation	1	.087	-.088
	Sig. (2-tailed)		.319	.316
	N	132	132	132
TAS CATEGORY	Pearson Correlation	.087	1	-.282**
	Sig. (2-tailed)	.319		<.001
	N	132	156	156
TPS CATEGORY	Pearson Correlation	-.088	-.282**	1
	Sig. (2-tailed)	.316	<.001	
	N	132	156	156

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix A.4: Tabulation of correlation between KAP using Pearson Correlation

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