



UNIVERSITI PUTRA MALAYSIA

**CATS AS A SOURCE OF ZOO NOTIC DISEASES:
A STUDY OF AWARENESS AND KNOWLEDGE GAP AMONG CAT
OWNERS IN SELANGOR**

AMIRAH SYAKILA BINTI RAZALI

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FPV 2018 7**

**CATS AS A SOURCE OF ZOO NOTIC DISEASES:
A STUDY OF AWARENESS AND KNOWLEDGE GAP AMONG CAT OWNERS
IN SELANGOR**

AMIRAH SYAKILA BINTI RAZALI

A project paper submitted to the
Faculty of Veterinary Medicine, Universiti Putra Malaysia

In partial fulfilment of the requirement for the
DEGREE OF DOCTOR OF VETERINARY MEDICINE

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CERTIFICATION

It is hereby certified that we have read this project paper entitled “Cats as a Source of Zoonotic Diseases: A Study of Awareness and Knowledge Gap among Cat Owners in Selangor”, by Amirah Syakila Binti Razali and in our opinion it is satisfactory in terms of scope, quality, and presentation as partial fulfillment of the requirement for the course VPD 4999 - Project.

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DEDICATIONS

Alhamdulillah

My dearest family,

Mak, Abah, Along, Ain, Abang Dayat and Amoi

My best friend, Mohamad Azwan

My cats,

Lembu, Siti, Udik, Anje, Hitam, Melon, Uteh, Tam, Mok, Baby, Bubu, Lembu Jr., Pungut

and Capsicum

This is for you...

Live bravely,

do more of what makes you happy ☺

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I would like to express my deepest gratitude and appreciation to Allah SWT and those who were directly or indirectly involved in making this project a reality.

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LIST OF ABBREVIATIONS

%	Percent
CALLISTO	Companion Animal multisectorial and Interdisciplinary Think Tank on Zoonoses
CDC	Centers for Disease Control and Prevention
CSD	Cat-Scratch Disease
EU	European Union
JKEUPM	Ethics Committee for Research Involving Human Subjects
RPO	Responsible Pet Ownership

ABSTRAK

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

**KUCING SEBAGAI SUMBER PENYAKIT ZONOTIK: KAJIAN MENGENAI
TAHAP KESEDARAN DAN JURANG PENGETAHUAN DI KALANGAN
PEMILIK KUCING DI SELANGOR**

Oleh

Amirah Syakila Binti Razali

2018

Penyelia: Dr Wan Mastura Shaik Mohammed Mossadeq Penyelia
bersama: Dr Siti Zubaidah Ramanoon

Pemilikan haiwan peliharaan merupakan salah satu ikutan yang popular pada masa kini kerana haiwan tersebut memberikan kegembiraan dan menjadi peneman pemiliknya.

Akan tetapi, terdapat risiko yang tersembunyi di mana kucing menyebarkan penyakit dan secara tidak langsung membahayakan pemiliknya. Isu yang tersembunyi ini boleh di lepas pandang dan tidak di pedulikan kerana ia di anggap sebagai hal yang tidak penting oleh pemilik keranafaedah memiliki haiwan peliharaan mengatasi risiko yang di bawa

olehnya. Tujuan kajian ini dijalankan adalah untuk menilai tahap kesedaran dan pengetahuan mengenai kucing sebagai potensi reservoir dan penyebaran penyakit seperti Sporotrikosis, Dermatofitosis dan Bartonellosis. Tinjauan keratan lintang telah dijalankan dengan mengagihkan set soalan kaji selidik kepada pemilik kucing di kawasan Selangor. Sejumlah 100 responden yang melawat klinik haiwan kesayangan atas pelbagai sebab sepanjang 3 minggu tempoh kajian telah di pilih. Keseluruhannya, majoriti responden (81%) menunjukkan kesedaran yang kurang mengenai penyakit zoonotik. Hanya 54% pemilik kucing yang dikaji tiada kesedaran mengenai Sporotrikosis, 57% mempunyai pengetahuan sederhana mengenai penyakit Dermatofitosis manakala 55% mempunyai pengetahuan sederhana mengenai Bartonellosis. Tiada kaitan signifikan antara faktor umur dan pendidikan dengan pengetahuan kesemua penyakit tersebut. Bagaimanapun, terdapat kaitan yang signifikan di antara kaum kesemua responden dengan kesedaran mengenai Sporotrikosis ($P=0.006$) dan Bartonellosis ($P=0.001$).

Kata Kunci: kucing, Sporotrikosis, Dermatofitosis, Bartonellosis, zoonotik, pengetahuan

ABSTRACT

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

CATS AS A SOURCE OF ZONOTIC DISEASES: A STUDY OF LEVEL OF AWARENESS AND KNOWLEDGE GAPAMONG CAT OWNERS IN SELANGOR

By

Amirah Syakila Binti Razali

2018

Supervisor: Dr Wan Mastura Shaik Mohammed Mossadeq

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Owning pets is one of the most popular trends nowadays as they bring happiness and companionship for the owner. However, there may be hidden risk of cats harboring diseases which may indirectly harm the owners. This underlying issue can be overlooked and neglected as it is considered as a dismissive matter by the owner considering that the benefit of keeping them may outweigh the risks brought about by

their pets. Thus, the aim of this study was to assess the level of awareness and knowledge on cats as a potential reservoir and spread of diseases such as Sporotrichosis, Dermatophytosis and Bartonellosis. A cross-sectional survey was conducted by distributing a set of questionnaires to cat owners in several areas of Selangor. A total of 100 respondents who attended small animal clinics for various reasons during the 3 week-long study period were selected. Overall, majority of the respondents (81%) were not aware of zoonotic diseases. Only 54% of cat owners surveyed were not aware of Sporotrichosis, 57% had average knowledge of Dermatophytosis while 55% had average knowledge of Bartonellosis. There was no significant association between age and education factors on knowledge for all diseases surveyed. The race of these owners however showed a significant association with awareness on Sporotrichosis ($P=0.006$) and Bartonellosis ($P=0.001$).

Keywords: cat, Sporotrichosis, Dermatophytosis, Bartonellosis, zoonotic, knowledge

1.0 INTRODUCTION

1.1 Background

Cats have been one of the most preferred household companion animals since the beginning of domestication of animals. Pets provide companionship, psychological and physiological benefits to the owners (McConnell et al., 2011), all of which outweighs the potential zoonotic risk that they might bring as well. Pet owners are more susceptible towards diseases originated from companion animals. Most of them regard their pet as their own family and might not realize the potential and risk of disease that their pets may bring.

Recently, there is increase in concern of cats as a potential zoonotic reservoir with regards to the close proximity of these animals to humans. The efficient technology nowadays allows the public to share and spread information about the recent outbreak or cases that happened. Despite this, owners may not be aware that their pets may harbor zoonotic diseases or may not even be informed of the danger of these diseases to their health or even their families. This is probably due to lack of information available on the media, pamphlets or in the news or unreliable source of information from the rumors. It may be simply be that the owners are indifferent towards this threat or regarded them as not life threatening. The knowledge of disease transmission and source of exposure are crucial so that the people who at risk can take an appropriate

preventive measure to minimize the disease transmission. Their knowledge may reflect their attitude and practices of controlling the cat-associated zoonoses as well. In Malaysia, there is limited study regarding the level of awareness on specific pet-associated zoonoses.

One study conducted in Australia revealed that although the respondents had heard about zoonoses, their knowledge of animals as a source of disease and associated exposure routes was generally low especially in relation to the important zoonoses. Most of the respondents stated that they were not concerned about contracting a disease from their pets (Steele & Mor, 2015). Despite this, the knowledge regarding mode of transmission and source of infection is extremely important in order to minimize the risk of contracting zoonotic diseases. Generally, the level of knowledge that they have may reflect the attitude and influence the practices in controlling and preventing the disease transmission. Certain improper practice of preventing disease such as directly touching the infected animals may expose the pet owners to infection. According to Companion Animal Multisectorial and Interdisciplinary Think Tank on Zoonoses (CALLISTO), a project by the European Union (EU) acceptance and promotion of the concept of responsible pet ownership (RPO) is required in order to reduce the risks of transmission of zoonoses from companion animals to man or production animals. This project also emphasized the importance of education and communication to the public especially to those who are at risk of acquiring the diseases such as children, pregnant women, elderly and immune-compromised person. CALLISTO recommended dissemination of messages regarding companion animal zoonoses including efforts to reach a balance

between maintaining or possibly increasing the benefits of keeping companion animals and mitigating or eradicating potential zoonotic risks. Apart from that, 'One Health' approach may be used to initiate awareness on zoonoses with the collaboration of human medical, veterinary medical and environmental in regards to addressing and promoting public health issues. The risk of pet spreading zoonotic diseases should be efficiently communicated to the public including those who do not own any pets at home. People who do not keep pets are able to acquire these infections from contact with cat feces and the parasites that leave the animals' bodies (Chomel et al., 2014). It is crucial for pet owners to acquire adequate knowledge regarding zoonoses originating from pets and the preventive measures in order to minimize the risks and transmission of zoonotic diseases.

1.2 Justification

Zoonoses from pets are one of the major concerns nowadays as pet owners live at close proximity to their cats. However, their level of awareness and knowledge associated with zoonotic diseases are still unknown since very limited studies regarding this issue has been published especially in Malaysia. This study aimed to assess the level of awareness and knowledge gap on common feline zoonoses in addition to the corrective measures practiced by the pet owners in the prevention and control of Sporotrichosis, Bartonellosis and Dermatophytosis. The result of this study can be used in the future as a reference on the effectiveness of communication on spreading the information about zoonotic diseases to the public and the factors that influence the level of awareness and knowledge gap among the cat owners. The potential risk factors associated with feline zoonoses and 'responsible pet ownership' must be efficiently communicated to the public. Improving public health awareness regarding feline zoonoses will help minimize pet-associated zoonoses transmission in the future.

1.3 Objectives

The objectives of this study are:

- (a) To analyze the public's general knowledge regarding important feline zoonoses associated with cutaneous infection.
- (b) To investigate the factors that associate with the level of knowledge among cat owners.
- (c) To assess for the preventive measures taken by the pet owners on controlling pet-associated zoonoses

1.4 Hypothesis

Null Hypothesis: Pet owners have a limited knowledge and awareness on the risk of cat-associated zoonoses particularly Sporotrichosis, Dermatophytosis and Bartonellosis.

Alternative Hypothesis: Pet owners have a good knowledge and awareness on the risk of cat-associated zoonoses particularly Sporotrichosis, Dermatophytosis and Bartonellosis.

2.0 LITERATURE REVIEW

2.1 Possibilities of Contracting Pet-associated Zoonoses

It is estimated that more than 50% of American households own at least one pet (Rabinowitz et al., 2007). This indicates that majority of the society lives in a close proximity with animal which makes them more vulnerable to diseases originated from their companion animals. A large percentage of cats and dogs are kept exclusively or partly indoors and 90% of owners regard their pet dog or cat as a family (Chomel et al., 2014). To a certain extent, the owners did not mind to sleep next to their pets. A study revealed that between 14% and 62% of owners allow their pet to sleep on their bed (Chomel et al., 2014). However, this practice comes with risks such as acquiring infection from scratches and bites from animals. Nearly half of the total respondents surveyed reported that they or someone in their household had been bitten or scratched by an animal in the past (Steele & Mor, 2015). Common zoonoses can be spread through various mode of transmission including direct contact, saliva, fecal contamination and through vectors like tick and fleas that are present on pets. Thus, it is crucial to emphasize the importance of responsible pet ownership by providing information on good general healthcare management of pets to sustain the welfare of the animals as well as to reducing the risk of infection to the owners. Majority of the respondents from a study conducted in New York vaccinated and dewormed their dogs (Sandhu & Singh, 2014). In Malaysia, there is lack information distribution and knowledge regarding specific pet-associated zoonoses catered for pet owners. Thus, the

risks of acquiring these diseases are high since there is a growing trend of keeping cats as companion among the public.

2.2 Important Feline Zoonoses-Sporotrichosis

Sporotrichosis was first discovered and reported in Baltimore in 1898 by Benjamin Schenck. In 1900, the morphology of this pathogenic fungus was described in more detail. This disease is caused by *Sporothrix schenckii* (*S. schenckii*) and was first discovered by Hekton and Perkins (Morris, 2002). The true prevalence of sporotrichosis in Malaysia is unknown (Tang et al., 2012) eventhough the first occurrence of Sporotrichosis in Malaysia was reported in 1990 (Zamri et al., 1990).

S. schenckii is a dimorphic fungus that is commonly found in nature. It is a common saprophyte that can be found in soil, fruits, tree bark, wood, rose shrubs and decaying vegetation and has been isolated from dogs, cats and horses (Barros et al., 2011). Sporotrichosis has been reported to be associated with scratches of thorn bushes and scratches and bites by the infected animals (Rakatansky, 2005).

Non-healing wound is the main lesion observed in the affected cats (Rathiyamaler et al., 2017). A retrospective study conducted in Malaysia revealed that a total of 19 cases of Sporotrichosis were identified within a period of 6 years where 13 cases were associated with history of cat scratches and bites (Tang et al., 2012). Lymphocutaneous sporotrichosis was the most predominant type identified (Tang et al., 2012). The

characteristic infection involves suppurating subcutaneous nodules that progress proximally along lymphatic channels.

In Rio de Janeiro, 759 cases in humans were reported between 1998 and 2004. In total, 83% of patients stated having a history of contact with cats (Schubach et al., 2001). The high incidence rate may be due to the number of dogs and cats admitted to hospitals with Sporotrichosis during that period of time.

2.3 Important Feline Zoonoses- Dermatophytosis

Dermatophytosis is prevalent worldwide and is one of zoonotic skin diseases that cat owners are at risk of contracting. Feline dermatophytosis is a superficial fungal skin disease. The most commonly isolated pathogen is *Microsporum canis*. Infection with *Microsporum persicolor*, *Microsporum gypseum* and *Trichophyton* species dermatophytosis is highly contagious but not life-threatening, treatable and curable, easily contracted by direct contact and of zoonotic importance (Moriello, 2014). Contact between infective spores and the skin, and concurrent microtrauma are prerequisites for disease development. Almost 20-50% of human skin infections were from zoonotic dermatophytes which are mainly found in companion animals (Murmu et al., 2015).

Dermatophytosis is one of the major public health concerns in tropical countries like Malaysia (Lim et al., 1992). Result from a retrospective study conducted in Malaysia

from January 1993 to May 2000 revealed that 576 dermatophytes were successfully isolated from the patients under study (Ng et al., 2003).

Prevalence of Dermatophytosis on cats in Europe and United State of America (USA) for the past 24 years ranged from 4-100%. However, these numbers can be very misleading and may overestimate the actual disease prevalence due to fomite carriage by cats (Moriello et al., 1994).

A study conducted in Kolkata reported clinically suspected cases of Dermatophytosis from 202 cats and 37 human beings. Cats have found to have the highest number of significant dermatophytic fungal infection among the total samples collected (Murmu et al., 2015).

The prevalence of more than 50 to 70% cases of human mycotic infections from animal hosts or mainly the pet animals were reported by Day et al. (2012) and Moretti et al. (2013). Cats and dogs are the most susceptible pet animals to the Dermatophytosis and can be the main source of human fungal infection. Large number of infected animals may lead to high susceptibility of human infection. However many factors contribute to the occurrence including low level of awareness and poor pet management.

2.4 Important Feline Zoonoses- Bartonellosis

Cat-scratch disease (CSD) is an infection caused by *Bartonella henselae*, acquired from exposure to infected cats. It is a fastidious gram-negative bacillus (Chang et al., 2002). Bartonellosis is an emerging disease and can cause zoonotic disease infection among children and adults. It is a self-limiting disease but may cause other potentially life-threatening disease.

Cats infected with this disease are commonly asymptomatic and appear to be healthy. However, in severe infection, the infected cats may develop clinical signs like uveitis, lymphadenomegaly, gingivitis, stomatitis, urinary tract infection and fever (Breitschwerdt & Kordick, 2000).

Apart from scratching, biting and licking from infected cats, fleas infestation in cats can be another major risk factors of *B. henselae* transmission among cats, but the exact role of the fleas (*Ctenocephalides felis*) in the transmission to human is not known (Zangwill et al., 1993).

Although the clinical manifestation in human is generally mild and self-limiting, the diagnosis of this disease can be quite challenging as the differential diagnosis often includes more serious disease conditions such as lymphoma, carcinoma, mycobacterial or fungal infection or neuroblastoma. This may result in difficulty in diagnosis and lengthy treatment before diagnosis (Lina et al., 2010).

Approximately 33% of the feral cats and 10% of the pet cats are bacteremic with the organism (Dennis, 2001). However, only 5% scratched by the same cats developed this disease in human beings.

Bartonellosis has a worldwide distribution. Approximately 22,000 cases reported in United States every year (Ridder et al., 2005). In Ontario, the overall prevalence of *Bartonella* spp. from blood sample of healthy cats in 1 year duration was 4.3% (Ali Kamrani et al., 2008). A retrospective study in Malaysia conducted from 2013 to 2014 reported that 16.9% out of 284 blood samples collected from cats were positive for *B. henselae* (Ummukulthum Lawal Hassan, 2015).



3.0 MATERIALS AND METHODS

3.1 Ethical Clearance Approval

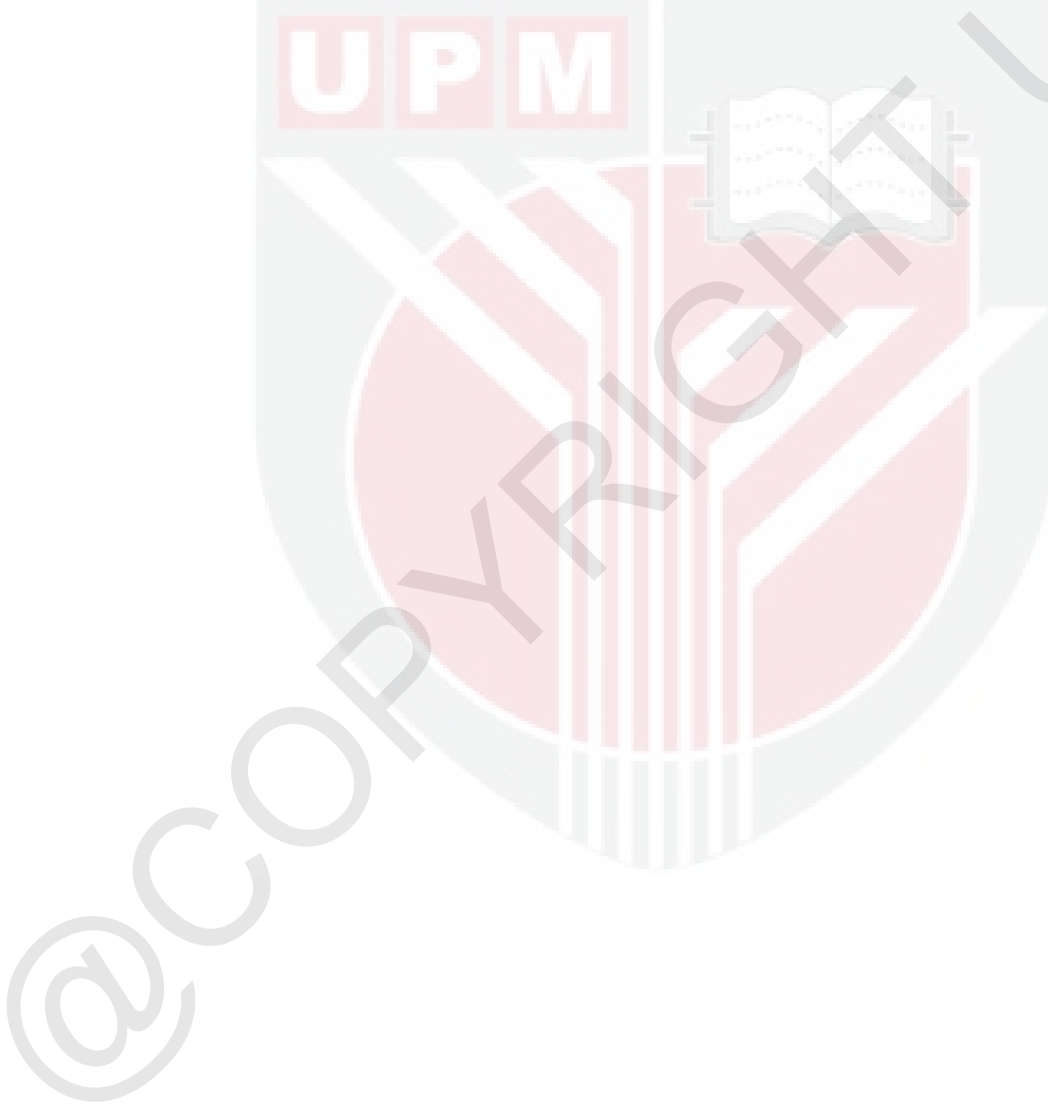
This research project has been approved by the Ethics Committee for Research Involving Human Subjects (JKEUPM) – JKEUPM-2018-281.

3.2 Data Collection

A cross-sectional questionnaire-based study was conducted among cat owners for a period of 3 weeks in January 2018 at small animal clinics in Selangor. A total of 100 respondents with recent or previous cat ownership surveyed. They were individually approached by the researcher prior to the distribution of questionnaire. The questionnaire was designed to obtain the information on socio-demographic, pet ownership and their general knowledge of cat-associated zoonotic diseases such as Sporotrichosis, Bartonellosis and Dermatophytosis. A standard questionnaire consisting of 26 questions was used in this study. The respondents were informed briefly about the study background, objectives, and importance of this study for the researcher and respondents of this study. They were also reminded that their information will be strictly confidential. The respondents were each asked to complete a consent form after they had agreed to participate in this study.

3.3 Statistical Analysis

The data was analyzed using IBM SPSS Statistic Version 22. Descriptive statistics was used to determine the pet owners' knowledge and awareness of zoonotic diseases. Crosstab analysis using Chi-square test was performed to determine the association between the demographic factors and the knowledge level.



4.0 RESULTS

4.1 Socio-demographic Information

The age of the respondents in this study ranged from less than 18 until more than 50 years. Overall, 72% of the respondents were between 18-29 years old. Table 1 shows the race of respondents in which the majority of the respondents is Malay (93%), followed by Chinese (4%) and others (3%). A large proportion of respondents are Degree holders (49%), followed by Diploma (23%), SPM (18%), Masters (7%) and STPM or Matriculation (3%).

Table 1: Socio-demographic information (N=100)

Criteria	N (%)
Age	
<18	2 (2.0)
18-29	72 (72.0)
30-40	11 (11.0)
41-50	7 (7.0)
>50	8 (8.0)
Race	
Malay	93 (93.0)
Chinese	4 (4.0)
Indian	0 (0.0)
Others	3 (3.0)
Education	
SPM	18 (18.0)
STPM/ Matriculation	3 (3.0)
Diploma	23 (23.0)
Degree	49 (49.0)
Master	7 (7.0)
PhD	

4.2 Awareness on Zoonoses

Majority of the respondents (81%) have not heard of zoonotic diseases before in their lives (Figure 1). However, the researcher had to explain the terminology in layman's term to provide an understanding of the disease further. However, majority of the respondents (83%) were interested to obtain more information about zoonotic diseases (Figure 2).

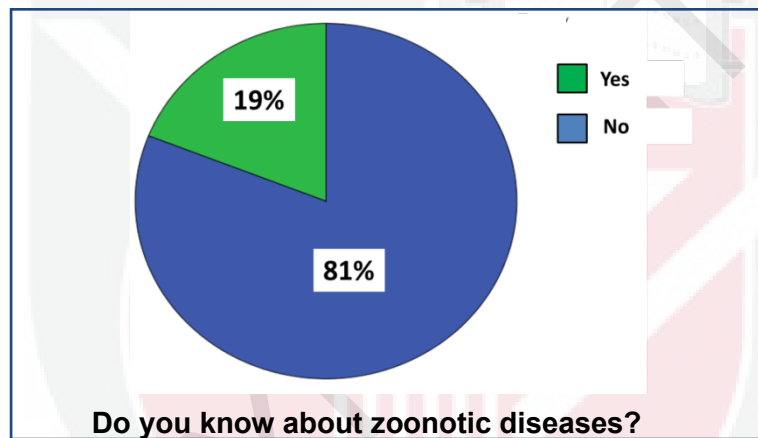


Figure 1: Awareness on zoonotic diseases

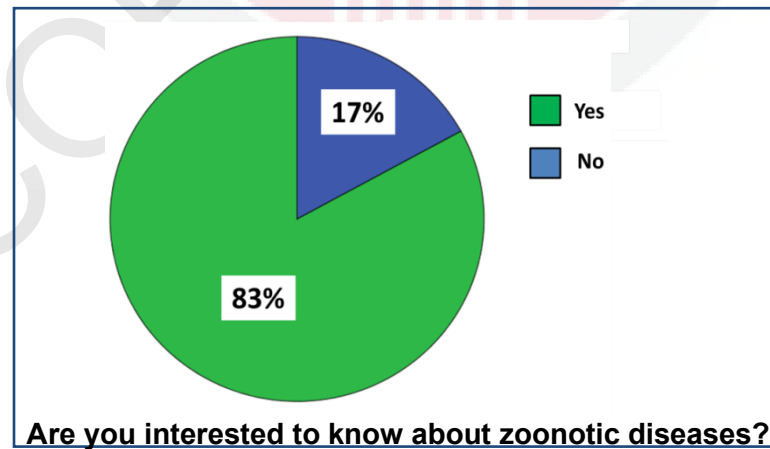


Figure 2: Interest in zoonotic diseases

4.3 Pet Ownership Information

Table 2 represents a summary of pet ownership information. Most of the respondents owned more than 5 cats (41%). From an overall perspective, majority of the respondents live together with their pet either keeping the cats as semi-roamer (52%) or indoor (32%). A total of 51% of the respondents sleep next to their cats.

However, most owners did vaccinate or deworm their cats

Table 2: Pet ownership information (N=100)

Criteria	N (%)
Cat(s) owned	
1	30 (30.0)
2	12 (12.0)
3	7 (7.0)
4	8 (8.0)
5	2 (2.0)
>5	41 (41.0)
Cat stay	
Indoor	32 (32.0)
Outdoor	16 (16.0)
Semi-roamer	52 (52.0)
Sleep with cat	
Yes	51 (51.0)
No	49 (49.0)
Vaccinated & dewormed cat	
Yes	56 (56.0)
No	44 (44.0)

4.4 Knowledge on Specific Zoonoses

This section comprises of 3 sections related to 3 different diseases i.e. Sporotrichosis, Dermatophytosis and Bartonellosis. Five multiple choice questions were asked regarding the aetiology, transmission, symptoms, risk factors, prevention and awareness. The respondents were required to answer the most relevant answers according to their knowledge. One mark was given for a correct answer while 0.5 mark was allocated for an acceptable answer. The total marks were reported in the form of percentage. Respondents who obtained more than 70% correct answers were considered to have good knowledge those with a range of 41 to 70% considered to have average knowledge while those with marks less than 40% were regarded as having poor knowledge. The results are shown in Table 3.

More than half of the total respondents (54%) still have poor knowledge of Sporotrichosis (Table 3). Fifty seven percent of the respondents had an average knowledge on Dermatophytosis compared to 23% who demonstrated a good knowledge on the subject (Table 3).

However, only 5% of the total respondents have good of Bartonellosis (Table 3).

Table 3: Knowledge on Cat Zoonoses (N=100)

Knowledge	N (%)
------------------	--------------

Sporotrichosis

Good	8 (8.0)
Average	38 (38.0)
Poor	54 (54.0)

Dermatophytosis

Good	23 (23.0)
Average	57 (57.0)
Poor	20 (20.0)

Bartonellosis

Good	5 (5.0)
Average	55 (55.0)
Poor	40(40.0)

4.5 Knowledge on Risk Factors and Prevention Aspect of Feline Zoonoses

Knowledge on prevention of each specific disease was assessed from the questions given. The respondents were given a choice of more than 1 answer. For Sporotrichosis, 55 respondents (35.4%) chose to isolate the infected cats from the other cats, 34 respondents (21.5%) will seek for advice from veterinarian and 40 of them (25.3%) chose to wash hands before eating. 17.7% of respondents chose to clean the wound on the infected cats.

traditional remedies was on the bottom of the list (5.2%). However, 28 respondents (24.1%) chose to bathe and clean the infected cats.

vaccinated cats while 17 respondents (14.2%) chose direct contact with cats' lesions as a risk factor. However, minority of them (5.4%) failed to recognize flea infestation in cats as another important risk factor apart from the scratches by infected cats. Results are shown in Table 4.

Table 4: Knowledge on Prevention of Sporotrichosis and Bartonellosis

Knowledge	n (%)
Prevention of Sporotrichosis (n=158)	
Wash your hands before eat	40 (25.3)
Clean the wound on infected cat	28 (17.7)
Consult the veterinarian	34 (21.5)
Isolate the infected cat from the other cats	56 (35.4)

Prevention of Dermatophytosis (n=116)

Vaccination and deworming program	48 (41.4)
Prevent direct contact on infected cat	34 (29.3)
Bathe and clean the infected cat	28 (24.1)
Apply traditional remedies on the cat's lesion	6 (5.2)

Risk factors of Bartonellosis (n=129)

Scratch from the infected cats	82 (63.6)
Fleas infestation (cats)	7 (5.4)
Non-vaccinated cats	23 (17.8)
Direct contact on cats' lesion	17 (13.2)

4.6 Awareness on Specific Feline Zoonoses

Overall results depicted that a majority of the respondents (62.9%) were aware that Dermatophytosis can be harmful as illustrated in Figure 3.

A total of 62.9% of respondents were not aware that Bartonellosis is harmful to human (Figure 4).

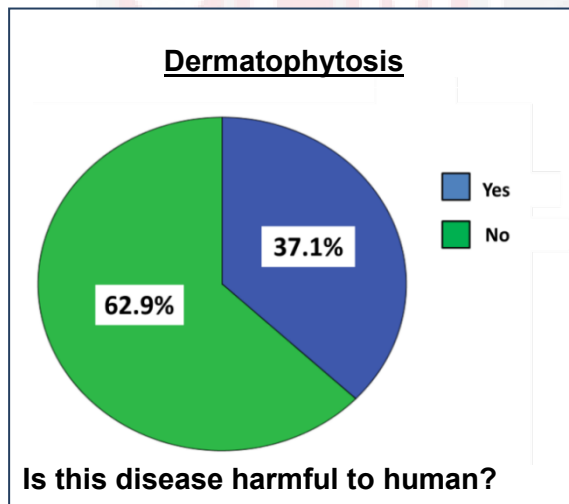


Figure 3: Awareness on risk of Dermatophytosis

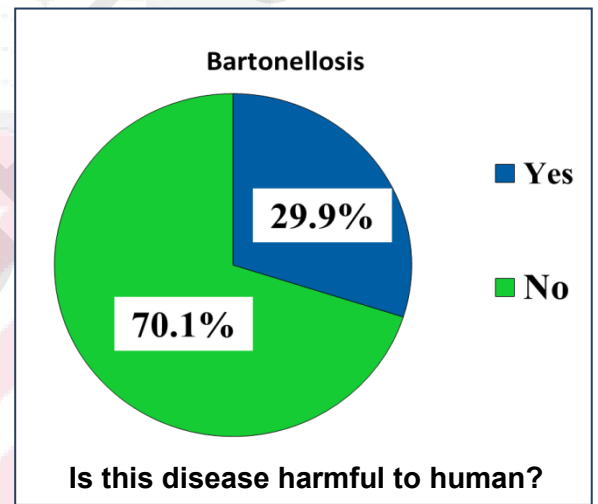


Figure 4: Awareness on risk of Bartonellosis

4.7 Factors Influencing the Knowledge Gap

No significant association was detected between age and education factors for all diseases as illustrated in Table 5. The race factor showed a significant association with knowledge on Sporotrichosis ($P=0.006$) and Bartonellosis ($P=0.001$) Thus, the race factor and level of knowledge on Sporotrichosis and Bartonellosis were dependent.

Table 5: Association of demographic factors and knowledge on diseases.

Criteria	P-value
Age Factor	
Sporotrichosis knowledge	0.946
Dermatophytosis knowledge	0.581
Bartonellosis knowledge	0.167
Education Factor	
Sporotrichosis knowledge	0.983
Dermatophytosis knowledge	0.998
Bartonellosis knowledge	0.911
Race Factor	
Sporotrichosis knowledge	0.006
Dermatophytosis knowledge	0.325
Bartonellosis knowledge	0.001

5.0 DISCUSSION

The response rate of this study was higher for the age group ranged between 18 and 29 years old indicative from the largest figure among the total respondents. Almost all respondents are Malay race, which could be due to the location of this study which is located in the Malay community area. Majority of the respondents are degree holders followed by diploma holders and SPM.

Majority of the respondents owned more than 5 cats at home. Most of the cats were kept as semi-roamer followed by indoor and outdoor cat. This shows that most of the cat owners allowed their cats to roam inside their house where they live in a close proximity with their cats. Apart from that, large figure of the respondents actually allowed their cats to sleep on their bed. However, when asked about zoonotic diseases, most of them were not familiar with zoonotic diseases although were briefed about the terminology prior to the survey. One study conducted in Australia reported similar finding, in which pet owners have incomplete knowledge on zoonotic diseases (Steele & Mor, 2015). Therefore, we can conclude that most of the pet owners did not realize or were not concerned with the risks that they might encounter although most of them owned multiple household cats. This could be due to unfamiliarity of the terminology used. Additionally, this study revealed that most respondents could not understand the term probably due to ineffective communication or limited exposure regarding this in a public setting. Client education is therefore vital so that owners or potential owners will become accustomed with the terminology. From the animal healthcare aspect, more than

a half of the total respondents chose to vaccinate and deworm their cats. This indicates that they are aware of the importance or benefits of these programs.

Regarding the knowledge on Sporotrichosis, a large percentage of the cat owners has poor knowledge regarding this disease. Most of them were not used to the term Sporotrichosis. This could be due to low Sporotrichosis prevalence in Malaysia, with 13 out of 19 cases in 6 years review from 2004 to 2010 (Tang et al., 2012) therefore limiting the exposure to news or information regarding this disease. A survey conducted among dog owners in New York revealed that most of them were able to name and list some common diseases associated with dogs (Sandhu & Singh, 2014). Due to lack of basic knowledge on this zoonotic disease in this country, the preventive measures that were practiced by the owners may be misguided. Quite a number of the respondents chose to clean the wound on the infected cats thereby indirectly exposing them to infection. A large number of respondents chose to isolate the infected cats from the healthy ones. This indicates that they are aware of the risk of contracting disease from the infected cats. However, the number of respondents that chose to consult a veterinarian upon encounter with this disease is still less than a half of the total respondents. This shows that most of them were not concerned about the possibility of contracting diseases from the animals, especially those that are transmitted through direct contact such as Sporotrichosis. Some even thought that a minor wound on cats is self-limiting and does not cause disease in humans.

On the subject of Dermatophytosis, most of the respondents have average knowledge on this disease. This could be due to high disease prevalence in Malaysia, as reported by Ng et al. (2003) where 576 dermatophytes have been successfully isolated from patients from 1993 to 2000. Hence, most of these respondents might have heard or encountered or even experienced this disease previously. When asked about their preference on preventive measures regarding this disease, most of them chose to vaccinate and deworm their cats. This indicates that they are aware of the importance of vaccination and deworming programs. However, these programs are not sufficient to prevent this disease. The diseases protected via vaccination and deworming programs should be effectively communicated to the pet owners. A study conducted among dog owners in New York showed that most of the respondents in that study admitted vaccinating their dogs against certain diseases (Sandhu & Singh, 2014). However, 40% of the respondents were not able to list even a single disease requiring vaccination as a preventive measure (Sandhu & Singh, 2014). It is crucial to emphasize the importance of vaccination in pets to ensure that owners are well-informed that their pets still have the potential to transmit a disease which is not protected through vaccination and deworming programs.

Less than 25% of the total respondents preferred to bathe the infected cats. Direct contact with the infected cats without proper protection such as gloves will increase their susceptibility towards this disease. Minority of the respondents still chose to apply traditional remedies on the cats' lesion. This could be due to the self-limiting nature of this disease. More than a half of the total respondents regarded this disease as not

harmful to human. Apart from that, majority chose to avoid direct contact from infected cats which suggest that they are familiar with the mode of transmission of Dermatophytosis.

Next, a majority of the respondents have average knowledge on Bartonellosis. In contrast, a study conducted in Australia showed that pet owners have good knowledge of this disease. However, this could be related to the alternative namesake of cat-scratch disease (Steele & Mor, 2015). Majority of the respondents from our study were aware that cat scratches as one of the source of this disease. However, minority of the respondents failed to recognize role of flea infestation on cats as one of the important risk factor for this disease transmission. This may be due to the namesake of the cat-scratch disease itself, which indicate that their knowledge on the risk factors of this particular disease are still incomplete. Moreover, majority of the respondents regarded this disease as not harmful to human. Their limited knowledge in regards to this disease could be due to the self-limiting nature and clinical manifestations of this disease. According to the Center for Disease Control and Prevention (CDC), Bartonellosis is generally a mild and self-limiting illness. However, the differential diagnosis often includes more serious conditions such as lymphoma, carcinoma or neuroblastoma that might involve extensive treatment plan and invasive diagnostic measures. Therefore, those who are at risk of acquiring this disease should be well-informed about the consequences and any complications of Bartonellosis.

The demographic factors such as age, race and education of the respondents were compared with the level of knowledge for every specific disease to deduce any significant association. However, only race factor has significant association with the respondents' level of knowledge on Sporotrichosis ($P=0.006$) and Bartonellosis ($P=0.001$). Despite random sampling there was a high proportion of Malays compared to the other races as the survey location was in the area of Malay community. A longer duration of study and inclusion of many areas populated by various race should be considered for future study.

6.0 CONCLUSION AND RECOMMENDATIONS

In conclusion, the results from this study indicated that a majority of the respondents were not aware of zoonotic diseases despite the fact they live in close proximity with their pets. Majority of the respondents have poor knowledge on Sporotrichosis and average knowledge on Dermatophytosis and Bartonellosis. The basic knowledge on preventive measure against specific disease is still limited. Thus, null hypothesis for this study was accepted. Based on the result, we can conclude that the information on common zoonotic diseases were not effectively communicated to the public especially pet owners. Pet-associated zoonoses should be effectively communicated especially for those who are at risk of infection. More studies on the important pet-associated zoonoses in Malaysia should be conducted to raise the public's awareness and eventually reduce the risk of disease transmission. The 'One Health' approach involving multi-sectorial expertise from different fields such as veterinary, medical, health and environmental science is therefore vital to ensure a better knowledge transfer to the public.

Those who are involved in the small animal practice such as pet distributors and pet shops should at least have an adequate general knowledge regarding important zoonoses in Malaysia and involve actively in educating the public. To maximize the accuracy for future study, we recommend the inclusion of pictures demonstrating specific clinical signs on animals in the questionnaire for clarity. Less scientific terminologies should be used as most of the respondents might encounter the disease at some point but could not recall the specific terminology used. In order to improve the accuracy of the results, a

longer duration of study at various sites populated by a multiracial community should be conducted.



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8.0 APPENDICES

8.1 JKEUPM Ethical Clearance Approval Letter

Ref. no: UPM/TNCPI/RMC/JKEUPM/1.4.18.2 (JKEUPM)

Date: 16/1/2018

Dear Prof / Dr. / Mr. / Ms.,

APPLICATION FOR JKEUPM ETHICAL CLEARANCE: APPROVED

With reference to the above, I am pleased to inform you that your application for ethical clearance for the research project entitled '**Cats As A Source of Zoonotic Disease: A Study of Awareness and Knowledge Gap Among Cat Owners in Selangor**' has been approved.

Please note that the official letter of approval will be issued as soon as possible. However, the ethical clearance is considered effective from the date of this email, and you may now proceed with your research.

Kindly please remind the ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.

Researchers should also complete a Study Final Report upon study completion. The form can be obtained from the Ethics Committee for Research Involving Human Subjects (JKEUPM) website (<http://www.rmc.upm.edu.my/documentfile>).

If you have any enquiries, please contact Ms. Nursuraya (03-89471605) or Ms. Nor Ellia (03-89471244).

Note: Please use this reference number for any transaction.
- JKEUPM-2017-281

Thank you.

Yours faithfully,

Prof. Dr. Zamberi Sekawi
Chair
Ethics Committee for Research Involving Human Subjects
Universiti Putra Malaysia

@c

8.2 Respondents Consent Form



JAWATANKUASA ETIKA UNIVERSITI UNTUK PENYELIDIKAN
MELIBATKAN MANUSIA (JKEUPM)
UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG,
SELANGOR, MALAYSIA

FORM 2.4: RESPONDENT'S INFORMATION SHEET AND INFORMED CONSENT FORM

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

1. STUDY TITLE :

Cats as a Source of Zoonotic Diseases: A Study of Awareness and Knowledge Gap among Cat Owners in Selangor.

2. INTRODUCTION:

Cats have been one of the most preferred household companion animals since the beginning of domestication of animals. Pets provide companionship, psychological and physiological benefits to the owners (McConnell et. Al., 2011), all of which outweighs the potential zoonotic risk that they might bring as well. Recently, there is increase in concern of cats as a potential zoonotic reservoir with regards to the close proximity of these animals to humans. However, those that do not keep cats as pets are also able to acquire these infections because of the transmission can be from cat feces and the parasites that leave their bodies (Chomel, 2014).

3. WHAT WILL YOU HAVE TO DO?

Please read this respondent's information sheet for further information on this study. If you agree to participate in this study, you will need to sign the informed consent as evidence of approval. A set of questionnaire will be given to you. The aim of this study is to assess your awareness and knowledge gap regarding feline zoonoses-sporotrichosis, bartonellosis and ring worm infection.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

Cat owners who do not stay in Selangor region.

5. WHAT WILL BE THE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?

Your level of awareness and knowledge gap regarding feline zoonoses will be a good understanding of the source, route of infection, spread, control and prevention of those particular zoonotic diseases which allows you and your pets to live together with minimal risk of disease transmission.

(b) TO THE INVESTIGATOR?

We will be able to assess the level of awareness and knowledge gap, the information sources and practices in regards of prevention and control measures regarding important feline zoonoses-sporotrichosis, bartonellosis and ringworm infection among the cat owners in Selangor. The result of this study can be used in the future as a reference on the effectiveness of communication/medium of communication on providing information about zoonotic diseases to the public and the factors related to the level of awareness and knowledge gap among the cat owners to reduce the transmission of zoonotic diseases.

6. WHAT ARE THE POSSIBLE RISKS?

There are no additional risks involved.

7. WILL THE INFORMATION THAT YOU PROVIDE AND YOUR IDENTITY REMAIN CONFIDENTIAL?

All information with regard to respondents' personal information will remain private and confidential. The answers and data collected from each individual are strictly confidential and will be used for the purpose of scientific research.

8. WHO SHOULD YOU CONTACT IF YOU HAVE ADDITIONAL QUESTIONS DURING THE



COURSE OF THE RESEARCH?

You may contact us at:

Dr Wan Mastura Shaik Mohammed Mossadeq
Jabatan Sains Pra Klinikal Veterinar
Fakulti Perubatan Veterinar,
Universiti Putra Malaysia, 43400 UPM,
Serdang,
Selangor Darul Ehsan.
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Contact Number: + 603-8609 3407

Dr Siti Zubaidah Ramanoon
Jabatan Perubatan dan Pembedahan
Haiwan Ladang Dan Ekstotik
Fakulti Perubatan Veterinar,
Universiti Putra Malaysia, 43400 UPM,
Serdang,
Selangor Darul Ehsan.
E-mail: sramanoon@upm.edu.my
Contact Number: + 603 8609 3910

Please initial here if you have read and understood the contents of this page _____

9. CONSENT

I Identity Card No.
address.....

.....hereby voluntarily agree to take part in the research stated above *(clinical /drug trial/video recording/ focus group/interview-based/ questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse

effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential and all information provided with regard to my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable)

* delete where necessary



Signature
(Respondent)

Signature
(Witness)

Date :

Name :

I/C No. :

I confirm that I have explained to the respondent the nature and purpose of the above-mentioned research.

Date

Signature
(Researcher)

@CC



8.3 Questionnaire Sample



BORANG KAJI SELIDIK / QUESTIONNAIRE

‘Kucing Sebagai Sumber Penyakit Zoonotik: Kajian Mengenai Kesedaran dan Pengetahuan Mengenai Penyakit Zoonotik di kalangan Pemilik Kucing di Selangor’

‘Cats as a Source of Zoonotic Diseases: A Study of Awareness and Knowledge of Associated Zoonoses among the Cat Owners in Selangor.’

Penyelidik/ *The Researcher:*

Amirah Syakila Binti Razali

Pelajar Doktor Perubatan Veterinar / *Doctor of Veterinary Medicine (DVM) student*

Fakulti Perubatan Veterinar / *Faculty of Veterinary Medicine*

Universiti Putra Malaysia (UPM)

H/P: 011-33370035

E-mail: amirahsyakila94@gmail.com

Sample No. : Clinic:
Date :

Sila baca soalan di bawah secara teliti. Jangan teragak-agak untuk bertanyakan soalan kepada penyelidik sekiranya terdapat sebarang kekeliruan.

Please read the following questions carefully. Do not hesitate to ask any questions which you do not understand to the researcher.

BAHAGIAN I: MAKLUMAT RESPONDEN/ PART I: RESPONDENT INFORMATION

Jawab setiap soalan dengan menandakan pada ruangan jawapan. Sila berikan jawapan anda yang terbaik.

Answer every question by the answer as indicate. Please give the best answer as you can.

1. Umur / Age: <18 18-29 30-40 40-50 > 50
2. Bangsa / Race: Melayu/ Malay Cina/ Chinese India/ Indian Lain-lain/ Others
3. Tahap Pendidikan / Educational Level: SPM/ SPM STPM/STPM /
Matrikulasi/Matriculation
 Diploma/ Diploma Ijazah/ Degree
 Master/ Master PhD/ PhD
4. Kawasan Tempat tinggal/ Area that you are staying: Klang Lain/Others (sila nyatakan/
please state): _____
5. Adakah anda tahu mengenai penyakit zoonotik? / Do you know about zoonotic disease?
 Ya/ Yes Tidak / No
6. Dari manakah anda tahu mengenai penyakit zoonotik? / From where do you hear about zoonotic disease?
 Ceramah/ Talks Pamphlet/ Pamphlet Veterinawan/
Veterinarian
 Media Sosial/ Social Networks Televisyen / Radio/ Television / Radio
 Lain-lain/ Others (Sila nyatakan/ Please state): _____
7. Adakah anda berminat untuk mengetahui tentang penyakit zoonotik?
Are you interested to know about zoonotic disease?
 Ya / Yes Tidak / No
Sebab/ Reason (sila nyatakan/ please state) _____

BAHAGIAN II: MAKLUMAT HAIWAN PELIHARAAN / PART II: PET OWNERSHIP INFORMATION

1. Berapa ekor kucing yang anda pelihara? (sekarang/ dahulu)
How many cats do you own? (recently/ previously)
 1 2 3 4 5 Lebih dari 5/ *more than 5*
2. Di manakah kucing anda di pelihara?/ *Where did you keep your cats?*
 Dalam rumah/ *Indoor* Luar rumah/ *Outdoor* Luar dan dalam rumah/ *Semi-roamer*
3. Adakah kucing anda tidur bersama anda?/ *Does your cat sleep together with you?*
 Ya / *Yes* Tidak / *No*
4. Adakah kucing anda di vaksin dan di beri ubat nyah cacing?/ *Does your cat was vaccinated and dewormed?*
 Ya / *Yes* Tidak / *No*

BAHAGIAN III (A): PENGETAHUAN PENYAKIT ZONOTIK - SPOROTRIKOSIS PART III (A): KNOWLEDGE ON ZOO NOTIC DISEASE – SPOROTRICHOSIS

1. Penyakit Sporotrikosis tersebar melalui... / *Sporotrichosis disease is transmitted via...*
 Vektor/ *Vector* Udara/ *Air* Sentuhan/ *Direct contact*
 Makanan/ *Food*
2. Tanda-tanda jangkitan Sporotrikosis pada manusia adalah ...
Signs of sporotrichosis infection in human is/ are....
 Demam / *Fever* Luka yang tidak sembuh/ *Non-healing wound*
 Sakit sendi/ *Joint pain* Bengkak nodul limfa/ *Swollen lymph nodes*
3. Faktor yang menyebabkan risiko jangkitan penyakit ini adalah.../ *Risk factor(s) of this disease is/ are...*
 Sistem immunisasi yang rendah / *Low immune system*
 Sentuhan jangkitan luka pada haiwan / *Direct contact on animal's wound*
 Makanan yang tercemar/ *Contaminated food*
 Sentuhan pada najis haiwan/ *Direct contact with animal's stool*
 Gigitan nyamuk/ *Mosquito bites*
4. Penyakit ini disebabkan oleh / *This disease is caused by...*
 Jangkitan kuman/ *Bacterial infection* Jangkitan virus/ *Viral infection*
 Jangkitan parasit/ *Parasitic infestation* Jangkitan kulat/ *Fungal infection*

5. Berikut merupakan langkah berjaga-jaga untuk mengelakkan penyakit ini...

This/ these is/are the preventive measure of this disease...

- Cuci tangan sebelum makan/ *Wash your hands before eat*
- Bersihkan luka pada kucing yang terjangkit/ *Clean the wound on infected cat*
- Dapatkan nasihat veterinarawan/ *Consult the veterinarian*
- Asingkan kucing yang terjangkit daripada kucing lain/ *Isolate the infected cat from the other cats*

BAHAGIAN III (B): PENGETAHUAN PENYAKIT ZOONOTIK - KURAP

PART III (B): KNOWLEDGE ON ZOONOTIC DISEASE – RINGWORM

1. Penyakit kurap tersebar melalui.../ *Ringworm can be transmitted via...*

- Vektor/ *Vector* Udara/ *Air* Sentuhan/ *Direct contact*
- Makanan/ *Food*

2. Tanda-tanda jangkitan kurap pada manusia ialah.../ *Signs of ringworm in human is/are...*

- Demam / *Fever* Luka yang tidak sembuh/ *Non-healing wound*
- Sakit sendi/ *Joint pain* Lingkaran bulat yang timbul pada kulit/ *Rounded-elevated lesion on skin*

3. Penyakit ini disebabkan oleh / *This disease is caused by...*

- Jangkitan kuman/ *Bacterial infection* Jangkitan virus/ *Viral infection*
- Jangkitan parasit/ *Parasitic infestation* Jangkitan kulat/ *Fungal infection*

4. Berikut merupakan langkah berjaga-jaga untuk mengelakkan penyakit ini...

This/ these is/are the preventive measure of this disease...

- Program vaksinasi dan ubat nyah cacing/ *Vaccination and deworming program*
- Elakkan sentuhan pada kucing yang terjangkit/ *Prevent direct contact on infected cat*
- Mandikan dan bersihkan kucing yang terjangkit/ *Bathe and clean the infected cat*
- Sapukan ubat tradisional pada kurap kucing/ *Apply traditional remedies on the cat's lesion*

5. Penyakit ini berbahaya pada manusia/ *This disease is harmful to human*

- Ya / *Yes* Tidak / *No*

BAHAGIAN III (C): PENGETAHUAN PENYAKIT ZOONOTIK – PENYAKIT CAKARAN KUCING

PART III (C): KNOWLEDGE ON ZOONOTIC DISEASE – CAT-SCRATCH DISEASE

1. Penyakit ini disebabkan oleh / *This disease is caused by ...*

<input type="checkbox"/> Jangkitan kuman/ <i>Bacterial infection</i>	<input type="checkbox"/> Jangkitan virus/ <i>Viral infection</i>
<input type="checkbox"/> Jangkitan parasit/ <i>Parasitic infestation</i>	<input type="checkbox"/> Jangkitan kulat/ <i>Fungal infection</i>

2. Tanda-tanda jangkitan penyakit cakaran kucing ini adalah.../ *Signs of cat-scratch disease is/are...*
 - Luka yang bernanah/ *Abscess wound*
 - Pening kepala/ *Dizziness*
 - Demam/ *Fever*
 - Bengkak nodul limfa/ *Swollen lymph nodes*

3. Penyakit ini berbahaya pada manusia/ *This disease is harmful to human*
 - Ya / *Yes*
 - Tidak / *No*

4. Faktor yang menyebabkan risiko jangkitan penyakit ini adalah.../ *Risk factor(s) of this disease is/are...*
 - Cakaran dari kucing yang berjangkit/ *Scratch from infected cats*
 - Sengkenit pada kucing/ *Fleas infestation on cats*
 - Kucing yang tidak di vaksin/ *Non-vaccinated cats*
 - Sentuhan jangkitan luka pada kucing/ *Direct contact on lesion of infected cats*

5. Penyakit ini hanya boleh berjangkit melalui cakaran kucing yang terjangkit
This disease only can be transmitted via scratching by the infected cats
 - Ya / *Yes*
 - Tidak / *No*

----- **TAMAT BORANG KAJI SELIDIK/ END OF QUESTIONNAIRE** -----

Penyertaan anda dalam kaji selidik ini amatlah dihargai./ *We really appreciate your participation in this study.*