



**UNIVERSITI PUTRA MALAYSIA**

**CAT OWNERS' PERCEPTION TOWARDS FELINE HEART DISEASE:  
A BEHAVIOURAL STUDY**

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FPV 2017 4**

CAT OWNERS' PERCEPTION TOWARDS FELINE HEART DISEASE: A  
BEHAVIOURAL STUDY

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A student project paper submitted to the  
Faculty of Veterinary Medicine, University Putra Malaysia  
In partial fulfilment of the requirement for the  
DEGREE OF DOCTOR OF VETERINARY MEDICINE

University Putra Malaysia

Serdang, Selangor Darul Ehsan

JUNE 2017

CERTIFICATION

It is hereby certified that we have read this project paper entitled “**Cat Owners’ Perception towards Feline Heart Disease: A Behavioural Study**”, by Lee Yong Chong and in our opinion it is satisfactory in terms of scope, quality, and presentation as partial fulfilment of requirement for the course VPD4999- Final Year Project.

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DEDICATION

It is with my deepest gratitude and warmest affection that I dedicate this thesis to  
my supervisor Dr. Khor Kuan Hua and co-supervisor Dr. Khor Kuan Siew  
who have been a constant source of support and knowledge.

To my family whose affection, love, encouragement and prayers  
that make me able to get such success

Along with all diligent and respected lecturers

## ACKNOWLEDGEMENTS

It has been a great learning experience for me when carrying out this research. I would like to reflect on the people who have supported and assisted me so much throughout this period.

First and foremost, I would like to express my heartfelt appreciation to my supervisor Dr. Khor Kuan Hua for her patience, motivation, knowledge and continuous guidance in helping me to complete this research. Her unconditional supervision and thoughtful comments had helped me all the time during my research and writing of this thesis. I could not have imagined having a better supervisor and mentor for my research project.

Besides my supervisor, I am sincerely grateful to be co-supervised by Dr. Khor Kuan Siew who has taught me a lot in statistical analysis which are vital for my research project. I am tremendously thankful for her unreserved sharing of knowledge and spending her precious time in teaching me.

I would also like to thank the Chairman of UVH, Professor Dr. Abdul Wahid Haron as well as UVH staffs at the clinic for allowing me to conduct my project in UVH for five weeks.

Last but not least, a wholehearted thanks to my friends and family: my beloved parents and sister for supporting me spiritually throughout my studies.

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## LIST OF ABBREVIATIONS

ACE-Is	Angiotensin-Converting Enzyme Inhibitors
ARVC	Arrhythmogenic Right Ventricular Cardiomyopathy
ATT	Attitude
DCM	Dilated Cardiomyopathy
ECG	Electrocardiography
EMP	Empathic Concern
HCM	Hypertrophic Cardiomyopathy
INT	Intention to Treat
PBC	Perceived Behavioural Control
PDA	Patent Ductus Arteriosus
RCM	Restrictive Cardiomyopathy
SN	Subjective Norm
TPB	Theory of Planned Behavior
UVH-UPM	University Veterinary Hospital-University Putra Malaysia
VHS	Vertebral Heart Size
VSD	Ventricular Septal Defect

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ABSTRAK

Abstrak daripada kertas projek yang dikemukakan kepada Fakulti Perubatan Veterinar untuk memenuhi sebahagian daripada keperluan kursus VPD 499- Projek Tahun Akhir.

PERSEPSI PEMILIK KUCING TERHADAP PENYAKIT JANTUNG KUCING:  
KAJIAN TINGKAH LAKU

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Keputusan untuk merawat kucing dengan penyakit jantung bergantung kepada kesedaran, pengetahuan dan tingkah laku pemilik kucing kesayangan. Tujuan kajian ini adalah untuk (i) menilai kesedaran dan pengetahuan pemilik tentang penyakit jantung kucing; (ii) menentukan halangan pemilik untuk merawat kucing dengan penyakit jantung; (iii) mengkaji hubungan antara sikap, norma subjektif dan tanggapan kawalan tingkah laku terhadap niat untuk merawat; dan (iv) memeriksa peranan perhatian empati dalam menyerdehana niat untuk merawat kucing yang telah disahkan menghidap penyakit jantung. Seramai 139 pemilik haiwan kesayangan kucing telah

mengambil bahagian dalam kajian ini. Data dikumpulkan dengan menggunakan soal selidik yang dibantu oleh penemuduga berkaitan dengan demografi, pemilikan kucing, kesedaran penyakit jantung kucing dan niat untuk merawat. Data dianalisis dengan menggunakan analisis deskriptif dan berdasarkan varians-pemodelan persamaan struktur. Majoriti responden (49.6%) sedar bahawa kucing boleh mempunyai penyakit jantung tetapi, kira-kira 89.2% responden tidak memahami tentang penyakit ini dan hanya 11.5% daripada mereka mempunyai keupayaan yang baik dalam mengenal pasti tanda-tanda yang berkaitan dengan penyakit jantung kucing. Responden menunjukkan bahawa sikap, norma subjektif dan tanggapan kawalan tingkah laku adalah positif berkaitan dengan niat untuk merawat walaupun kos adalah halangan utama (45.5%). Dapatan kajian juga menunjukkan bahawa perhatian empati hanya menyederhana hubungan antara tanggapan kawalan tingkah laku dan niat untuk merawat. Kesimpulannya, strategi dan pendidikan intervensi harus diadakan untuk meningkatkan kesedaran dan pengetahuan pemilik kucing mengenai penyakit jantung.

*Kata kunci: kesedaran, penyakit jantung kucing, niat untuk merawat, sikap, norma subjektif, tanggapan kawalan tingkah laku*

ABSTRACT

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfilment of the course VPD4999- Final Year Project.

CAT OWNERS' PERCEPTION TOWARDS FELINE HEART DISEASE: A  
BEHAVIOURAL STUDY

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2017

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Informed decisions to treat cat with heart diseases depend on awareness, knowledge and behaviour of owners. The purposes of this study were to (i) assess owner's awareness, and knowledge of feline heart diseases; (ii) determine barriers to treat cats with heart disease; (iii) examine relationship between attitude, subjective norms and perceived behavioural control towards intention to treat; and (iv) examine moderating role of empathic concern towards intention to treat feline that have been diagnosed with heart diseases. A total of 139 cats' pet owners participated in the survey.

Data was collected using interviewer-assisted questionnaires on demographic, cat ownership, awareness of feline heart disease and intention to treat. Data were analysed using descriptive analysis and variance-based structural equation modeling. Majority of the respondents (49.6%) were aware that cats can have heart disease but, approximately 89.2% respondents did not understand about the disease and only 11.5% of them had good ability in identifying symptoms related to feline heart disease. The respondents showed that attitude, subjective norms and perceived behavioural control are positively associated with intention to treat even though cost was the main barrier (45.5%). Findings also indicated that empathic concern only moderates the relationship between perceived behavioural control and intention to treat. In conclusion, strategies and educational interventions are warranted to increase awareness and knowledge of cats' owners about feline heart disease.

*Keywords: awareness, feline heart disease, intention to treat, attitude, subjective norm, perceived behavioural control*

## CHAPTER 1.0

## INTRODUCTION

## 1.1 INTRODUCTION

Feline heart diseases often received less attention compared to canine heart diseases (Fuentes, 2015). Reasons for the species biasness may include differences in prevalence of heart disease, mortality rates, and popularity as pets, or differences in the attitudes of owners or veterinarians (Fuentes, 2015). A study conducted in Sweden reported that the prevalence of cats diagnosed with heart disease was 8.0% and of the total number of cats presented with heart disease, congenital heart disease was 0.2% (Tidholm *et al.*, 2015). Another study in US reported the prevalence of hypertrophic cardiomyopathy (HCM) was 14.7%, congenital heart disease was 0.5%, and other cardiomyopathies was 0.1% (Payne *et al.*, 2015). Based on these studies, cats diagnosed with heart diseases do not seem to be less common than in dogs. Fuentes (2015) reported that the mortality of cats due to cardiac disease does not appear to be lower than dogs. Another study showed that the cardiovascular age-standardised mortality rates (ASMR) was 30 deaths per 10,000 cat-years at risk in Swedish cats (Egenvall, 2009).

In Malaysia, every 1 out of 100 cats was diagnosed with a heart disease (unpublished; Zakaria *et al.*, 2015). Common presenting complaints for cardiac disease include dyspnea or tachypnea, coughing, exercise intolerance, syncope, distended

abdomen, cyanosis, anorexia or decreased appetite, and poor growth or performance (Tilley *et al.*, 2008). Veterinarian in our teaching hospital, University Veterinary Hospital (UVH), has often expressed that many of the cats' owners were not aware that cats can have heart disease. Even if their cats have been diagnosed with heart diseases, these owners may not necessarily treat their cats. Therefore, we intend to investigate the level of awareness and knowledge of Malaysian cat owners on feline cardiac disease. A survey of owner perception on quality of life in cats with heart diseases by Reynolds (2010) showed that majority of owners expressed that multiple visits and long term treatment may negatively impact their cat's quality of life and might be a factor causing owner reluctance to seek veterinary attention (Reynolds, 2010). This situation could be similar in Malaysia as Zakaria *et al.* (2015) noted in his study that a proportion of owners' with cardiac disease cats does not comply with the long term therapy as advised. Many factors may play a role in the issue to compliance towards treatment. Hence, there is a need to determine the predictors that affect the cats' owners' intention to treat cats with heart diseases.

Therefore, the level of awareness, attitude towards treatment and level of compliance toward treatment of cat with heart disease should be investigated. Information obtained would then allow clinician to strategise or improve strategies in client education. Ultimately, increase awareness among owners would allow prompt actions such as prevention, regular health check-up, early treatment and proper management of feline heart disease to be taken by the owner if their cats was diagnosed

with heart disease. This will ensure a better quality of life as well as longevity of their cats.

## 1.2 OBJECTIVES

The objectives of the study were

1. To assess cats' owners' awareness and knowledge of feline heart disease.
2. To determine the barriers to treat cats with heart disease.
3. To examine the relationship between attitudes, subjective norms and perceived behavioral control towards intention to treat cats with heart disease.
4. To examine the moderating role of empathic concern towards intention to treat cats with heart disease.

## 1.3 HYPOTHESES

The null hypotheses for this study were:

- H1<sub>o</sub>. Cat owners' perceived behavioral control does not affect their intention to treat cats with heart disease.
- H2<sub>o</sub>. Cat owners' subjective norm positively does not affect their intention to treat cats with heart disease.
- H3<sub>o</sub>. Cat owners' attitude positively does not affect their intention to treat cats with heart disease.

H4<sub>o</sub>. Empathic concern does not moderate the relationship between (a) perceived behavioral control, (b) subjective norm, and (c) attitude and intention to treat cats with heart disease.

The alternative hypotheses were:

H1<sub>a</sub>. Cat owners' perceived behavioral control positively affects their intention to treat cats with heart disease.

H2<sub>a</sub>. Cat owners' subjective norm positively affects their intention to treat cats with heart disease.

H3<sub>a</sub>. Cat owners' attitude positively affects their intention to treat cats with heart disease.

H4<sub>a</sub>. Empathic concern moderates the relationship between (a) perceived behavioral control, (b) subjective norm, and (c) attitude and intention to treat cats with heart disease.

## CHAPTER 2.0

## LITERATURE REVIEW

## 2.1 TYPES OF FELINE HEART DISEASES AND IT'S PREVALENCE

Feline heart disease can be generally classified into three different groups which are congenital heart malformations, acquired heart diseases i.e. cardiomyopathies and other forms of structural heart diseases such as acquired valvular disease and cardiac neoplasia (Côté *et al.*, 2011).

## 2.1.1 Congenital Heart Malformations

Congenital heart malformations are defined as developmental defects of the heart present at birth which can be either inherited or develop spontaneously (Côté *et al.*, 2011). In general, feline congenital heart disease is much less common than cardiomyopathies. Around 5% of cats were diagnosed with congenital heart malformation at the School of Veterinary Medicine at the University of California-Davis over a 10-year period (MacDonald, 2006). Another study from two veterinary cardiology facilities in Switzerland reported that 12% of the feline heart disease cases were congenital heart disease (Riesen *et al.*, 2007). In Malaysia, a study conducted at UVH reported that 2% of the feline heart diseases cases were consist of congenital heart disease (unpublished; Zakaria *et al.*, 2015). The most commonly reported congenital heart malformations are mitral and tricuspid valve malformations and ventricular septal defects; and follows by atrial septal defect, common atrioventricular canal, aortic

stenosis, pulmonic stenosis, patent ductus arteriosus, and tetralogy of Fallot (Riesen *et al.*, 2007).

### 2.1.2 Cardiomyopathies

Cardiomyopathies are referred as diseases of heart muscle. In cat, there are four types of cardiomyopathies namely, hypertrophic cardiomyopathy (HCM), restrictive cardiomyopathy (RCM), dilated cardiomyopathy (DCM) and arrhythmogenic right ventricular cardiomyopathy (ARVC).

Table 1: Types and Prevalence of Cardiomyopathies

Types of Cardiomyopathies	Prevalence
<p>HCM</p> <ul style="list-style-type: none"> <li>- It is defined as concentric hypertrophy of the left ventricle that leads to increased ventricular muscle stiffness and abnormal relaxation of the heart muscle which will then impair the diastolic filling of the left ventricle and cause</li> </ul>	<p>It is the most common cardiac disease in cats. Ferasin <i>et al.</i> (2003) reported a high prevalence at 58.0%. In clinically healthy cats, 14.5% to 34.0% of these cats was diagnosed with HCM (Paige <i>et al.</i>, 2009; Wagner <i>et al.</i>, 2010). A study carried out in UVH reported that HCM had the highest prevalence at 47% among other feline heart disease (unpublished; Zakaria <i>et al.</i>, 2015). Familial HCM has been described in Maine coon cats and Ragdoll cats which is caused by</p>

<p>left heart failure (Côté <i>et al.</i>, 2011).</p>	<p>mutations in myosin binding protein C (Meurs <i>et al.</i>, 2005). This mutation is identified in 34% of Maine Coon cats worldwide (Fries <i>et al.</i>, 2008).</p>
<p>RCM</p> <ul style="list-style-type: none"> <li>- It is characterised by a normal or mildly reduced myocardial systolic function, normal left wall thickness, atrial enlargement and abnormal filling of heart that lead to left heart failure (Côté <i>et al.</i>, 2011).</li> </ul>	<p>It is less prevalent in cats in Malaysia with prevalence of 15% (unpublished; Zakaria <i>et al.</i>, 2015). Another report of 106 cats with cardiomyopathy identified RCM were approximately 20.0% (Ferasin <i>et al.</i>, 2003).</p>
<p>DCM</p> <ul style="list-style-type: none"> <li>- It is characterised by dilation of the left ventricular lumen and decreased systolic myocardial function (Côté <i>et al.</i>, 2011).</li> </ul>	<p>DCM used to be the most common form due to insufficient levels of taurine in commercial pet food (Pion <i>et al.</i>, 1987). The prevalence of DCM in the late 1990s was reports between 5.0 to 7.0%. However, it is now considered uncommon due to the supplementation of taurine in commercial pet foods. Study conducted in UVH reported that DCM had prevalence of 18.0% among other cat with</p>

	heart diseases (unpublished; Zakaria <i>et al.</i> , 2015).
ARVC - It is characterised by fibrofatty infiltration of the right ventricle that causes right heart enlargement (Fuentes, 2006).	It is uncommon and one report estimated that it represented 2–4% of feline myocardial diseases diagnosed at the Animal Medical Center in New York (Fox, 1999). A more recent study that screened apparently healthy cats for the presence of heart disease identified ARVC in 1 out of 103 cats (Paige <i>et al.</i> , 2009).

### 2.1.3 Structural Heart Diseases

Acquired degenerative valve disease that leads to significant valvular regurgitation often result in myocardial remodeling due to the volume overload. However, it is very uncommon in cat when compared to dogs. Besides that, cardiac neoplasms such as lymphoma and chemodectoma are well-recognised in cat but are rare diseases. Other miscellaneous myocardial diseases are myocarditis, endocardial fibroelastosis and excessive moderator bands (Côté *et al.*, 2011).

## 2.2 SPECIFIC CLINICAL SIGNS OF FELINE HEART DISEASES

The specific symptoms that usually can be seen in cat with heart disease are coughing, dyspnea, syncope, weakness, exercise intolerance, ascites, cyanosis, weight

loss and paresis. Coughing is a sudden, involuntary expiration to clear debris from the tracheobronchial tree (Côté *et al.*, 2011). It is rarely associated in cats with heart diseases as compared to dogs (Gompf, 2008). Coughing in cats most often is related to primary respiratory diseases (Gompf, 2008). Dyspnea is difficult, laboured, or painful breathing which is usually followed by tachypnoea (Côté *et al.*, 2011). Signs such as open-mouth breathing, panting and exaggerated abdominal respiratory movements can be seen (Côté *et al.*, 2011) especially in cats with right-heart failure leading to pleural effusion or left-heart failure causing pulmonary oedema (Gompf, 2008).

Syncope is sudden and brief loss of consciousness and all skeletal muscle tone due to cerebral hypoperfusion (Gompf, 2008). Animals usually collapse suddenly and the recovery is spontaneous. There may or may not be prodromal signs such as stumbling, vocalizing, ptialism or disoriented (Côté *et al.*, 2011). Examples for causes of syncope in cats were severe bradycardia, atrial or ventricular tachycardia, HCM, DCM, Tetralogy of Fallot, subaortic and pulmonic stenosis (Gompf, 2008).

Weakness and exercise intolerance are nonspecific signs of heart disease and are rarely noted in cats because of their sedentary lifestyle (Côté *et al.*, 2011). Both signs can be the early indicators of decompensated heart failure such as DCM, advanced mitral valve disease, subaortic stenosis, HCM and pulmonary edema or pleural effusion (Gompf, 2008). Cyanosis is blue-tinged mucous membranes of the gums, tongue, eyes and ears. It is usually associated with right to left shunting congenital heart defects such as Tetralogy of Fallot (Gompf, 2008).

Ascites is the buildup of fluid in the abdomen due to the failure of right heart to pump the blood or pericardial disease which prevent the blood enters the right heart (Gompf, 2008). This will lead to liver and splenic congestion and increased venous pressure cause the leakage of fluid out of organ (Gompf, 2008). Ascites is less common in cats as compared to dog and is usually due to tricuspid dysplasia and dilated cardiomyopathy (Gompf, 2008).

Weight loss in cats can be related with chronic right-sided heart failure (Gompf, 2008). Cardiac cachexia is a condition which there is loss of total body fat and lean body mass in spite of a normal appetite and proper treatment for heart disease (Gompf, 2008). Ascites in cats may cause reduced appetite due to discomfort, compression on the stomach that makes the animal feels full and restricted gastric emptying. Malabsorption and maldigestion occur due to congestion of the intestines and pancreas secondary to the ascites (Gompf, 2008). Increased effort to breath and increased myocardial oxygen consumption result in the increased use of energy by the heart and lungs (Gompf, 2008).

Cats that exhibit acute, posterior paresis or paresis of one front leg often is often caused by thromboembolism secondary to cardiomyopathy (Gompf, 2008). The thrombi that are formed in the dilated left atrium or left ventricle will chip off and lodge in the aortic bifurcation (Gompf, 2008). This will cause severe pain to the cat, cold and swollen distal limbs, cyanotic pads on the rear feet and pulses cannot be detected (Gompf, 2008).

## 2.3 THE IMPORTANCE OF SCREENING OF HEART DISEASES

Screening for heart disease should be carried at any stage of the cats' life so that early preventive and therapeutic measures can be taken in order to improve their quality of life and prolonged their cats' lifespan. The trend of feline heart disease patient presented in UVH-UPM, Malaysia increased each year between year 2013 to 2015 (unpublished; Zakaria *et al.*, 2015). Cat owners may not know if their cats were suffering from heart disease as most cats may not exhibit the clinical signs due to their sedentary lifestyle. A screening of cardiomyopathy in 780 apparently healthy cats from rehoming center documented a high prevalence (40.8%) of heart murmur and majority of cats were diagnosed with HCM (14.7%) followed by congenital (0.5%) and other cardiomyopathies (0.1%) (Côté *et al.*, 2004; Payne *et al.*, 2015). In another study, heart murmurs are detectable in a large proportion of overtly healthy cats which appear to be caused by structural heart disease that is in a clinically latent state (Côté *et al.*, 2004).

In the screening and diagnosing feline heart diseases, the modalities include a good history taking and physical examination, auscultation of heart murmurs, thoracic radiography, echocardiography, cardiac biomarkers and electrocardiography. However, echocardiography provides the definitive diagnosis of the heart disease.

### 2.3.1 Echocardiography

Echocardiography is an important diagnostic tool for feline heart disease in order to assess cardiac size, structure, function, and blood flow within the heart (Côté *et al.*, 2011). Three types of echocardiography are the two-dimensional echocardiography, M-mode echocardiography and Doppler echocardiography. Two-

dimensional echocardiography is used to demonstrate the cardiac morphology while M-mode echocardiography performs time-dependent measurements such as chamber dimensions and wall motion (Fuentes, 2008). Doppler echocardiography is applied to detect abnormal direction or velocity of blood flow, to find out the origin of turbulent blood flow, to determine flow volumes, to evaluate systolic and diastolic function and to measure intracardiac pressures (Fuentes, 2008). Yearly echocardiography should be performed in cats for screening as prevalence was found to be increased with age (Payne *et al.*, 2015).

#### 2.4 PREVENTION AND TREATMENT OF CONGESTIVE HEART FAILURE

The American College of Veterinary Internal Medicine (ACVIM) has come out with cardiomyopathy classification-based diagnostic, treatment, and follow-up strategies for cat (Gordon, 2016). ACVIM has classified them into five stages as shown in Table 2.

Table 2: Cardiomyopathy Classification-based Treatment, and Follow-up Strategies (Gordon, 2016)

Stages	Treatment and Follow-up Strategies
Stage A Cats at risk of developing cardiomyopathy based on signalment and physical examination.	There is no treatment recommended for the cats. However, periodic screening by using echocardiography or cardiac biomarkers may be suggested in cats with a known predilection to cardiomyopathy.

<p>Stage B1</p> <p>Cats that have mild cardiomyopathy with minimal cardiac remodeling and do not show clinical signs of heart disease.</p>	<p>Treatment is usually not recommended unless an underlying cause is identified. However, scheduled screening to assess for worsening heart disease is recommended once every 6 to 12 months.</p>
<p>Stage B2</p> <p>Cats that have moderate to severe cardiomyopathy and are asymptomatic.</p>	<p>Disease specific treatment is recommended. The decision to treat depends on owner's ability and willingness to medicate the cat long term and the cat's tolerance of the medication. For example, angiotensin-converting enzyme inhibitors (ACE-Is) and anticoagulant such as Clopidogrel or aspirin is usually given in Stage B2 cats with moderate to marked left atrial enlargement or with reduced left atrial function that have increased risk of aortic thromboembolism (ATE). In cats with stage B2 HCM, beta-blockers like atenolol is used to reduce severity of left ventricle outflow tract obstruction, mitral regurgitation, myocardial oxygen consumption and progressive hypertrophy. Client education regarding potential clinical signs of CHF for monitoring of cats and</p>

	<p>periodic reevaluation to track the progression of disease are needed.</p>
<p>Stage C</p> <p>Cats that have symptomatic cardiomyopathy.</p>	<p>Treatment may involve pleurocentesis to relieve the signs of respiratory distress associated with pleural effusion. Standard CHF therapy includes administration of diuretics such as furosemide, ACE-I and anticoagulant. Chronic CHF in cats is treated with an ACE-I such as enalapril, benazepril or lisinopril. Administration of an anticoagulant is usually recommended because cats with CHF usually suffer atrial enlargement and are at increased risk of developing ATE. Cats with echocardiographic ventricular systolic dysfunction, pimobendan may be added to the treatment. Atenolol is an adjunctive therapy that can be given when the cat does not have clinical signs of CHF. Low salt diet should be provided to their cats. Client education and scheduled follow-up for reevaluation of disease progression, complication of treatment as well as assessing the owner compliance are essential.</p>
<p>Stage D</p>	<p>Treatment consists of stopping medications that cause side effects, increasing of doses of current medications,</p>

Cats that have refractory cardiomyopathy or progressed from stage C which require additional medication or management.	use of alternative medications, improving owner compliance in giving medications, and treating anorexia and cachexia.
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## 2.5 CATS' OWNERS' AWARENESS OF FELINE HEART DISEASES

A study conducted shown that there was a changing trend of pet demographics which people who keep cats as pet has outnumbered people who keep dogs as pet in many countries (Fuentes, 2015). This statement is supported by a study conducted by the American Veterinary Medical Association in 2012 which reported that there were 74.1 million cats in the US as compared with 69.9 million dogs. The European Pet Food Industry Federation (fediaf.org) reports the same finding which cats outnumbering dogs in many countries in Europe such as UK, France and Germany (Fuentes, 2015). The trend of feline heart disease patients presented to UVH increased each year from 2013 to 2015 (unpublished; Zakaria *et al.*, 2015). These studies revealed the increase in the number of owners who owned cats and cases related to feline heart disease, but there were no studies done before to evaluate the awareness and knowledge of cats' owners on feline heart diseases. Hence, it is important for us to determine the cats' owner's level of awareness and knowledge on feline heart diseases in this study.

Currently, there are no studies done to examine the awareness and knowledge of general cats' owners in feline heart disease which may contribute to the fact that many cats with heart diseases are underdiagnosed. Heart disease in cats is common but often remains undiagnosed because symptoms usually does not appear at early stage of the disease (Collins *et al.*, 2015). However, several studies related to awareness of heart disease reported that most women in US did not perceive heart disease is a substantial health concern and they were not well informed about their risk (Mosca *et al.*, 2000) and therefore the level of awareness could be speculated even poorer since the disease of interest is not about the owner but their pet cats.

The level of awareness of owners on feline heart disease depends on many factors. The lack of representation of cat-related literature in publications may be a reason. According to Fuentes (2015), feline heart disease has received less attention than canine heart disease. Database of literature search has found that articles published regarding about heart disease in dogs were four time more than in cat in the Journal of Veterinary Cardiology (Fuentes, 2015). In Journal of Veterinary Internal Medicine, similar was observed as canine published articles were approximately three times more than feline (Fuentes, 2015). In general, veterinary literature on cat is significantly less as compared to dog. This could be a reason which leads to the misconception that feline heart diseases are less important than canine heart diseases and may contribute to lack of emphasis of the disease in cats during health screening by their veterinarian.

The lack of communication between veterinarians and cats' owners may be another reason that contribute to lack of awareness among cats' owner of feline heart

disease. According to one survey conducted on awareness of human heart disease pointed out that more than 70% of participants reported that medical doctors had not discussed heart disease with their patient during discussion about health which had caused them to be less aware of the risk of heart disease (Mosca *et al.*, 2000). This might be true in veterinary practice as well.

Intention of owners to treat their cats if their cats suffered from heart disease should be evaluated in order to know their behavior towards their cats. One study reported that average household veterinary expenditure on dogs of \$378 per year as compared with only \$191 on cats in US (Fuentes, 2015). Less spending on veterinary care for cats may suggest that the perception of owners is more reluctant to spend money on veterinary fees for cats as compared to dogs (Fuentes, 2015). Reynold *et al.* (2010) revealed that many owners perceived administration of medication and hospital visits as very stressful for their cat which may be a reason that prevents owner to seek treatment for their cats. They viewed that this two main activities are potentially affecting quality of life in cat with heart disease (Reynold *et al.*, 2010).

In general, cats may have received less medical attention and it is important to examine the reason causing such scenario considering cats are as important as dogs in providing companionship. Therefore, there is a need to determine whether Malaysian cat owners' perceived behavioural control, subjective norm and attitude positively would affect the owners' intention to treat cats with heart disease. Information as such would guide clinician to understand the general behavior of cat owners locally and their commitment to their pets.

## CHAPTER 3.0

## MATERIALS AND METHODS

## 3.1 RESEARCH DESIGN

A descriptive design was used in this study to determine the awareness, perception and knowledge of feline heart diseases among Malaysian cats' owners as predefined categories of respondents. The aim of this method was to define phenomena through description on association between variables. Descriptive research is preplanned and organised so the data gathered can be statistically deduced on a population.

The research methodology adopted for this study was quantitative method to determine the relationship between the independent and dependent variables. In descriptive design, combination of questionnaire and interview was used to collect data. A validation process was conducted prior to the actual conduct of the study to ensure that questions was straight forward to understand and all the item was validated with the Cronbach's Alpha of > than 0.7.

## 3.2 QUESTIONNAIRE DESIGN

A 40-items questionnaire was developed for the use in this study. There are total 4 sections in the questionnaire. All the items in the questionnaire were being

designed in a way for ease of understanding of each items and to increase compliance from the respondents.

The first section contained questions about demographic characteristics such as gender, age, number of occupancy in the household, monthly household income and employment status. The second section queried on the cat ownership information. Respondents were asked dichotomous and multichotomous closed-ended question concerning whether they have cats under their care, years of experience taking care of cats, purpose of having cat, details of each cat that owners have, the lifespan of a cat and whether heart disease can be inherited in cat according to owners' notion. The third section assessed on owner awareness of feline heart disease. This section contained a mixture of multiple choice closed-ended questions such as whether they know cats can suffer from heart disease, the means which owners obtained their knowledge, willingness to treat cat with heart disease, barriers that would be faced by the owners and whether they would feel troublesome when seeking treatment. Besides that, this section also included question that quantified how well does the respondents understand about feline heart disease using ten-point scale that ranged from 1 (poor) to 10 (very good). They were further tested on the ability to identify the clinical signs of cat suffering from heart disease using closed-ended questions in order to determine their level of knowledge.

The last section was to assess on the owners' intention to treat if their cat was diagnosed with heart disease. Theory of planned behavior (TPB) was adopted in this study. According to Icek Ajzen, it is a social cognitive model of expectancy value that

hypothesizes that behavioral intention is influenced by three conceptually independent constructs which are attitude, subjective norm and perceived behavioural control. According to TPB, the more favorable the attitude and subjective norm, and the greater the perceived control, the stronger the owners' intention to treat their cat (Ajzen, 1991). Empathic concern was postulated as moderator in the relationship of attitude, subjective norm and perceived behavioral control towards intention to treat. The respondents were prompted for subjective rating of their degree of agreement on each items under the constructs specified in the TPB: intention to treat (four items), perceived behavioural control (four items), subjective norm (four items), attitude (five items) and empathic concern (three items). The items were posed to respondents using a 7-point Likert type scale from 1=strongly agree to 7=strongly disagree. A full illustration of questionnaire is available in Appendix I.

### 3.3 SAMPLING METHOD AND DATA COLLECTION

Non-random sample selection method was used in this research which the population was not given an equal probability to be selected. Convenience or accessibility sampling was used in this study by asking a cat owner who was most accessible to respond to a survey.

Study participants were cat owners obtained from University Veterinary Hospital (UVH), UPM, Selangor. The data was collected between 9<sup>th</sup> January to 18<sup>th</sup> of January of 2017. Participants ( $n=150$ ) were approached and given a standardised interviewer-assisted questionnaire while these owners were waiting for their turn going

into consultation room. Each interview lasted approximately 15 minutes and were conducted in either English or Malay depending on the respondent preference. Interviewer would assist in explaining and translating the terms or sentences that the respondents did not comprehend. In order to eliminate any potential bias, no specific selection was made in choosing respondents whose cats had heart disease and interviewer was not allowed to provide his own opinion to the respondent.

The respondents were required to answer a standardised owner's demographic section and cat ownership information section. The third section consisted of a series of questions related on the owner awareness, perception and knowledge on feline heart disease. In the final section, the respondents were prompted for subjective rating of their degree of agreement on each items under the constructs specified in the TPB. Monitoring of respondents when answering the questionnaire was done to ensure accuracy of the data provided. The participants were assured and informed that their responses will be kept confidential and used for research purposes only.

#### 3.4 DATA ANALYSIS METHOD

The IBM Statistical Package for the Social Sciences (SPSS) software version 22.0 was used for descriptive statistics and multivariate normality test on the demographic characteristics, cat ownership information, and owners' awareness or knowledge level on feline heart disease. Data are presented as percentages. Besides that, the study applied variance-based structural equation modeling to test on the research hypotheses related to intention of cats' owners to treat their cats if they have

been diagnosed with heart disease is related to attitude, perceived behavioral control and subjective norms by using the Smart PLS Version 3.2.6 software. According to the recommended two-stage analytical procedure, the measurement model which were validity and the reliability of measures were initially tested. Next, it was then followed by an examination of the structural model which was testing on the hypothesised association. A bootstrapping method (5000 resamples) was employed in order to check on the significance of the path coefficient and the loading.

## CHAPTER 4.0

## RESULTS

A total of 150 respondents were approached but the final usable data were 139 after data cleaning using multivariate normality test and factor analysis to remove outliers.

#### 4.1 DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

The respondents' race composition of the 139 participants in this survey consist of 86.3% Malay, 7.9% Chinese, 2.9% Indian and 2.9% are from other ethnic group (refer Figure 1).

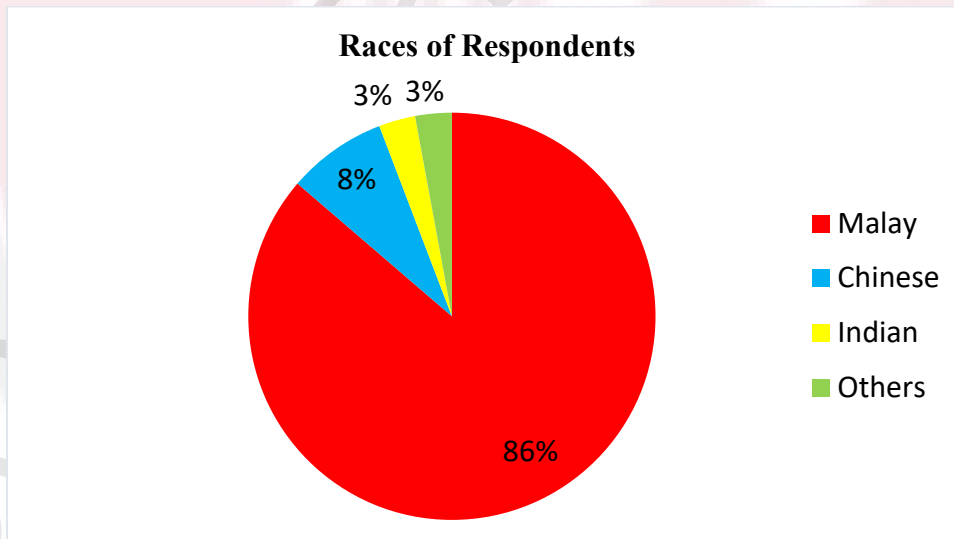


Figure 1: The percentage distribution of the respondents' race composition ( $n=139$ )

Majority of the respondents' gender was females ( $n=46$ ) and male ( $n=93$ ) respondents (refer Figure 2).

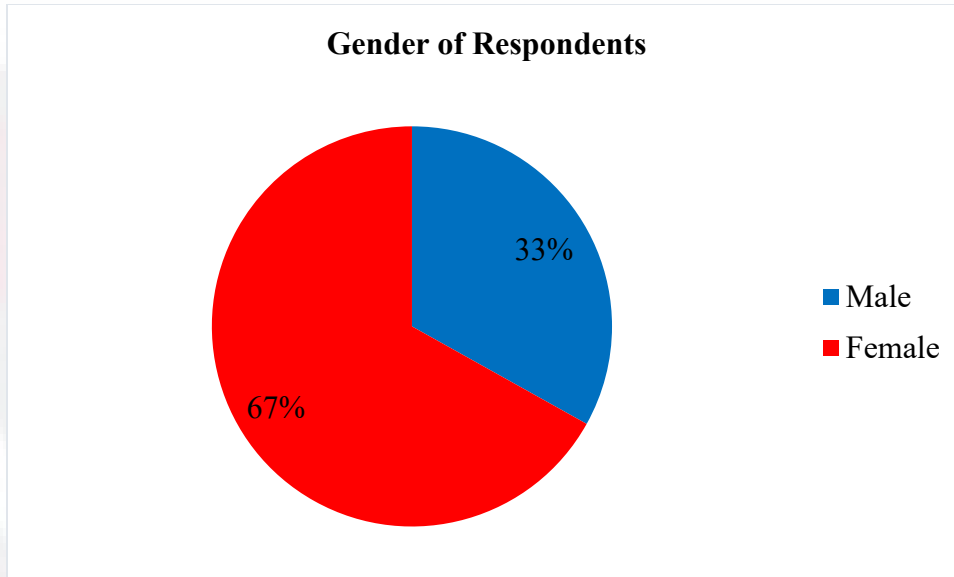


Figure 2: The percentage distribution of respondents' gender ( $n=139$ )

The largest representation of respondents based on age falls under the category from 20 to 29 years old (32.4%), followed by, from 30 to 39 years old (22.3%), above 50 years old (22.3%), from 40 to 49 years old (16.5%) and lastly, below 20 years old (6.5%) (refer Figure 3).

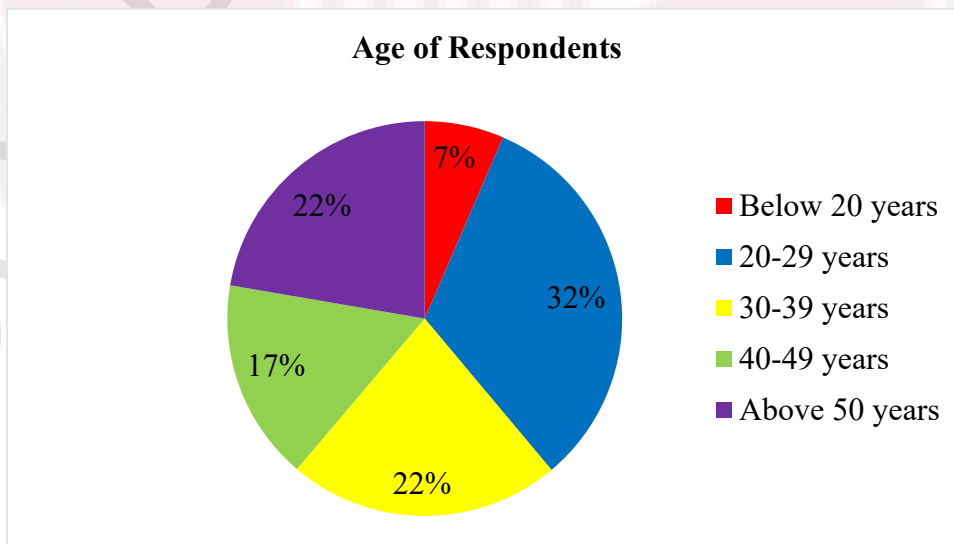


Figure 3: The percentage distribution of respondents based on age ( $n=139$ )

Majority of the respondent's monthly household income level was between RM5,001-RM10,000 (34.5%), followed by RM2,001-RM5,000 (28.8%), below RM2,000 (15.8%), RM10,001-RM20,000 (15.8%) and lastly, more than RM20,000 was 5% (refer Figure 4).

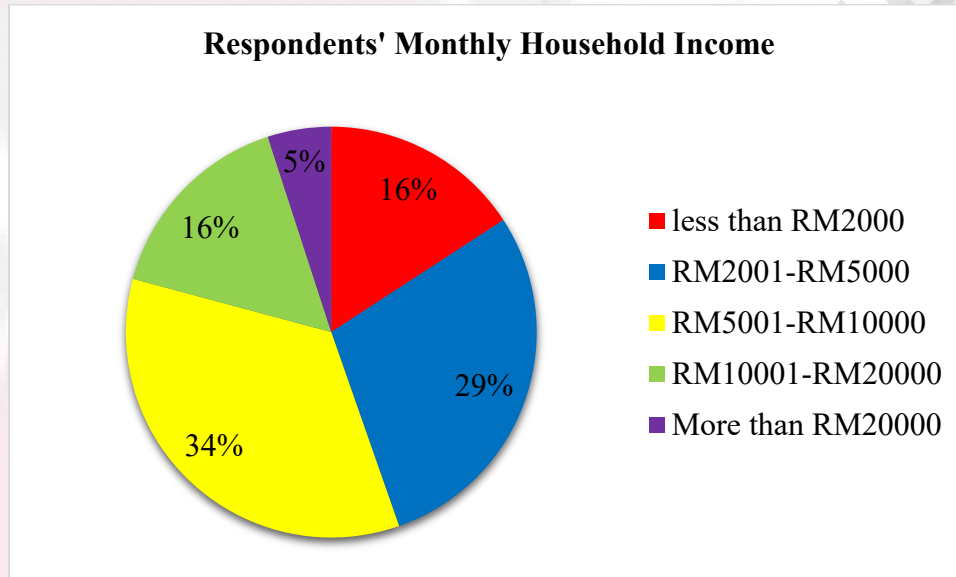


Figure 4: Percentage distribution of respondents based on monthly household income ( $n=139$ )

Majority (46.8%) of respondents were employed, 20.1% were self-employed, 14.4% were student, 8.6% were retired, 7.9% were unemployed and 2.2% were housewife (refer Figure 5).

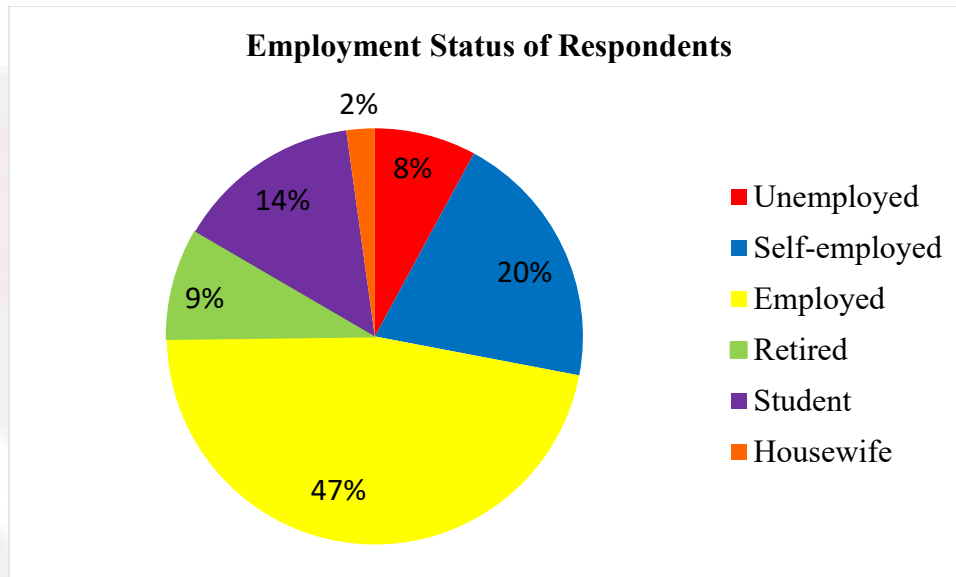


Figure 5: Percentage distribution of respondents' employment status ( $n=139$ )

#### 4.2 CAT OWNERSHIP INFORMATION

Of the total 139 respondents, 99.3% of the respondents had cat(s) under their care while only 0.7% used to own a cat. Majority (38.8%) of the cat's owners had less than or equal to 5 years of experience of taking care of cats, followed by 30.2% of the respondents had 6 to 10 years, 13.7% had 11 to 15 years of experience, 9.4% had 16 to 20 years and lastly, only 7.9% of the respondents had more than 20 years of experience of having cats as pet (refer to Figure 6).

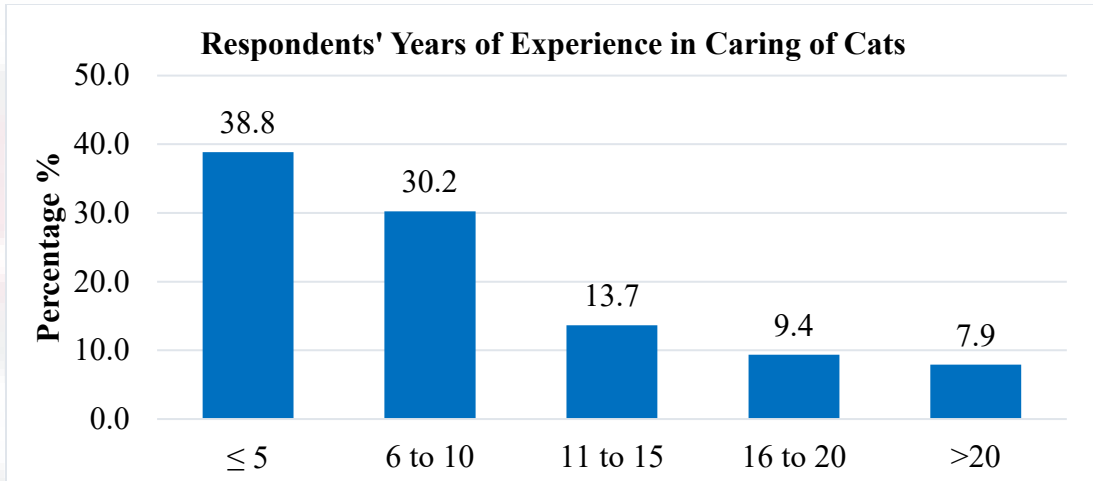


Figure 6: The percentage distribution of respondents' number of years of experience in taking care of cats ( $n=139$ )

Among all the respondents who completed the survey, 46.2% of them revealed that the purpose for having a cat was as a pet for themselves. Besides that, some of them were cat rescuer (20.8%) and 20.4% of the respondents loves cats as companion. There were 9.9% of respondents stated that they had cat(s) as pet for their children, 1.8% chose others reason and, only 0.9% stated they were cat breeders (refer to Figure 7).

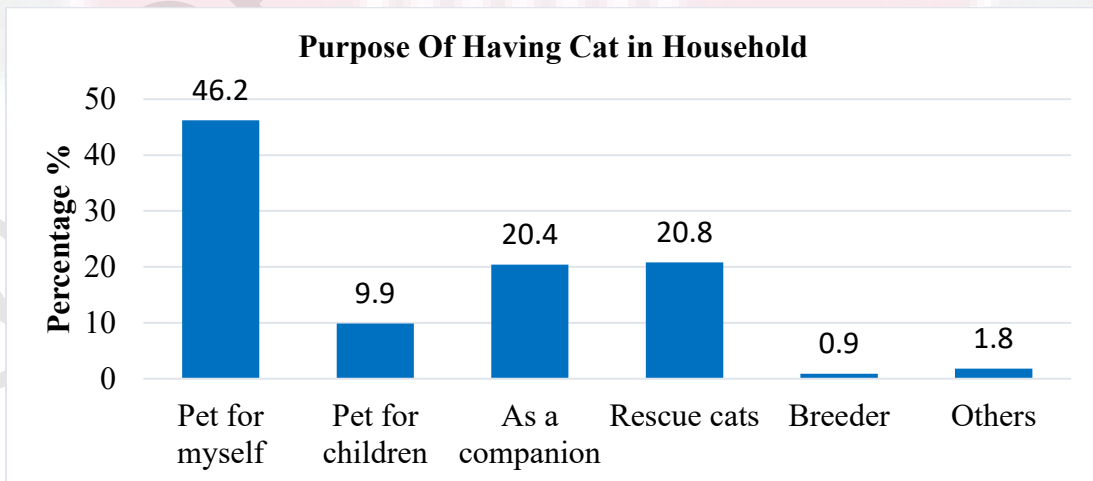


Figure 7: The percentage distribution of respondents' purpose to have cats in the household

Majority of the respondents (41.0%) thinks that cat can live for 10 to 15 years. About, 31.7% of respondents thought that the lifespan of cat was from 5 to 10 years, followed by, 18% of them believed cat can live more than 15 years, and 9.4% of them assumed cat's lifespan was only between 2 to 5 years. Nevertheless, no respondents thought a cat can live less than two years (refer Figure 8).

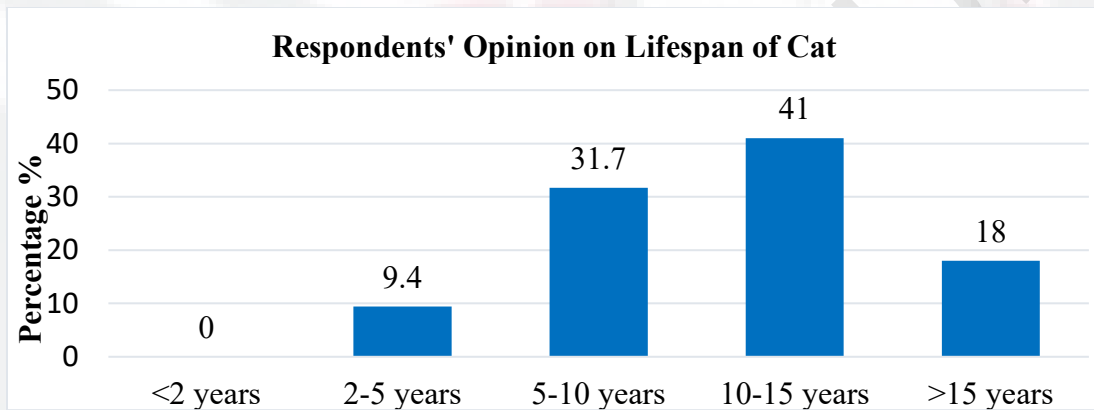


Figure 8: The percentage distribution of respondents' opinion lifespan of cats ( $n=139$ )

Almost 51.1% of the respondents in this study revealed that they were unsure as to whether feline heart disease can be inherited, while 24.5% of them did not know and only 24.5% knew that feline heart disease can be inherited (refer Figure 9).

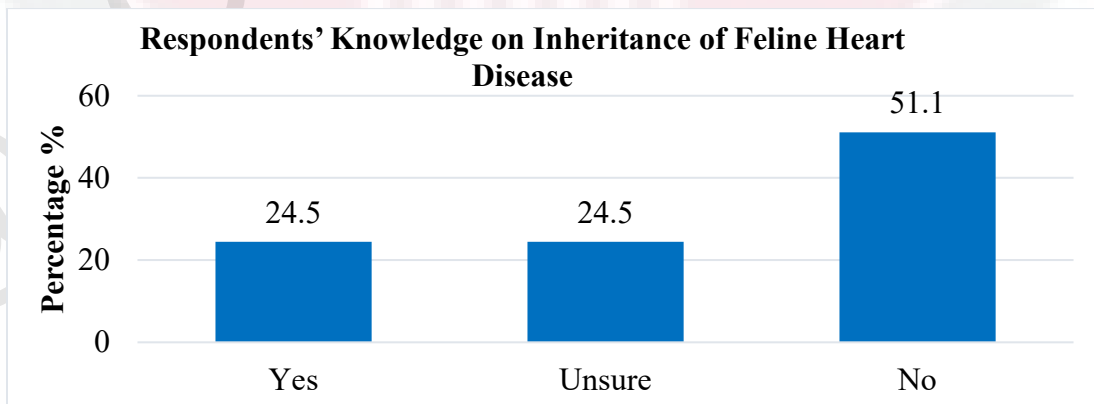


Figure 9: The percentage distribution of respondents' knowledge on inheritance of feline heart disease ( $n=139$ )

#### 4.3 AWARENESS, PERCEPTION AND KNOWLEDGE OF FELINE HEART DISEASES

The distribution of all responses to the question whether the owners know that cats can suffer from heart diseases as shown in Figure 10. Approximately 49.6% of the respondents correctly identified that cats can suffer from heart disease, whereas 30.2% reported that they didn't know and 20.1% were unsure that cats can have heart disease.

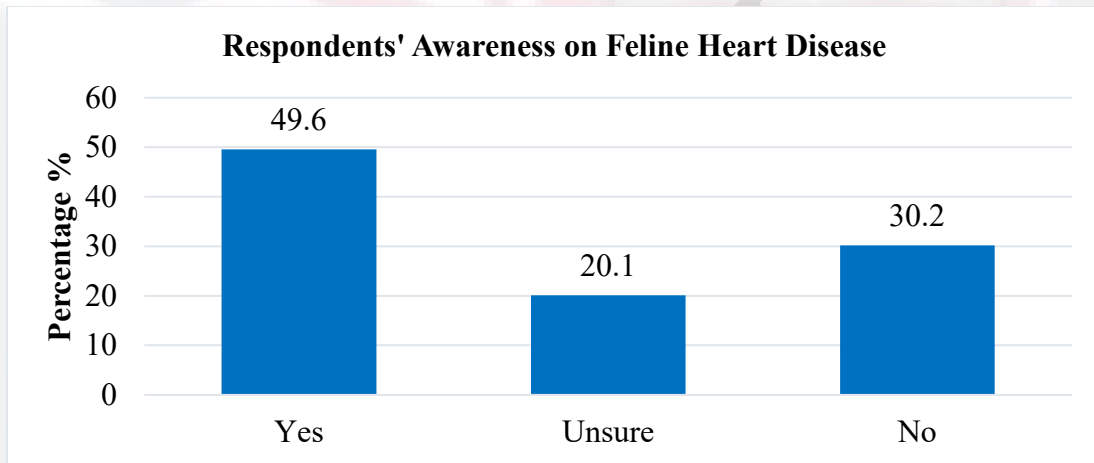


Figure 10: The percentage distribution of respondents' awareness on feline heart disease ( $n=139$ )

The three main leading sources of information which allowed the owner understand about feline heart disease was from reading/searching from the internet or social media (31.5%), followed by 18.9% of them was educated by veterinarians, 16.8% of them obtained the information from pet books, magazines or newspaper articles (refer to Figure 11).

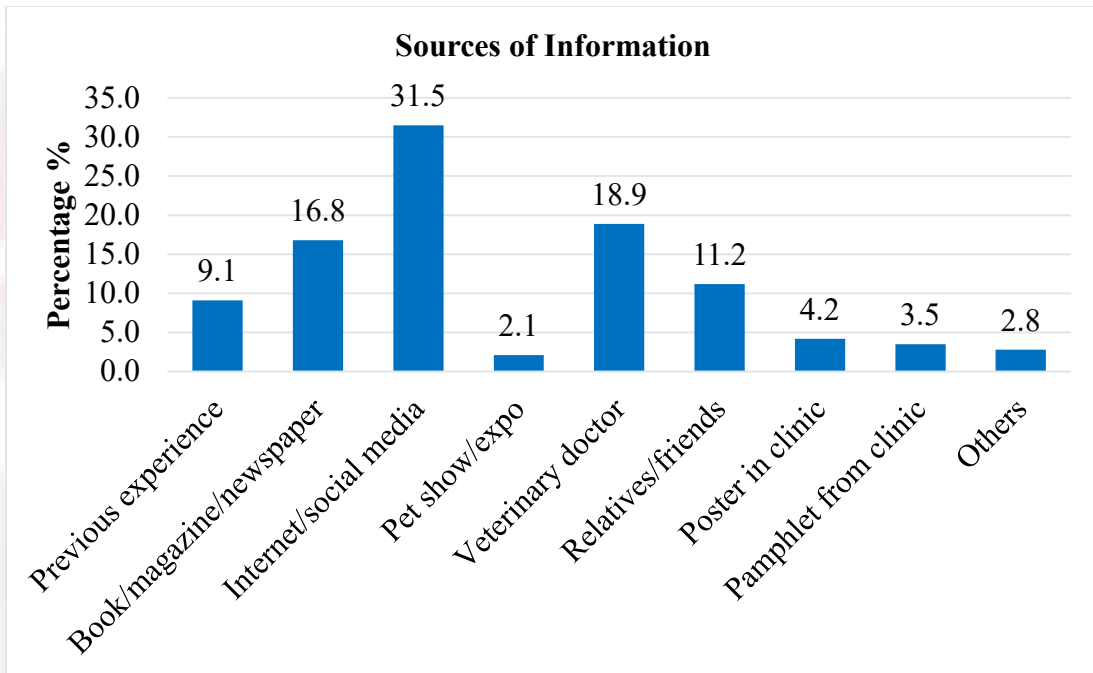


Figure 11: The percentage distribution of respondents' source of information on feline heart disease

Majority (89.2%) of the respondents scored themselves as having poor understanding (Scale 1 to 5) about heart disease in cats and only 10.8% of the respondents perceived themselves to understand (Scale 6 to 10) about the disease (refer to Figure 12).

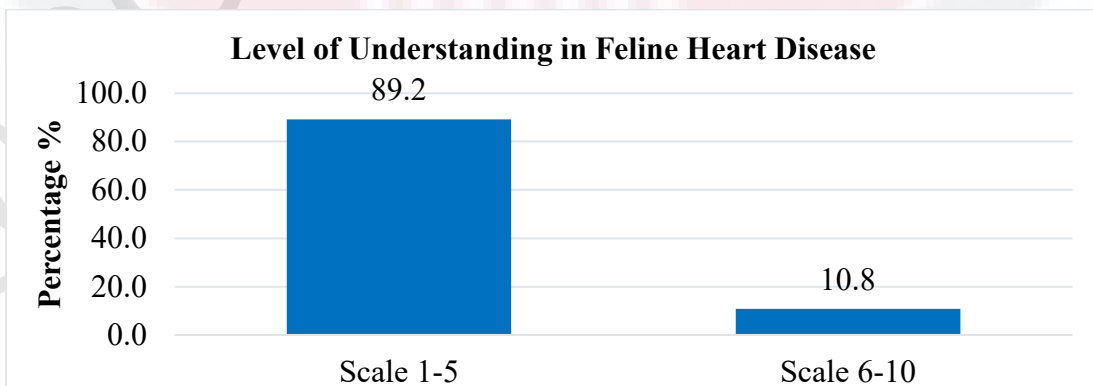


Figure 12: The percentage distribution of respondents' level of understanding in feline heart diseases ( $n=139$ )

When the data of respondents' awareness and level of understanding in feline cardiac diseases were combined, the result revealed that those who were aware and understand about the disease were only 9.4%. Majority of the respondent were aware but did not understand about the disease were 40.3%. The respondents who were unsure and not understand about the disease were only 19.4%. Lastly, those respondents were not aware and did not understand about the disease were 29.5% (refer Figure 13). The Chi-square test for independence indicated significant association between respondents' awareness and level of understanding,  $\chi^2 (2, n=139) = 9.246, p = 0.01$ .

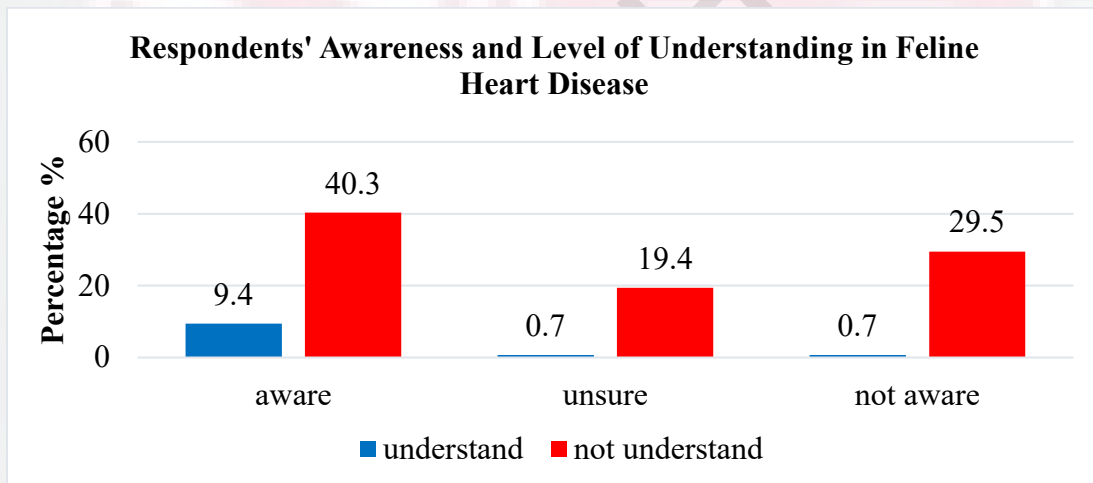


Figure 13: The percentage distribution of respondents' awareness and level of understanding in feline heart disease ( $n=139$ )

Besides that, the respondents were also queried on their willingness to treat their cats if they have been diagnosed with heart disease. Almost 96.4% of them reported that they would treat their cats if the cats have been diagnosed with heart disease, whereas only 3.6% stated they may be would seek treatment for their cats with heart disease. There were no respondents that chose no for this question (refer to Figure 14).

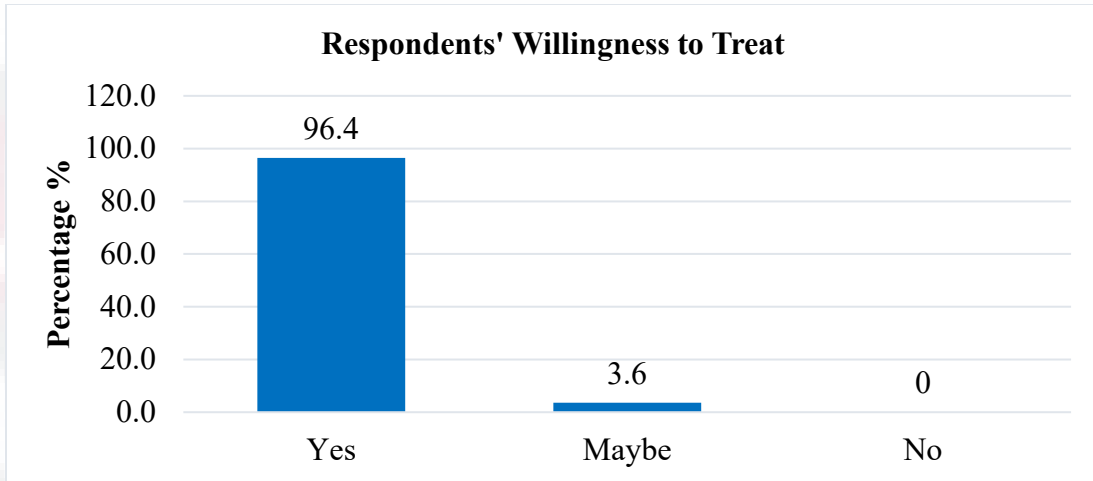


Figure 14: The percentage distribution of respondents' willingness to treat if their cats have been diagnosed with heart disease ( $n=139$ )

The leading barriers that challenge them from treating their cats was mainly due to cost-related (45.4%). Second barrier was time-related (31.6%). About 10.7% of them revealed that there was no particular reason to prevent them from treating their cats, 9.2% reported that there is no cure for heart disease and 3.1% of them had other reasons (refer to Figure 15)

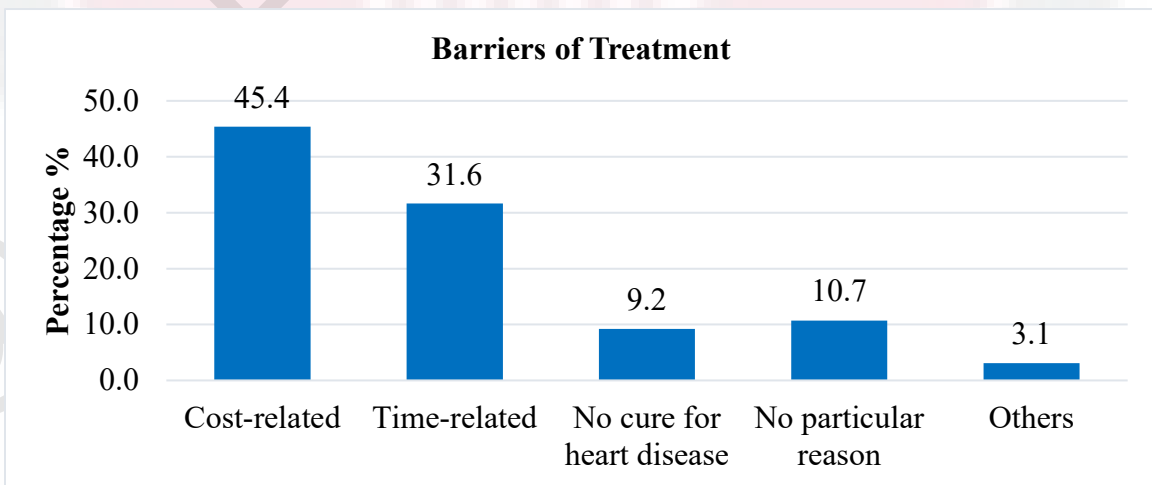


Figure 15: The percentage distribution of the respondents' opinion on barriers that challenge respondents from treating their cats

A high percentage of respondents (45.3%) considered that daily long term treatment therapy for cat diagnosed with heart disease was not troublesome. However, 29.5% of the respondents felt that it may be troublesome and 25.2% agreed that it is troublesome for them to follow the lifelong treatment regime for their cats (refer to figure 16).

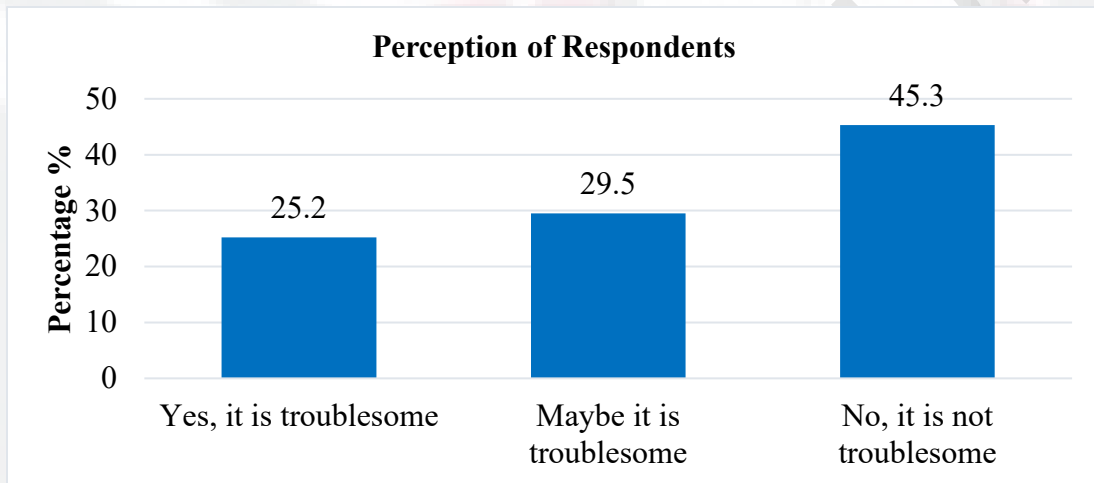


Figure 16: The percentage distribution of respondents' perception on lifelong treatment regime for their cat ( $n=139$ )

The respondents were asked to spontaneously identify the correct clinical signs of a cat suffering from heart disease in order to test their level of knowledge. Out of the 25 clinical signs provided in the questionnaire, only 12 were related to cat suffering from heart disease. Respondents that were then categorised into 3 groups; good, fair and poor. About 56.8% of the respondents were graded fair as they managed to pinpoint five to eight correct clinical signs and 31.7% of them was categorised as poor because they only able to identify nothing to four correct signs. On the other hand, there were

only 11.5% of the respondent were considered good as they were able to identify nine to twelve clinical signs correctly (refer to Figure 17).

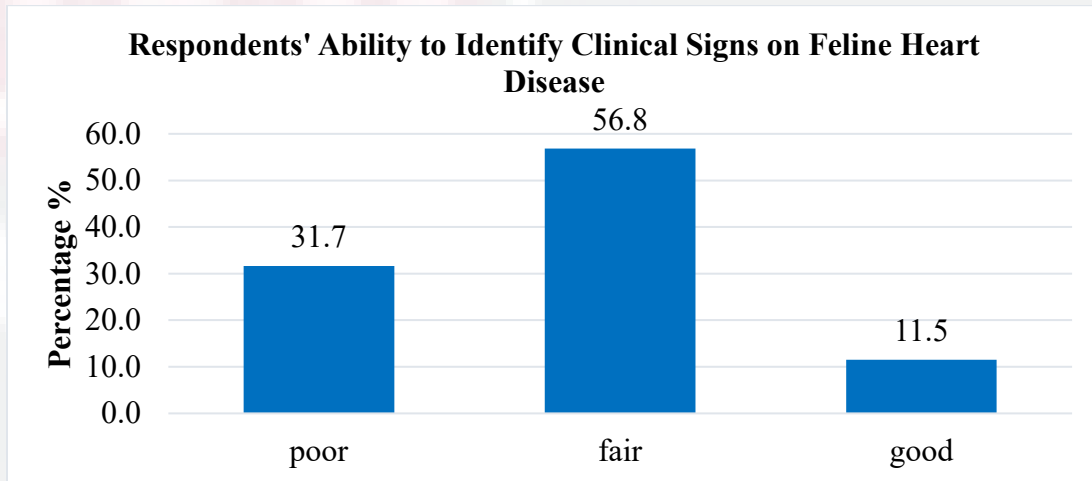


Figure 17: The percentage distribution of respondents' ability to identify the clinical signs on feline heart diseases correctly ( $n=139$ )

When the data of respondents' awareness and ability to identify clinical signs on feline heart disease were combined, it appeared that only 28.1% of the respondents who aware had fair ability to identify clinical signs of cats with heart disease, 16.5% were poor and 5.0% were considered good. On the contrary, percentages of respondents' who were unsure but has the ability to identify clinical signs of heart disease were 14.4% for fair, 3.6% for poor and 2.2% for good. Lastly, there were 11.5% of respondents' who did not know and had poor ability to identify clinical signs of cats with heart disease, 14.4% of them were fair and only 4.3% managed to score good in the questionnaires (refer to Figure 18). The Chi-square test for independence indicated no significant association between respondents' awareness and ability to identify clinical signs,  $\chi^2(4, n=139) = 4.382, p = 0.357$ .

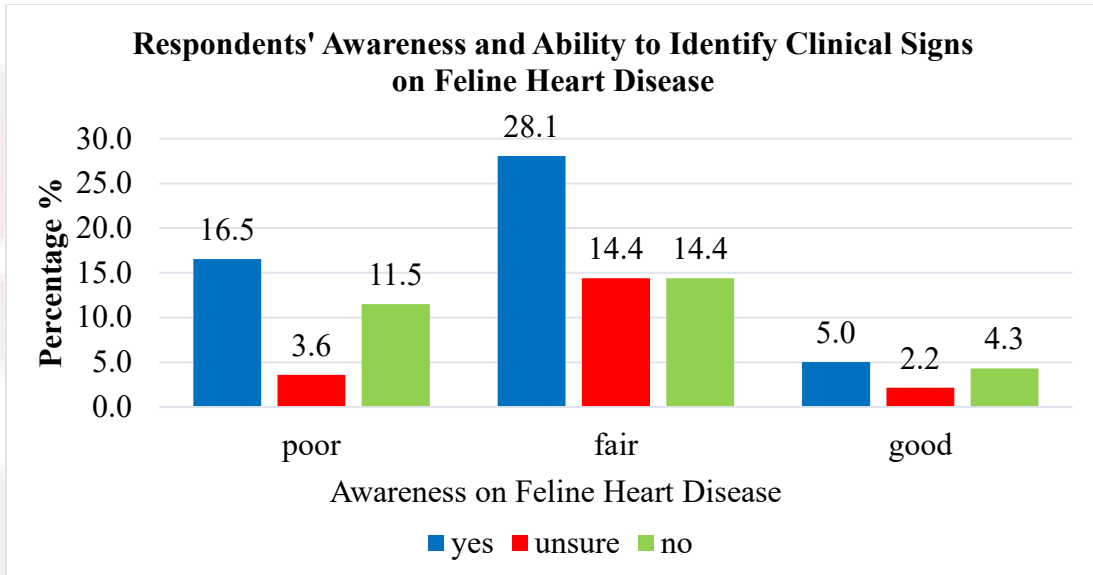


Figure 18: The percentage distribution of respondents' awareness and ability to identify clinical signs on feline heart disease ( $n=139$ )

In addition, the data of respondents' level of understanding which they gauged themselves and ability to identify clinical signs on feline heart disease were combined, it appeared that 51.8% respondents that did not understand about feline heart disease had fair ability to identify clinical signs, 27.3% were poor and 10.1% were good. In contrast, percentage of respondent that considered themselves understand about feline heart disease and scored fair in identifying clinical signs were 5.0%, 4.3% for poor and only 1.4% scored good (refer to Figure 19). The Chi-square test for independence indicated no significant association between respondents' level of understanding and willingness to treat,  $\chi^2 (2, n=139) = 1.221, p = 0.543$ .

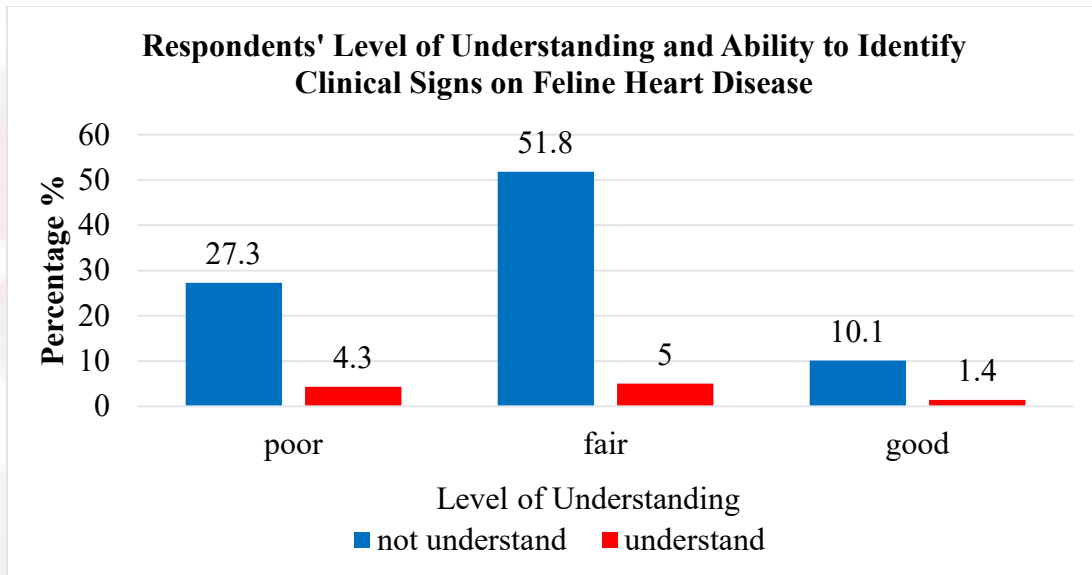


Figure 19: Respondents' level of understanding and ability to identify clinical signs on feline heart disease ( $n=139$ )

#### 4.4 INTENTION TO TREAT CAT WITH HEART DISEASE

##### 4.4.1 Assessment of Measurement Model

The measurement model for this study comprised of five constructs, each measured at least of one item. These constructs included intention to treat, perceived behavioural control, subjective norm, attitude and empathic concern. The assessment was done by using convergence and discriminant validity analysis. Convergent validity of constructs is the measure of constructs that theoretically should be related to each other are actually related (Trochim, 2006). Factor loadings composite reliability (CR) and average variance extracted (AVE) were used to assess convergence validity. The loading for all items must exceed the recommended value of 0.7 to accept the validity of the items, while loading lower than 0.4 showed that the items should be removed.

However, if the item loading was between 0.4 to 0.7 should be considered to remove if the removal enhances the CR and AVE results. The loadings for the items were range from 0.566 to 0.925. The CR value was to show the degree to which item and its recommended value was 0.7. The latent construct of this study range from 0.792 to 0.961 which had exceeded the suggested value. The AVE was in the range of 0.561 to 0.796 which exceeded the recommended value of 0.5. Meanwhile, the Cronbach's alpha was in the range of 0.612 to 0.955 and must fulfill the recommended value of 0.7 (refer to Table 3).

Table 3: Convergent Validity of Constructs

Constructs	Items	Loadings	AVE	CR	Cronbach's Alpha
Intention to Treat	INT1	0.919	0.796	0.940	0.914
	INT2	0.908			
	INT3	0.845			
	INT4	0.894			
Perceived Behavioural Control	PBC1	0.701	0.618	0.865	0.799
	PBC2	0.819			
	PBC3	0.868			
	PBC4	0.744			
Subjective Norm	SN2	0.769	0.561	0.792	0.612
	SN3	0.801			
	SN4	0.671			
Attitude	ATT1	0.810	0.682	0.915	0.884
	ATT2	0.839			
	ATT3	0.800			
	ATT4	0.862			
	ATT5	0.817			
Empathic Concern	EMP1	0.925	0.684	0.861	0.765
	EMP2	0.935			
	EMP3	0.566			

The next analysis that was done was discriminant validity which used the Fornell-Lacker criterion and the cross loading comparisons. Discriminant validity of constructs is the measure of constructs that theoretically should not be related to each other are in fact not related (Trochim, 2006). It was examined by comparing correlations between constructs and the square root of AVE from the construct. According to Fornell-Lacker, the square root of the AVE was greater than the correlation with other construct indicating adequate discriminant validity. Hence, the measurement model for this study were adequate discriminant validity as shown in Table 4.

Table 4: Discriminant Validity of Constructs

Latent Variables	Intention to Treat	Perceived Behavioural Control	Subjective Norm	Attitude	Empathic Concern
Intention to Treat	<b>0.892</b>				
Perceived Behavioural Control	0.618	<b>0.786</b>			
Subjective Norm	0.277	0.168	<b>0.749</b>		
Attitude	0.825	0.597	0.221	<b>0.826</b>	
Empathic Concern	0.704	0.477	0.278	0.734	<b>0.827</b>

Note: Diagonals (bold face) represent the square root of the AVE while the other entries represent the correlations.

#### 4.4.2 Assessment of Structural Model

The results of structural model were presented in Table 3 and Figure 20. All statistical tests were using 1 percent and 10 percent level of significance with two-tailed

t-test. The path coefficients concluded the strength of the hypothesized relationships among the latent variables.

The result shows that the coefficient of determination ( $R^2$ ) value was 0.745 for the intention to treat which suggested that the model variable could explain 74.5% of the variance of intention to treat.

Table 5 revealed the relationship between intention to treat, perceived behavioral control, subjective norm and attitude. According to the analysis done in H1, there was a positive relationship between perceived behavioral control and intention to treat ( $\beta=0.226$ ,  $p<0.01$ ). Similarly, the result showed a significant association between subjective norm and intention to treat ( $\beta=0.091$ ,  $p<0.1$ ) for H2 as well as association between attitude and intention to treat ( $\beta=0.560$ ,  $p<0.01$ ) for H3. The result in H4a was also significant ( $\beta=-0.207$ ,  $p<0.1$ ) which indicated that empathic concern did actually moderate the relationship between perceived behavioral control and intention to treat. However, the results in H4b ( $\beta=-0.048$ ,  $p>0.1$ ) and H4c ( $\beta=0.098$ ,  $p>0.1$ ) were not significant. These meant that empathic concern did not moderate the relationship between subjective norm and intention to treat as well as relationship between attitude and intention to treat.

The post hoc graph from Figure 20 was used to explain more on the moderating role of empathic concern. The graph showed that respondents with high empathic concern, the strength of relationship between perceived behavioural control and intention to treat was not that strong while respondents with low empathic concern the

strength of relationship between perceived behavioural control and intention to treat was stronger. This means that owners with low empathic concern, the veterinarians should target to improve their confidence and commitment in following vets' instructions or skill in giving medication so that they will have higher perceived behavioural control and intention to treat.

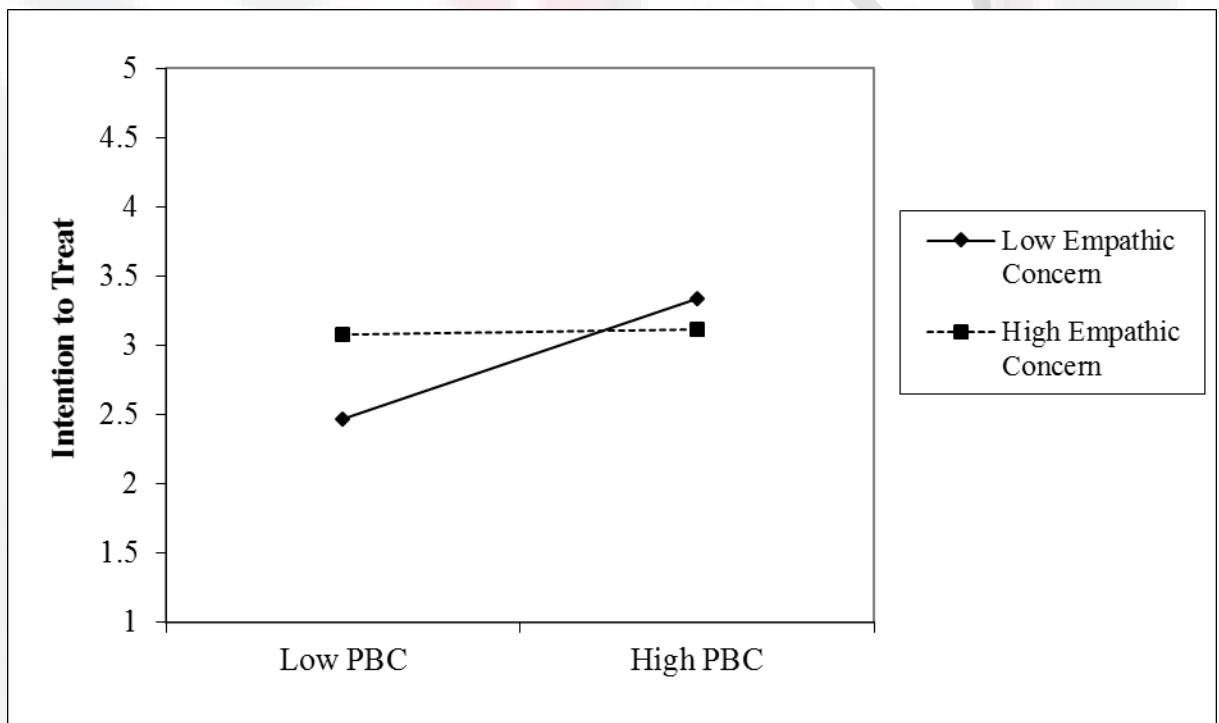


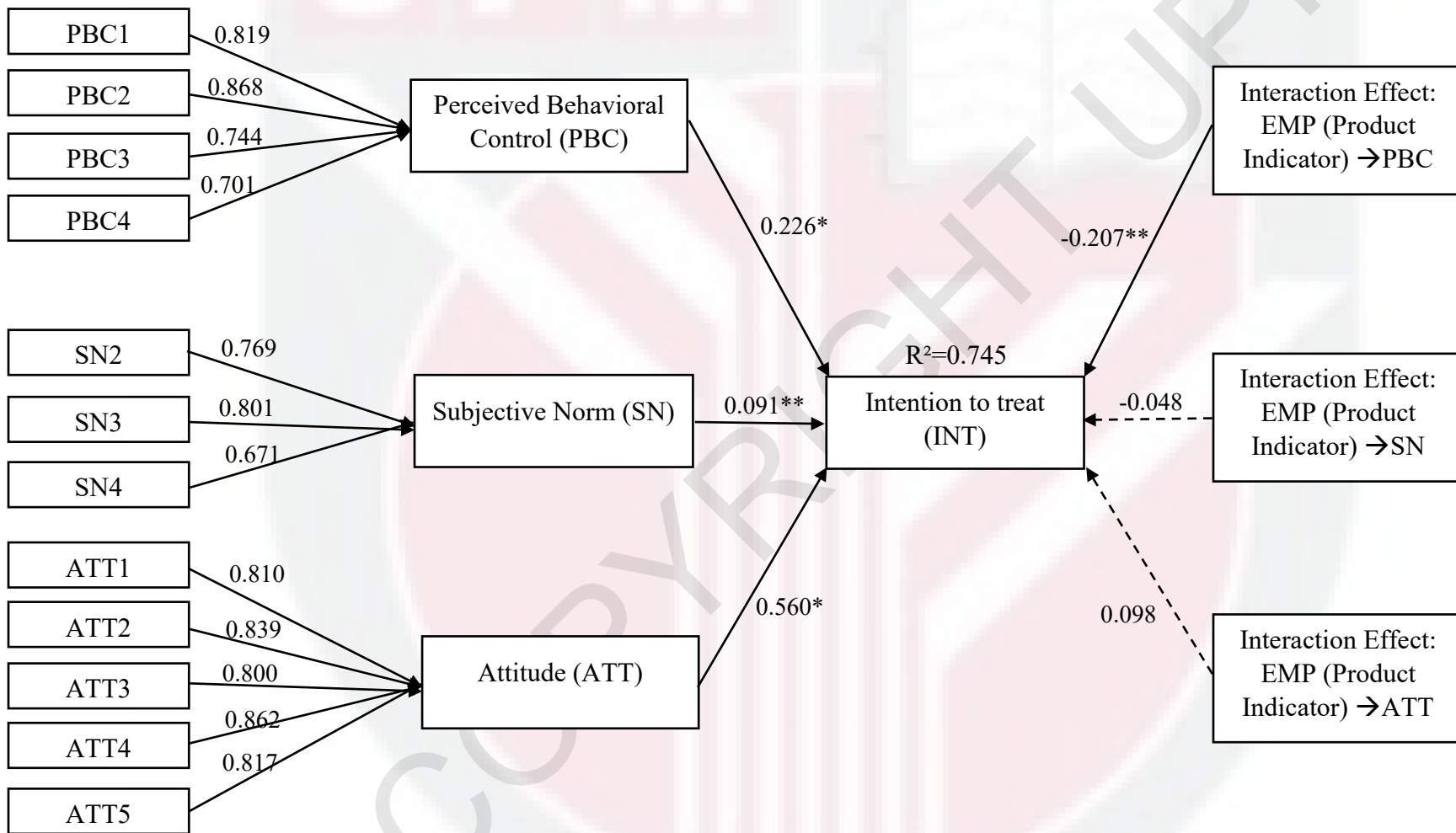
Figure 20: Post hoc graph on moderating role of empathic concern in the relationship between perceived behavioral control and intention to treat

Table 5: Path Coefficients and Hypothesis Testing

Hypotheses	Path Coefficients	Standard Beta	Standard Error	T Statistics	P Values	Findings
H1	PBC→INT	0.226	0.064	3.544*	0.000	Supported
H2	SN→INT	0.091	0.050	1.831**	0.067	Supported
H3	ATT→INT	0.560	0.077	7.301*	0.000	Supported
H4a	Interaction Effect: EMP (Product Indicator)→PBC→INT	-0.207	0.108	1.928**	0.054	Supported
H4b	Interaction Effect: EMP (Product Indicator)→SN--> INT	-0.048	0.075	0.634	0.526	Not Supported
H4c	Interaction Effect: EMP (Product Indicator)→ATT--> INT	0.098	0.105	0.926	0.355	Not Supported

Intention to Treat ( $R^2$ )=0.745

Note: \* $p < 0.01$ ; \*\* $p < 0.1$ . Solid line denotes significant relationship whereas dotted line denotes insignificant relationship



Note: \* $p < 0.01$ ; \*\* $p < 0.1$ . Solid line denotes significant relationship whereas dotted line denotes insignificant relationship.

Figure 21: Structural Model Analysis Output

#### 4.4.3 Summary of Hypotheses Testing

The summary of hypotheses testing results was summarized in Table 6.

Table 6: Summary of Hypotheses Test Results

Hypotheses		Results
H1	Perceived behavioural control is related to owner's intention to treat cat with heart disease	Supported
H2	Subjective norm is related to owner's intention to treat cat with heart disease	Supported
H3	Attitude is related to owner's intention to treat cat with heart disease	Supported
H4a	Empathic concern is altering the relationship between perceived behavioural control and intention to treat	Supported
H4b	Empathic concern is altering the relationship between subjective norm and intention to treat	Not Supported
H4c	Empathic concern is altering the relationship between attitude and intention to treat	Not Supported

## CHAPTER 5.0

## DISCUSSION

## 5.1 METHODOLOGY

The decision to collect data through interviewer-assisted questionnaire were due to several factors such as time constraints, sample size and geographical distribution. Interviewer-assisted questionnaire or through face to face was beneficial as it allowed clarification about the questions to participant if needed, assured every questions were answered and higher participation rate by personal contact in comparison to self-administered questionnaire. However in this study, applied interviewer interference assisted respondents, thus increased the response rate.

Convenience sampling technique was used because it was easier, less costly and less time consuming to obtain a big sample size. However, these people may not be representative of the whole target population and results may not be able to generalise to the entire population. Study participants were obtained from University Veterinary Hospital (UVH), UPM because the number of customers who had cats in the hospital was desirable.

## 5.2 DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Majority of the respondents who took part in the survey were female. According to a study on pet attachment, women reported higher attachment levels to their pets

including cat and dog on the Owner-pet Relationship Scale than men (Smolkovic *et al.*, 2012). This could be one of the main reason why majority of the respondents are female and most of them (61%) aged below 40 years old. According to Ackerman (2008), increased age of pet owners were associated with higher levels of knowledge of pet care. This is because the quantity of knowledge is most probably resulted from experience and experience is supposed to increase continuously with advancing age. Hence, it would be interesting to know whether age can be a factor in affecting the level of awareness and knowledge of respondents on feline heart disease.

In this study, majority of the respondent's monthly household income was between RM5,000 to RM10,000 (34.5%) and most of them were employed (46.8%). The significance in intention to treat will possibly be affected by the earning capabilities of their owners. Respondent's monthly household income and employment status was not looked in depth but it was suspected that it would affect cat owners' decision to treat if their cats have cardiac diseases. In one study conducted in US, on average each household spent just over \$500 on pets including pet food, supplies, medicine and veterinarian services which were about 1% of total spending per year for the average household (Henderson, 2013). Research had also revealed that the amount households spent on pets increased with income. According to Henderson (2013), the lowest income group (less than \$18,558) spent \$216 annually; the middle income group (\$35,600 and \$58,200) spent \$485 on pets annually which was twice more than the lowest income group; and the highest income group (from \$93,800 and up) spent \$870 on pets which was four times more than the lowest income group.

### 5.3 CAT OWNERSHIP INFORMATION

The information on number of years of experience in taking care of cats be acquired in this study is important to determine whether people who have more experience in taking care of cats will have better awareness and knowledge compared to those who have less. Respondents in the category of ten or less than ten years had the largest representation (69%) and only 31% of them have more than ten years of experience. Most of respondents' purpose to have cats was as pet for themselves (46.2%). A proportion of them (20.8%) also rescued cats. Majority of the respondents had more than one cat in their household. When the respondents were queried on the lifespan of a cat can live up to, majority of them (41%) answered that cats can live for between 10 to 15 years. Study had shown that the median longevity was 14.0 years (O'Neill *et al.*, 2015). However, according to American Animal Hospital Association (AAHA) and American Association of Feline Practitioners (AAFP) that geriatric cats can survive more than 15 years old. Besides that, different breeds of cats may have different lifespan (Vogt *et al.*, 2010). Crossbred cats had a higher median longevity than the purebred cats (O'Neill *et al.*, 2015). When respondents were enquired whether they knew that heart disease can be inherited in cats, more than half of them were either unsure (24.5%) or did not know (51.1%). This indicate that majority of the owner's understanding of the disease were poor. For instance, heart disease that can be inherited are congenital heart diseases and HCM which are predisposed in several breeds (Meurs, 2016).

#### 5.4 AWARENESS, PERCEPTION AND KNOWLEDGE OF FELINE HEART DISEASES

Almost half of the respondents (49.6%) reported that they know that cats can suffer from heart disease but the other half of the respondents' reactions who were unsure and completely unaware were often surprised when informed that cats can have cardiac disease. Some of them understood well that cats can have diseases related to viral infection, respiratory, kidney, gastrointestinal, liver and neoplasia but not heart diseases. The prevalence of other diseases are higher compared to cardiac diseases in cat. This observation can be supported by O'Neill *et al.* (2015) in which the most common causes of death in cats were trauma (12.2%), kidney disease (12.1%), cancer (10.8%), lumps (10.2%), brain disease (7.0%) and lung disease (5.5%) and lastly cardiac disease which only comprised of 4.2%.

Majority of the respondents' awareness on feline heart diseases were contributed from the internet or social media. In this era, pet owners are highly dependent on the usefulness of web search engine. A survey reported that 13.4% of the pet owners confined the internet at least weekly for pet health information and at least monthly was 24.2% due to curiosity and desire for clarification of information given by their veterinarian (Kogan *et al.*, 2009). In another study revealed that the most common pet health topics clients searched for online were specific disease or medical problem (Kogan *et al.*, 2012). A proportion of respondents (18.9%) reported that their cat's veterinary doctor told them about it. This result may indicate that there is still lack of discussion or communication between clinician and the cats' owner about the risk

of cat having heart disease which is important especially during regular check-up or screening. It was also interesting to note that some of the respondents (1.8%) had the perception that cats can have heart disease by relating them same as human who also can suffer from heart disease. A study on awareness on human heart disease among women in US also stated that less than 30% of woman reported that their physicians discussed heart disease when discussing their health (Mosca *et al.*, 2000) and this situation could be again the similar in veterinary medicine.

Majority of the cat owners (89.2%) revealed that they had poor understanding (scale 1 to 5) on feline heart disease. The Chi-square test for independence indicated significant association between respondents' awareness and level of understanding. The higher the level of awareness, the higher the level of understanding. These results indicated that even though some of the respondents knew cats can have heart disease but they did not understand the disease much in terms of the types, causes, risk factors, prevention and treatment of feline heart diseases. In order to test the knowledge of respondents, they were asked to identify twelve of the correct symptoms of a cat suffering from heart disease which are difficulty in breathing, panting even at rest, vomiting, syncope, paralysis, seizure, poor body score, exercise intolerance, coughing, sleep most of the time, tired and big swollen belly. Majority of them (56.8%) scored fairly by identified five to eight correct symptoms. There were only 11.5% of the respondents were considered good by identifying nine to twelve symptoms. Out of 69 respondents were aware of feline heart disease, only 10.1% (n=7) had good score. Out of 15 respondents that considered they understand (scale 6 to 10) about the disease,

only 13.3% ( $n=2$ ) had good score. The Chi-square test for independence indicated there was no significant association between respondents' awareness or understanding and ability to identify symptoms. These findings showed that their knowledge or ability to identify clinical signs were poor regardless of their awareness and own perceived understanding. No studies has previously assess the knowledge of feline heart disease but there were studies related to human heart disease. A study on rating of self-knowledge targeted 914 women in US reported that only 5% ( $n=48$ ) of them were very well informed on human heart disease while majority of them (16.1%,  $n=147$ ) were moderately informed (Mosca *et al.*, 2000). Therefore, the lack of knowledge in human heart disease may be a factor that indirectly affects the respondents in correctly identifying the symptoms in feline heart disease. From our observation during the survey, majority of the respondents answered the questions (identifying the symptoms) base on their knowledge or perception in human heart disease.

Based on this group of respondents, 96.4% of cat owners reported that they were willing to treat their cats if they has been diagnosed with heart disease. During the interview, most respondents revealed that it was their responsibilities to ensure the well-being of their pets and their cats are part of the family members. This showed that majority of the cats' pet owners would seek treatment for their cats with heart disease. However, the two main barriers that challenge them from treating their cats were due to cost (45.4%) and time-related (31.6%) issue. Three out of 10 pet owners claimed they have been unable to afford veterinary services and many pet owners (62%) agreed with the statement that "veterinary services are very expensive" (Lue *et al.*, 2008).

Another study carried out by Australian Veterinary Association stated that pet owners perceived cost as the main concern to taking their own pet for a veterinary checkup (Balzer, 2014). However, there are price sensitive owners who were still willing to spend whatever it takes to keep their pet healthy (Lue et al., 2008).

Cat owners felt that long term treatment regime were troublesome that may eventually affect the owners' compliance in treating the cats. Considerable proportion of respondents (54.7%) felt that 'it may be troublesome' and 'troublesome' for them. According to a study conducted in UVH, in 2013 there were 24 new cases on feline heart disease and there were only 10 follow-up cases in 2014; while there were total 52 new cases in 2014 but there were only 26 follow-up cases in 2015 (unpublished; Zakaria *et al.*, 2015). These data showed that only a proportion of owners followed up with their cats' long term treatment and their reasons was not investigated. A study on owners' opinion about the long term treatment of diabetic reported that 62% of 610 owners thought daily treatment of their cats interferes very little with owner's daily schedule but they expressed concerns related to arranging care for their cats when they are traveling and the cost of the treatment (Aptekmann *et al.*, 2014). Hence, these findings pointed out that although most owners were willing to treat their cats with heart disease, but cost and time may be the factors that affected their decision making in treating their cats.

## 5.5 INTENTION TO TREAT CAT WITH HEART DISEASE

The theory of planned behaviour (TPB) is a major outline for understanding, predicting and changing human social behaviour. According to Ajzen (1991), intention is the immediate antecedent or determinant of behaviour and intention is influenced by three conceptually independent constructs which are attitude, subjective norm and perceived behavioural control. Empathic concern is a variable external to the TPB that is expected to influence owners' behaviour and intentions to treat indirectly through the independent constructs.

This study had enhanced our understanding of cat owners' intention to treat if their cats were diagnose with heart disease and veterinarian needs to examined the predictors of intention to treat to understand underlying behaviour of intention to treat. The final result from the structural model analysis output explained 74.5% of intention to treat hence, suggested very strongly that if cats' owners were very concerned about the well-being or health of their cats, they will treat their cats that suffered from heart disease.

Perceived behavioral control is defined as the perception of the ease or difficulty to perform the behavior of interest (Ajzen, 1991). This result was depended on the degree of agreement on the items under the construct. Out of 139 respondents, 66.9% perceived that they have the resources including time and money to support the cat's heart treatments; 78.5% agreed that they are confident to nurse their cats according to veterinarian instruction; 82% agreed that they can be committed to administer prescribed long term medication to their cat; and 60.4% agreed they have

skills to administer oral drugs to their cat. Thus, perceived behavioural control was positively related to owner's intention to treat cat with heart disease which means the increase positivity in perceived behavioural control would contribute to increase the owners' intention to treat their cats if diagnosed with heart disease

Besides that, the finding also showed that subjective norm was positively related to owner's intention to treat cat with heart disease. Subjective norm is whether a person's perception on particular behavior which in this case is intention to treat is influenced by social pressure or the judgment of others (Ajzen, 1991). For instance, 92.1% of respondents agreed that family's support is important; 53.3% of them agreed close friend's support is important; 49% of them disagreed peers' or colleagues' support are important; and 71.9% of them agreed spouse's support is important when they seek treatments for their cats. Therefore, increased subjective norm would lead to higher owners' intention to treat their cats if diagnosed with heart disease.

Attitude is defined as an individual's opinion about whether a behavior is positive or negative (Ajzen, 1991). For instance, 90% of the participants agreed it is wise to bring their cats for regular check-ups; 98.5% of them agreed it is good idea to ensure their cat is healthy; 92.8% of them believed it is wise to continue life-long therapy for the benefits if their cats; 94.3% agreed that they will update their veterinarian during each check-ups on their cats' condition during treatment at home; and 95.7% agreed they will get in touch immediately with their veterinarian when their cats suddenly look sick. Attitude was positively related to owner's intention to treat cat with heart disease.

While three of the TPB constructs were correlated with owner's intention to treat, attitude and perceived behavioural control appeared to be the most important predictors of owners' intention to treat in cats with heart diseases.

The result also found that empathic concern is altering the relationship between perceived behavioural control and intention to treat. According to Batson (2011), empathic concern is defined as other-oriented emotion including feelings of sympathy, compassion, softheartedness, tenderness, sorrow, sadness, upset, distress, concern, and grief which elicited by and congruent with the perceived welfare of someone in need. From the survey, all of the respondents agreed that they had tender and concerned feelings for animals; 99.3% of them considered their cats as family member; and 95.7% of them described themselves as soft-hearted people.

## CHAPTER 6.0

## CONCLUSION AND RECOMMENDATIONS

The level of cats' pet owners' awareness and knowledge on feline heart disease was poor because less than half (49.6%) of respondents knew that cats can suffer from heart disease and majority of them (89.2%) considered themselves did not understand much about this disease. Only a small proportion of them (11.5%) managed to get good score in identifying the correct clinical signs of feline heart diseases. This showed that education programs and interventions about feline heart disease are warranted and should be directed to the general cats' pet owners. Information related to feline heart disease can be delivered to owners by the means of magazines, newspapers, pet expo, poster and pamphlet in clinics as well as better communication between veterinarian and cats' owner to provide health information to their clients. This is because the study indicated that majority of participants knew about the disease through internet but not through other sources of information. Improvement in the awareness and knowledge can be achieved by educating the pet owners on the type, risk and symptoms of feline heart disease, importance of heart screening and regular checkup as well as the treatment and prevention in feline heart disease. Increase awareness and knowledge will ensure prevention, early treatment and proper management of cat with cardiac disease which will lead to better welfare by having good quality of life and longevity.

According to most of the participants, the main barrier to treat cat with heart disease was primarily due to cost concern. Knowing this concern and further development of communication skills to improve the discussion of the monetary aspects of veterinary care within the challenging environment of the veterinarian-client-patient interaction is essential for veterinarians. Veterinarians can explain the value of thorough examination procedures, tests and treatment in order to change the owners' perception that the treatment regime are beneficial for their cats. Discussion of costs should be initiated upfront in order to allow they could properly budget for veterinary care. However, cost- related aspect of treatment can pose barriers and challenges for pet owners as well as veterinarians.

This study also revealed that attitude, subjective norms and perceived behavioural control are positively associated with intention to treat cats with heart disease. Owners have higher intention to treat, if they have more positive attitude, subjective norms and perceived behavioural control. Besides that, findings showed that empathic concern only moderates the relationship between perceived behavioural control and intention to treat. These information obtained will allow clinician to handle or improve strategies in client education during consultation by targeting the factors that may affect the owners' intention to treat. These help veterinarian in planning the treatment and counselling owners about the treatment. Veterinarian can also provide encouragement to owners to undertake treatment of newly diagnosed patients, improve client compliance and ensure follow-up with the long term treatment.

One of the recommendation is to have a larger sample size with different geographical coverage and demographic background in order to avoid biasness, obtain more accurate result, allow greater prediction and capture the effect of empathic concern. Besides that, questionnaire can be structured in English as well as Malay should be taken into consideration because a number of respondents had the difficulty in understanding English which may affect the reliability of the data collected. Back-to-back translation for questionnaire in English & Malay is important to reduce effect of method bias. Future research such as prospective studies can be carried out to determine the cause and effect relation of other factors in awareness, perception and knowledge of cats' owners in feline heart diseases. Last but not least, a longitudinal study can be conducted to evaluate the awareness and knowledge of cats' owner on feline heart diseases whether there is improvement seen over a period of time.

## CHAPTER 7.0

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## CHAPTER 8.0

## APPENDIX

## Appendix I: Questionnaire on Owner's Perception toward Feline Heart Diseases

**Part A-***Awareness, Perception, and Knowledge of Feline Heart Diseases in Malaysia*

Date \_\_\_\_\_

**Survey on Owner's Perception towards Feline Heart Diseases**

Dear Respondents,

This study is conducted to examine your awareness, perception, and knowledge of feline heart diseases. We intend to ascertain if cats' pet owners are aware that cats, like human, are at risks of heart diseases.

You are selected to participate in this survey research and we thank you for occupying some time to answer a few short questions to the best of your ability. Be assured that your responses will be kept confidential and used for **RESEARCH PURPOSES ONLY**. Should you have any questions or suggestions, please do not hesitate to contact us.

Once again, thank you for your contribution.

Sincerely,

Khor Kuan Hua (PhD, FRCV)  
Senior Lecturer  
Department of Veterinary Clinical Studies  
Faculty of Veterinary Medicine  
University Putra Malaysia  
43400 UPM Serdang  
Selangor  
Tel: (603) 8609 3926  
Email: [khhkhor@upm.edu.my](mailto:khhkhor@upm.edu.my)

Your contact will be kept confidential.

Owner's Name:	_____
Address:	_____
	_____
Telephone:	_____
Email:	_____



**Part A-***Awareness, Perception, and Knowledge of Feline Heart Diseases in Malaysia***A. Demographic.***Please ✓ and fill in accordingly.*

- |   |   |
|---|---|
| <p>1. Gender</p> <p><input type="checkbox"/> Male</p> <p><input type="checkbox"/> Female</p> <p>2. Age</p> <p><input type="checkbox"/> Below 20 years</p> <p><input type="checkbox"/> 20 – 29 years</p> <p><input type="checkbox"/> 30 – 39 years</p> <p><input type="checkbox"/> 40 – 49 years</p> <p><input type="checkbox"/> Above 50 years</p> <p>3. How many family members reside in your household?</p> <p>_____</p> | <p>4. What is the approximate range of your monthly household income?</p> <p><input type="checkbox"/> Less than RM 2,000</p> <p><input type="checkbox"/> RM 2,001 – RM 5,000</p> <p><input type="checkbox"/> RM 5,001 – RM 10,000</p> <p><input type="checkbox"/> RM10,001 – RM 20,000</p> <p><input type="checkbox"/> More than RM 20,000</p> <p>5. Employment Status</p> <p><input type="checkbox"/> Unemployed</p> <p><input type="checkbox"/> Self-employed</p> <p><input type="checkbox"/> Employed</p> <p><input type="checkbox"/> Retired</p> <p><input type="checkbox"/> Others: (please specify) _____</p> |
|---|---|

**B. Cat Ownership Information***Please ✓ / circle and fill in accordingly.*

1. Currently, do you have a cat(s) under your care?
- Yes
- No
2. How many years of experience do you have in caring for a cat(s)? \_\_\_\_\_ years
3. What is the purpose for having a cat in your household?  
(Please ✓ one or more options where applicable)
- |   |   |
|---|---|
| <input type="checkbox"/> As a pet for myself      | <input type="checkbox"/> I rescue cats                  |
| <input type="checkbox"/> As a pet for my children | <input type="checkbox"/> I am a breeder                 |
| <input type="checkbox"/> As a companion           | <input type="checkbox"/> Others: (please specify) _____ |
4. How long do you think a cat can live up to?
- Less than 2 years
- 2 – 5 years
- 5 – 10 years
- 10 – 15 years
- More than 15 years

**Part A-***Awareness, Perception, and Knowledge of Feline Heart Diseases in Malaysia*

5. Please list and fill in the details of each pet cat that you have / had.

Name of the cat	Gender		How long have you cared for the cat?	Nature of the cat?		Is the cat healthy (as per today)?		If no, what disease is it suffering from?	Have you used oral medication for this cat?		If yes, how did you administer?	
	M	F		Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
1.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
2.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
3.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
4.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
5.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
6.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
7.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
8.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
9.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
10.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
11.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth
12.			Year(s)	Fierce	Good	Yes	No		Yes	No	Hide in food	Into the mouth

6. Do you know that heart disease can be inherited in cats?

- Yes  
 Unsure  
 No

7. If you have more than a cat as listed in Question 5, are they related to one another?

- Yes  
 No

8. If yes, please draw the family tree or indicate how they are related to one another?

**Part A-***Awareness, Perception, and Knowledge of Feline Heart Diseases in Malaysia***C. Owner Awareness of Feline Heart Disease***Please "✓" and fill in accordingly.*

1. Do you know that cats can suffer from heart disease(s)?
  - Yes
  - Unsure
  - No
  
2. How did you know that cats can also have heart disease(s)? *(Please "✓", more than one is allowed)*
  - From previous experience of having a cat with heart disease
  - Read up from pet book / magazine / newspaper
  - Read up from the internet/ social media
  - From a pet show / expo
  - My cat's veterinary doctor told me
  - My relatives or friends told me
  - I saw a poster available in the veterinary clinic
  - I was given a pamphlet obtained from the veterinary clinic
  - Others: *(please specify)* \_\_\_\_\_
  
3. How well do you think you understand feline heart diseases? *(Please "✓")*  
 Scale of 1 \_\_\_\_\_ to \_\_\_\_\_ 10
 

1	2	3	4	5	6	7	8	9	10
Poor									Very good
  
4. Would you treat your cat if he/she has been diagnosed with heart disease?
  - Yes
  - Maybe
  - No
  
5. What seems to be the barriers that challenge you from treating your cat(s)?  
*(You can choose more than one answer)*
  - Cost-related
  - Time-related
  - There is no cure for the heart disease
  - No particular reason
  - Others:(please specify) \_\_\_\_\_
  
6. Would the treatment regime be troublesome if the veterinarian told you that it is a life-long daily therapy?
  - Yes
  - Maybe
  - No

**Part A-***Awareness, Perception, and Knowledge of Feline Heart Diseases in Malaysia*

7. Which of the followings in your opinion are clinical signs of a cat suffering from heart disease? (Please "✓", only one is allowed for every clinical sign)				
a)	Difficulty in breathing	Yes	No	Maybe
b)	Panting all the time	Yes	No	Maybe
c)	Panting even at rest	Yes	No	Maybe
d)	Pants longer these day after walk	Yes	No	Maybe
e)	No appetite	Yes	No	Maybe
f)	Vomiting	Yes	No	Maybe
g)	Diarrhoea	Yes	No	Maybe
h)	Syncope (Fainting)	Yes	No	Maybe
i)	Paralysis	Yes	No	Maybe
j)	Urinate all over the place	Yes	No	Maybe
k)	Cannot urinate	Yes	No	Maybe
l)	Drinks a lot of water	Yes	No	Maybe
m)	Seizure	Yes	No	Maybe
n)	Poor body score (Thin)	Yes	No	Maybe
o)	Exercise intolerance	Yes	No	Maybe
p)	Nasal discharge	Yes	No	Maybe
q)	Sneezing all the time	Yes	No	Maybe
r)	Dry cough	Yes	No	Maybe
s)	Cough with phlegm	Yes	No	Maybe
t)	Itchy skin	Yes	No	Maybe
u)	Sleep most of the time	Yes	No	Maybe
v)	Looks lethargy (tired)	Yes	No	Maybe
w)	Swollen legs	Yes	No	Maybe
x)	Big swollen belly	Yes	No	Maybe
y)	Others: (Please specify) _____			

**Part A-***Awareness, Perception, and Knowledge of Feline Heart Diseases in Malaysia*

Answer the following that best reflects your experience with your cat, **IF** your cat was diagnosed with heart disease

Referring to the statements below, please TICK (✓) one only on the box allocated. Example:

1	2	3	4	5	✓	7
---	---	---	---	---	---	---

1. Intention to treat		Strongly Disagree _____ Strongly Agree						
a)	I intend to follow-up with my cat's heart treatments.	1	2	3	4	5	6	7
b)	I intend to administer medications recommended by the veterinarian.	1	2	3	4	5	6	7
c)	I intend to buy other suitable supplement to support the heart for my cat.	1	2	3	4	5	6	7
d)	I intend to feed my cat with special formulated diet to support the heart.	1	2	3	4	5	6	7

2. Perceived behavioural control		Strongly Disagree _____ Strongly Agree						
a)	I have the resources (i.e. time and money) to support my cat's heart treatments.	1	2	3	4	5	6	7
b)	I am confident that I can nurse my cat according to the veterinarian's instruction.	1	2	3	4	5	6	7
c)	I can be committed to administer prescribed medication (long term) to my cat.	1	2	3	4	5	6	7
d)	I have the skills to administer oral drugs to my cat.	1	2	3	4	5	6	7

3. How important is the below person's support when you seek treatments for your cat?		Strongly Disagree _____ Strongly Agree						
a)	Family.	1	2	3	4	5	6	7
b)	Close friend(s).	1	2	3	4	5	6	7
c)	Peers/ Colleagues.	1	2	3	4	5	6	7
d)	Spouse.	1	2	3	4	5	6	7

**Part A-***Awareness, Perception, and Knowledge of Feline Heart Diseases in Malaysia*

<b>4. Attitude</b>		Strongly Disagree <span style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></span> Strongly Agree						
		1	2	3	4	5	6	7
a)	It is wise to bring my cats for his/her regular check-ups.							
b)	It is a good idea to ensure that my cat is healthy.							
c)	It is wise to continue the life-long therapy (medication) for the benefits of my cat's life.							
d)	I will update my veterinarian during each check-ups on my cat's condition during treatment at home.							
e)	I will get in touch immediately with my veterinarian when my cat suddenly look sick.							

<b>5. Empathic Concern</b>		Strongly Disagree <span style="display: inline-block; width: 100px; border-bottom: 1px solid black;"></span> Strongly Agree						
		1	2	3	4	5	6	7
a)	I often have tender and concerned feelings for animals.							
c)	My cat is a family member.							
e)	I would describe myself as a pretty soft-hearted person.							

**End of Questionnaire.**

Thank You