RETROSPECTIVE STUDY OF SPOROTRICHOSIS IN COMPANION ANIMAL CASES PRESENTED TO VETERINARY TEACHING HOSPITAL, UNIVERSITY MALAYSIA KELANTAN

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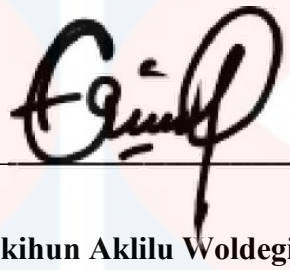
UNIVERSITY MALAYSIA KELANTAN

CERTIFICATION

This is to certify that we have read this research paper entitled "Retrospective study of sporotrichosis in companion animal cases presented to Veterinary Teaching Hospital, UMK" by Kosheilasri A/P Subbaraoo. In our opinion, it is satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirements for the course DVT 55204 - Research Project.



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Family

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DVM 5 class of 2023

Thank you

DEDICATIONS

I would like to dedicate this treatise to my family who are my pillar of strength. They have always been my source of inspiration and gave me strength throughout these 5 years with their constant moral, spiritual, emotional and financial support.

I would also like to dedicate this research paper to many of my lecturers and seniors who have given me the support and encouragement to finish this thesis. Special dedication to Dr.Erki, Dr. Goni, Dr. Lavanyah, Dr. Rishi and Dr. Thivashini for deepening my knowledge and training me to become a better veterinarian by showering me with their experiences and knowledge.

Not forgetting my close friends and fellow classmates DVM 2023 for motivating and encouraging me throughout my DVM years. They have always supported me and been there to guide so that we all be successful together.

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ABSTRACT

An abstract of the research paper was presented to the Faculty of Veterinary Medicine, University Malaysia Kelantan in partial fulfillment of the requirements of the course DVT 55204 - Research Project.

Sporotrichosis is one of the most common fungal infection that affects companion animals. It is a zoonotic disease that has an impact on public health. The current prevalence of sporotrichosis in Kelantan, advances in diagnostic approaches and choice of treatment, and the associated risk factors are not known. This retrospective study was conducted to determine the prevalence, common diagnostic approaches and the risk factors associated with sporotrichosis in companion animals (cats and dogs). To achieve this, data was retrospectively obtained from Veterinary Teaching Hospital, UMK and Bacteriology Lab, FPV UMK from the year 2017 to 2021. The primary data of patients including breed, age, sex, management, species, month diagnosis method and drugs administered were taken. From 2017 to 2021, a total of 10955 patients were presented to the hospital and out of that, 349 were tentatively diagnosed for sporotrichosis based on the presented clinical signs such as skin problem, wound, unhealing wound, dermatophytosis, fungal, mange, malassezia , rhinitis. The prevalence of total suspected sporotrichosis over the number of cases presented for five years was 3.18% and the prevalence of overall total positive sporotrichosis cases (n=140) from the suspected sporotrichosis cases (n=349) in the span of five years is 40.11%. Chi-square tests was performed to analyze the association of the data obtained. As for the result, the overall prevalence of sporotrichosis in companion animals in Kelantan from 2017 to 2021 was 40.11% and this was solely obtained from the feline species while 0% was obtained from canine species.

The most statistically significant risk factors (P-value < 0.05) associated with the occurrence of sporotrichosis in companion animals are outdoor pets in a multiple animal household (n=79, p= 0.001), young adult cats (n=72, p= 0.001), felines (n= 140, p= 0.001), domestic short hair breed (n= 79, p= 0.001). However for the statistically non-significant risk factors (P-value >0.05), sex (p= 0.142) was divided to male (n=85) and female (n=55), season (p= 0.102) was divided to rainy weather (n=58) and sunny weather (n=82). The common diagnostic method used to definitively diagnose sporotrichosis are impression smear (n=139) and itraconazole (n=103) was chosen as the choice of drug for treating

sporotrichosis. In conclusion, the current findings suggest that the prevalence of sporotrichosis is high in cats and the associated risk factors are the breed, management, species and age while impression smear is the routinely used diagnostic approach and itraconazole was used as the choice of treatment. Therefore, an awareness campaign is required by the authorities or veterinarians to educate the public and highlight the risk of public health given the zoonotic nature of sporotrichosis. Identification of the disease's risk factors and clinical signs exhibited may aid in the development of the appropriate preventative strategies and to control the spread of disease.

Keywords: Companion animals, Sporotrichosis, Prevalence, Risk factors, Zoonotic

ABSTRAK

Abstrak daripada kertas penyelidikan dikemukakan kepada Fakulti Perubatan Veterinar, Universiti Malaysia Kelantan untuk memenuhi sebahagian daripada keperluan kursus DVT 55204 - Projek Penyelidikan.

Penyakit sporo atau sporotrichosis adalah salah satu jangkitan kulat yang biasa ditemui dalam haiwan peliharaan. Penyakit ini adalah penyakit zoonotik yang memberi impak kepada kesihatan awam. Pentingnya kajian ini adalah untuk mengisi jurang pengetahuan tentang kelaziman semasa penyakit sporotrichosis di Kelantan, kemajuan dan pendekatan diagnostik yang biasa digunakan dan pilihan rawatan, dan faktor risiko yang berkaitan dan perihal status epidemiologi semasa sporotrikosis, di Kelantan, Malaysia. Kajian retrospektif ini dilakukan untuk menentukan kelaziman penyakit kulat sporo, faktor risiko yang berkaitan dan kaedah diagnosis yang lazim dalam haiwan peliharaan (kucing dan anjing) di negeri Kelantan. Sumber data adalah dari Hospital Pengajar Veterinar Universiti Malaysia Kelantan dan Makmal Bakteriologi, FPV UMK dari tahun 2017 hingga 2021. Untuk mencapainya, data primer yang diambil daripada pesakit adalah baka, jantina, pengurusan haiwan, umur, cuaca, bulan, kaedah diagnosis and ubat yang diberi telah diambil. Dari 2017 hingga 2021, sejumlah 10955 pesakit telah dihantar ke hospital dan daripada itu 349 telah didiagnosis sementara untuk sporotrichosis berdasarkan tanda-tanda klinikal yang ditunjukkan seperti masalah kulit, luka, luka tidak sembuh, dermatofitosis, kulat, kurap, malassezia, rinitis. Kelaziman jumlah sporotrichosis yang disyaki berbanding bilangan kes yang dikemukakan selama lima tahun ialah 3.18% dan prevalens keseluruhan kes sporotrichosis positif (n=140) daripada kes yang disyaki sporotrichosis (n=349) dalam tempoh lima tahun ialah 40.11 %. Ujian Chi-square digunakan untuk menganalisis perhubungan antara data. Secara lazimnya, penyakit kulat secara keseluruhan dalam haiwan peliharaan di Kelantan adalah 140 (40.11%) dan jumlah ini hanya diperoleh daripada spesis kucing manakala untuk anjing pula 0%. Faktor risiko yang paling ketara secara statistik (nilai P <0.05) yang dikaitkan dengan kejadian sporotrichosis dalam haiwan pendamping ialah haiwan peliharaan di luar rumah yang melebihi satu (n=79, p= 0.001), kucing dewasa muda (n=72, p= 0.001), kucing (n= 140, p= 0.001), baka rambut pendek domestik (n= 79, p= 0.001).

Bagi faktor risiko tidak signifikan secara statistik (nilai P >0.05), jantina (p= 0.142) dibahagikan kepada jantan (n=85) dan betina (n=55), musim (p= 0.102) dibahagikan kepada cuaca hujan (n=58) dan cuaca cerah (n=82). Kaedah diagnostik yang biasa digunakan untuk mendiagnosis sporotrichosis secara muktamad ialah kesan calitan (n=139) dan itraconazole (n=103) sebagai pilihan ubat untuk merawat sporotrichosis. Kesimpulannya, penemuan semasa menunjukkan bahawa prevalens sporotrichosis adalah tinggi dalam kucing dan faktor risiko yang berkaitan adalah baka, pengurusan, spesies dan umur manakala calitan smear adalah pendekatan diagnostik yang digunakan secara rutin dan itraconazole digunakan sebagai pilihan rawatan. Meskipun, kempen kesedaran perlu dilanjutkan oleh pihak atasan dan doktor veterinar untuk menekankan risiko kesihatan awam. Pengenalpastian faktor risiko yang berpotensi untuk jangkitan sporotrichosis boleh membantu dalam perancangan strategi serta pengawalan penyebaran penyakit sporotrichosis.

Kata kunci: Companion animals, Sporotrichosis, Prevalence, Risk factors, Zoonotic

1.0 INTRODUCTION

Sporotrichosis is a zoonotic disease that is caused by a dimorphic fungal infection of a species *Sporothrix schenckii* that can affect humans, dogs, cats, and also interspecies (Barros *et al*., 2011). This *Sporothrix schenckii* grows in moist soil rich in decaying vegetation, sphagnum moss, grass, and bark of trees and is introduced via skin trauma and occasionally by animal injury (Schubach *et al*., 2004; Sizar.,2022.).

Studies revealed that there is a genetic heterogenecity of this cryptic fungus comprising of five species which are *Sporothrix globosa*, *Sporothrix brasiliensis*, *S. schenckii sensu stricto*, *Sporothrix mexicana* and *Sporothrix luriei* that are pathogenic and they are divided into different clades based on their molecular typing and geographical distribution. *Sporothrix brasiliensis* is a species that is restricted to Brazil, *S. schenckii sensu stricto* is found in America and Asia, and *Sporothrix globosa* are isolated predominantly in Asia (Siew, 2017).

The clinical findings observed with Sporotrichosis are multiple non-healing wounds on the cutaneous and subcutaneous parts of the head, ears, and thorax, and sometimes it is concurrent with respiratory signs. These clinical findings can be classified into three forms such as lymphocutaneous, cutaneous, and disseminated in which the most common form that is seen in companion animals is the lymphocutaneous form (Taboada, 2018). Usually, the diagnostic workup that can be done to confirm the presence of sporotrichosis is by conducting a sample culture or microscopic examination from the tissue exudate or biopsy. Pleomorphic, cigar-shaped with single cell can be seen histopathologically and via culture, fine, branching septate hyphae with pear-shaped conidia can be seen on sabouraud dextrose agar (Taboada, 2018).

Risk factors associated with sporotrichosis are that it is a zoonotic disease; thus, when the owner has an open wound and gets in contact with the discharge or the fungus, it directly gets transmitted. So, as a control measure it is always advisable to wear gloves and long sleeves when handling animals suspected of having sporotrichosis (Barros et al., 2011).

The first reported study of sporotrichosis in feline in Malaysia was done in in the 1990's by Zamri-Saad and since, studies revealed that *Sporothrix schenckii sensu stricto* is the most common cause of disease in Malaysia (Siew, 2017). This statement is further supported by Han, (2020) where out of 866 cats that underwent post-mortem in veterinary teaching hospital, 104 (12%) were due to sporotrichosis of the similar clonal strain.

There was no reported or published cases of canine sporotrichosis in Malaysia. Most canine sporotrichosis cases that were reported in Brazil were typically infected during hunting activities and possible transmission of *Sporothrix* sp. is by thorns or wood splinters. Common form of sporotrichosis reported were classified into cutaneous that are either localized or fixed, lymphocutaneous or disseminated cutaneous form and also mucosal form (Figueiredo et al., 2022). Frequently, the most observed lesions are nodules and ulcers where the lesions are neither painful or pruritic and when presented to the veterinary clinic, they are usually in good clinical condition (Boechat et al., 2020)

Although sporotrichosis has been recognized as a group of thermodiphormic pathogens that affects companion animals (Rodrigues et al., 2016) worldwide and has public health concern due to its zoonotic potential, studies on the prevalence of sporotrichosis in different parts of the world is limited. There were no published cases on sporotrichosis in companion animals in Kelantan state, therefore, this study is important to educate and to fill in the gap of knowledge on this zoonotic disease and to emphasize on the current status of sporotrichosis in Kelantan, Malaysia. The importance and relevance of this research is to understand the prevalence of sporotrichosis and the associated risk factors. Since sporotrichosis is a zoonotic disease, the findings from this research may help in creating public awareness about the public health risks posed by the disease and its transmission from animals to humans.

1.1 Research Problem

Despite sporotrichosis being distributed worldwide and the public health importance, the actual prevalence of sporotrichosis among companion animals in Kelantan remains unknown.

Sporotrichosis commonly occurs on the urban area due to their poor sanitation, unsatisfactory housing with minimal access to health services that highly suggestive that most of the increasing of cases could be due to the negligence of pet owners that have limited or no access to veterinary care (Sanchotene et al., 2015).

Many factors such as age, management practice, breed, gender, sex and season could contribute to the development of sporotrichosis. However the most common risk factors contributing to the infection of this disease amongst companion animals are not identified. Therefore, this study aims to conduct retrospective analysis of data obtained from Veterinary Teaching Hospital, UMK and Bacteriology Laboratory of Faculty of Veterinary Medicine, University Malaysia Kelantan for the past five years on the sporotrichosis cases in companion animals.

1.2 Research Question

a) What is the prevalence of sporotrichosis in companion animals in Kelantan?
b) What are the common methods to diagnose and treat sporotrichosis in Kelantan?
c) What are the major risk factors associated with sporotrichosis in companion animals in Kelantan?

1.3 Research Hypothesis

a. The prevalence of sporotrichosis is higher by 12% in cats compared to dogs in Kelantan.
b. Age, sex, breed, management, season and species are the most common risk factors associated with sporotrichosis in Kelantan.

1.4 Research objectives

a. To determine the prevalence of sporotrichosis in a companion animal in Kelantan.
b. Identify the common methods used to diagnose and treat sporotrichosis in Kelantan.
c. To determine the risk factors associated with sporotrichosis in Kelantan companion animals.

2.0 LITERATURE REVIEW

2.1 Etiology of sporotrichosis

*Sporothrix schencki*i is a dimorphic fungus that is from the Moniliaceae family of the Deuteromycete class of fungi (Barros *et al*., 2011). This fungus survives in the environment and becomes pathogenic due to its dimorphic ability that converts from a yeast-like form to a mycelial phase with branching, septate hyphae at 35-37°C in the environment and 25-30°C in the laboratory (Welsh, 2003).

2.2 Pathogenesis of sporotrichosis

Mechanism of its potential to infect the host is by the ability to change phases to an ascomycete teleomorph that survives on living or decaying plant material as it has been isolated from the decaying vegetation such as thorns, straw, hay, wood, moss, and soil. Besides that, they enter the skin from trauma such as puncture, bite, or scratch, and the fungus converts to the yeast phase and causes lesions locally and systemically in some cases. Subcutaneous and other rare forms of infection are present in man and animals. The host range for the condition of this mycotic agent is broad, including humans, horses, dogs, cats, pigs, fowl, rats, mice, hamsters, and chimpanzees (Crothers *et al*., 2009).

Three clinical syndromes are known: localized or fixed cutaneous, lymphocutaneous, and multifocal disseminated sporotrichosis (Welsh, 2003). Among cats, the lymphocutaneous and localized forms of the most common and essential zoonotic transmission and most often observed on the legs, face, or nasal plenum, while for dogs, it is usually rare and is characterized by multiple cutaneous lesions on the head, ears, and thorax (Schubach *et al.*, 2006). Disseminated sporotrichosis is rare and only occurs when the initial infection spreads into the body to a secondary location, while there is pulmonary

sporotrichosis that arises due to inhalation of *Sporothrix schenckii* spores that makes the infected animal be more predisposed to developing pneumonia.

2.3 Predisposing factors in the development of sporotrichosis

Companion animals usually will be infected to *Sporothrix schenckii* as a consequences of traumatic inoculation of the pathogenic fungus into the skin via wound contamination or penetrating foreign bodies such as thorns, wood chips, scratching, or direct contact of biting wounds from infected animals, or inhalation (Tang et al., 2012). Sporotrichosis is more common in hunting dogs than indoor management dogs with no sex or age predisposition in these species (Rossie et al.,2013), while for cats, the males are more predisposed as of their habit of wandering away from home (Han et al., 2020). It is believed that the disease to be acquired from infected teeth from other cats (Rossie et al., 2013).

2.4 Diagnosis of sporotrichosis

The differentials of skin lesions in companion animals may include bacterial pyoderma, mycobacteriosis, nocardiosis, actinomycosis, cryptococcosis, sporotrichosis, foreign body, squamous cell carcinoma, immune-mediated disease, systemic lupus erythematosus, pemphigus vulgaris and allergy reaction (Peaston., 1993).

Sporothrix schenckii is isolated from exudates and tissue fragments that are collected from the affected animals that are potentially affected. This is done by collecting the surface secretion with swabs from an exudative lesion or draining tracts and punch skin biopsy specimen that recovered from the border of active lesions (Costa et al,. 2017). The tissue fragments are macerated with a portion where the first half is used for direct microscopy with 4% sodium hydroxide

solution, and another half is inoculated onto Sabouraud-dextrose agar and mycobiotic agar to be incubated at 25°C (Madrid *et al*., 2008). Punch skin biopsy specimens are submitted for histopathological examination, and blood samples are collected for routine serum biochemistry and complete blood count examination (Schubach *et al*., 2003).

2.5 Sporotrichosis infection in animals in Malaysia

The initial emerging of feline sporotrichosis as a zoonotic disease in Malaysia was reported by Zamri *et al*. in 1990. He reported that raised and ulcerated wound was developed on the eyes, nose, both ears and between the shoulder blades in 5 adult crossbreed male cats. Recently, a clonal strain of *S. schenckii sensu stricto* is the only species that causes sporotrichosis in Malaysia predominantly in cats. It is proven by sequence analyses from the calmadulin gene and this suggests that this species is constantly evolving and able to undergo purifying selection process and subsequent population expansion depending on the local environment or host selection pressure. Study also showed that out of 866 cat post mortem cases that was presented to a veterinary teaching hospital, the cause of death of 104 (12%) cats were from the clonal strain of *S. schenckii sensu stricto* (Han, 2020).

For feline sporotrichosis, its frequently seen in young adult, roaming intact male and clinical signs that are commonly seen are chronic non-healing ulcerated wound with granulomatous nodules and skin crusts seen on the bridge of nose, distal limb, ear tip and distal limb or tail base region. The occurance of lesions are more common at the cooler body parts such as ear tips and nose is highly associated with the lack of thermotolerability of the *S. schenckii sensu stricto* and clinical signs that are exhibited are dyspnoea, sneezing and respiratory distress (Han, 2020). Till this date, there is no reported sporotrichosis cases in dogs in Malaysia.

2.6 Sporotrichosis infection in humans in Malaysia

Sporotrichosis infection in humans were first reported by Tang *et al*., 2012 by a retrospective study on all cutaneous sporotrichosis from July 2004 to June 2010 was done and another retrospective study was made from 2011 to 2015 (Fu et al.,, n.d).

From the first retrospective study by Tang et al., (2012), a total of 19 cases were reported and seven cases reported cat scratches or bite. Lymphocutaneous sporotrichosis was seen in 13 cases (68.4%), followed by 4 cases of fixed cutaneous sporotrichosis and 2 cases of disseminated sporotrichosis. From the culture, *Sporothrix schenckii* was cultured in 12 cases (63.2%). Choice of drugs used to treat is either itraconazole for 110 days or intravenous amphotericin B (Tang et al., 2012).

From the second retrospective study by Fu et al., (n.d), in the span of 5 years a total of 51 patient were diagnosed with cutaneous sporotrichosis. Out of the 22 patients documented trauma, nearly half of them (45.6%, n= 10) had trauma related to cat scratch or bite and the remaining reported to have contact with cat despite not recalling any cat bite or scratch. Lymphocutaneous sporotrichosis was the predominant subtype observed followed by fixed cutaneous sporotrichosis and disseminated sporotrichosis. The patients were treated with oral itraconazole or oral terbinafine due to side effect of itraconazole for 12 to 45 weeks.

The clinical signs exhibited in humans are multiple skin nodules arranged in a linear fashion over the limbs, often with associated lymphadenopathy (Devaraj, 2020) while other clinical signs are cough, dyspnea and hemoptysis etc, depending on the type and site involved (Costa,et al 2017)

2.7 Zoonotic importance

Sporothrichosis is an important zoonosis that transmits from animals to humans when in close contact. *Sporothrix globosa*, *Sporothrix brasiliensis*, *S. schenckii sensu stricto* have been found in most of the human reported cases while S. *luriei*, S. *mexicana* have been described rarely (Spickler, 2017).

Increase in number of human cases have been reported after in contact with those infected and healthy carrier cats in endemic countries (*Sporotrichosis*,2015). According to Rossie et al. (2013), the zoonotic potential is isolated from fragments of skin lesion and materials from the oronasal cavities of the animals, where it gives a substantial risk to public health as they serve as source of infection to humans and other animals through bites and scratches, fights by contaminating through breaks in the skin (Rossie et al., 2013).

Therefore, veterinarians and pet owners should take extreme precautions when handling pets that are suspected with sporotrichosis. Usage of long-sleeved gowns, mask, gloves is recommended when working with animals multiple skin lesions and respiratory signs (*Emerging Transmissible Sporotrichosis in Cats*, 2020).

2.8 Treatment for Sporotrichosis in animals

There are several antifungal drugs that can be used to treat sporotrichosis in animals, such as itraconazole, fluconazole, ketoconazole and amphotericin B. Potassium or sodium iodide can be given for those exhibited cutaneous or lymphocutaneous forms and it administered orally for 30 days beyond apparent clinical cure (Spickler, 2017). Signs of iodide toxicity must be monitored, such as anorexia, vomiting, depression, muscle twitching, hypothermia, cardiomyopathy, cardiovascular collapse, and death which cats are susceptible to iodides due to iodism development (Taboada, 2018). However, the standard drug choice for sporotrichosis in small animal is Itraconazole which it should be continued 3-to 4 weeks beyond the apparent clinical cure (Taboada, 2018).

Terbinafine which is an allylamine derivative can be used as an alternative for patients that cannot tolerate or responds poorly to itraconazole or if there is an azole resistance that is suspected (*Sporotrichosis*, 2015).

In addition to antifungal medications, alternative therapies for cutaneous sporotrichosis have included surgical removal, cryotherapy, and thermotherapy and this can be done alone or in conjunction with the antifungal drugs that were stated above. Thermotherapy was successful in a cat with a single localised lesion where in this technique, the area of the lesion is heated to 42-43°C twice a day by using a warm bag, infrared or any preferable method (Spickler, 2017).

2.9 Prognosis of animals infected with Sporotrichosis

In Malaysia, the prognosis of animals remains guarded to poor due to the cost constraint, prolonged treatment time, fear of zoonotic transmission and the potential adverse effect of antifungals when administered for a long-term basis. Not only that, the commonly used registered antifungal for veterinary usage comprises of Itraconazole is not sufficient to address the low fungal susceptibility (Han, 2020). However, if the treatment duration and owner compliance are satisfactory, then the prognosis could be good (*Sporotrichosis*, 2015).

2.10 Treatment for Sporotrichosis in humans

As most cases of sporotrichosis involve the skin or the tissue that is underneath the skin, they are not life threatening and can be treated with antifungal prescription for 3-6 months. The common antifungal that is prescribed is itraconazole per oral. Besides that, supersaturated potassium iodide (SSKI) can be used for skin sporotrichosis. To be noted that both SSKI and itraconazole is not advisable for pregnant women as SSKI could lead to neonatal hypothyroidism, thyromegaly, fetal airway obstruction, prolonged labor Costa et

al., (2013) and oral itraconazole could lead to eye defect in neonate (Liu et al., 2019).

If the sporotrichosis is severe that it has affected the lungs, joints, bones of the central nervous system, intravenous administration of amphotericin B is given concurrently with itraconazole tablets for a duration of at least 1 year. For humans who are diagnosed with sporotrichosis in the lungs, they are recommended to undergo surgery for removal of the affected tissue (*Sporotrichosis*, 2022).

3.0 MATERIAL AND METHOD

3.1 Study design

Retrospective cohort study was conducted where it is a study where the members of the cohort is exposed to a certain risk factors in the past and are traced back if they have developed the outcome of interest and when both the exposure and development has occurred.

In this study, a retrospective analysis of companion animal (cats and dogs) that are suspected of having sporotrichosis at Veterinary Teaching Hospital, UMK from year 2017 to 2021 was reviewed.

Inclusion criteria such as cats and dogs that are presented with skin problem, wound, unhealing wound, dermatophytosis, fungal, mange, malassezia and rhinitis have been suspected for sporotrichosis.

3.2 Data collection

Canine and feline cases presented to Veterinary Teaching Hospital, UMK diagnosed with Sporotrichosis during the years 2017-2021 was reviewed. This data is were corroborated with data from Bacteriology Laboratory of Faculty of Veterinary Medicine, UMK. The data is collected from the case files, computerized data, and patient medical record. From the patient case file, the patient signalment including age, sex, management, month of visit, species, breed, diagnostic approach and the treatment given were collected from Veterinary Teaching Hospital, UMK and laboratory records at Bacteriology Laboratory, UMK and these information was filled into the data collection form (See appendix) for easier and systematic way to obtain relevant data.

3.3 Data analysis

Data were entered, validated and explored in Microsoft Excel 2016 and analyzed using IBM SPSS Statistics (Version 27) for Chi-square analysis at 95% confidence interval (CI).

The prevalence of sporotrichosis in companion animals (cats and dogs) in Kelantan were calculated by identifying positive cases for sporotrichosis reported in Veterinary Teaching Hospital, UMK and Bacteriology Laboratory, FPV UMK and dividing by the number of tentatively diagnosed sporotrichosis cases upon presentation of clinical signs such as skin problem, wound, unhealing wound, dermatophytosis, fungal, mange, malassezia , rhinitis that were reported to Veterinary Teaching Hospital, UMK.

For the common diagnostic workup and common treatment approach used, total of each diagnostic workup used to diagnose sporotrichosis from year 2017 to 2022 was divided with the cumulative total number of diagnostic work up done over the span of 5 years was tabulated and similar steps were repeated to determine the common treatment approach used.

The Chi-square test was used to analyse the association of the predisposing risk factors of sporotrichosis, where a P-value <0.05 was considered statistically significant.

4.0 RESULTS

4.1 Prevalence of sporotrichosis in companion animals in Veterinary Teaching Hospital, UMK from year 2017 to 2021

Out of 10955 that were presented to Veterinary Teaching Hospital, UMK from year 2017 to 2021, 2719 were dogs while 8236 were cats. There were a total of 349 of suspected sporotrichosis cases that were tentatively diagnosed based on the presented clinical signs such as skin problem, wound, unhealing wound, dermatophytosis, fungal, mange, malassezia , rhinitis.

From the 349 suspected sporotrichosis cases, 140 were confirmed positive for sporotrichosis. The overall prevalence of confirmed positive cases for sporotrichosis (N=140) out of the suspected sporotrichosis cases (N= 349) that was presented over the five years is 40.11%. Out of 140 positive sporotrichosis cases reported in 5 years in Veterinary Teaching Hospital, UMK and Bacteriology Lab, UMK, the prevalence of sporotrichosis was highest in 2019 where 53 (37.87%) positive cases were seen. On the other hand, the lowest was encountered in year 2021, where 16 (11.43%) positive cases was encountered as shown in Figure 1.

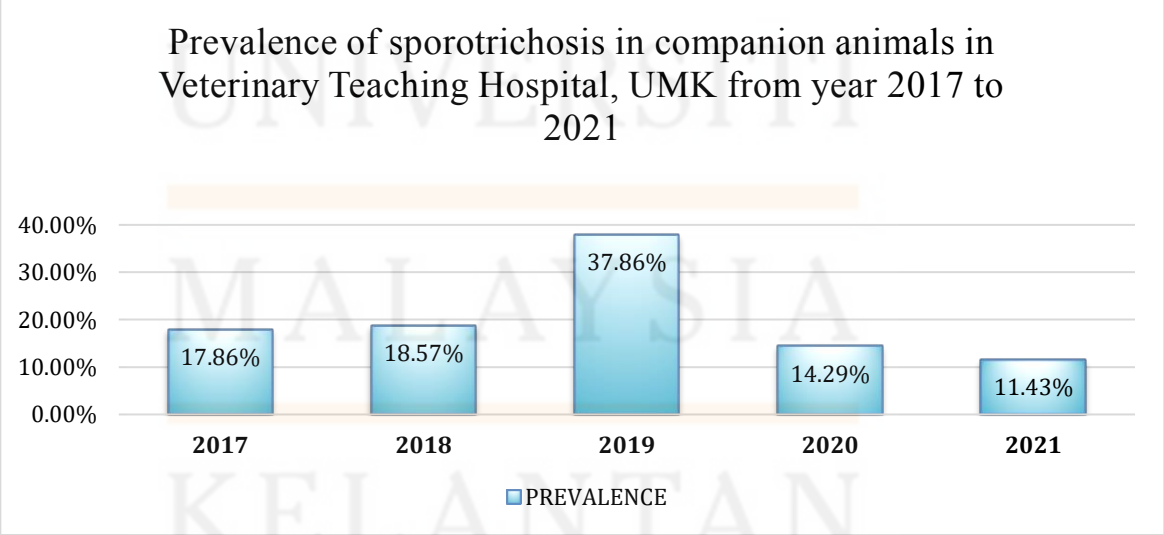

Figure 1 Prevalence of sporotrichosis in companion animals in Veterinary Teaching Hospital, UMK from the year 2017 to 2021.

4.2 Most common methods used to diagnose and treat Sporotrichosis in companion animals from the year 2017 to 2021 in Veterinary Teaching Hospital, UMK.

Based on the data collected and analysed, the most common diagnostic approach used to identify sporotrichosis was impression Smear (n=139, 73.5%), followed by peripheral blood film (n=1, 0.5%) shown in Figure 2.

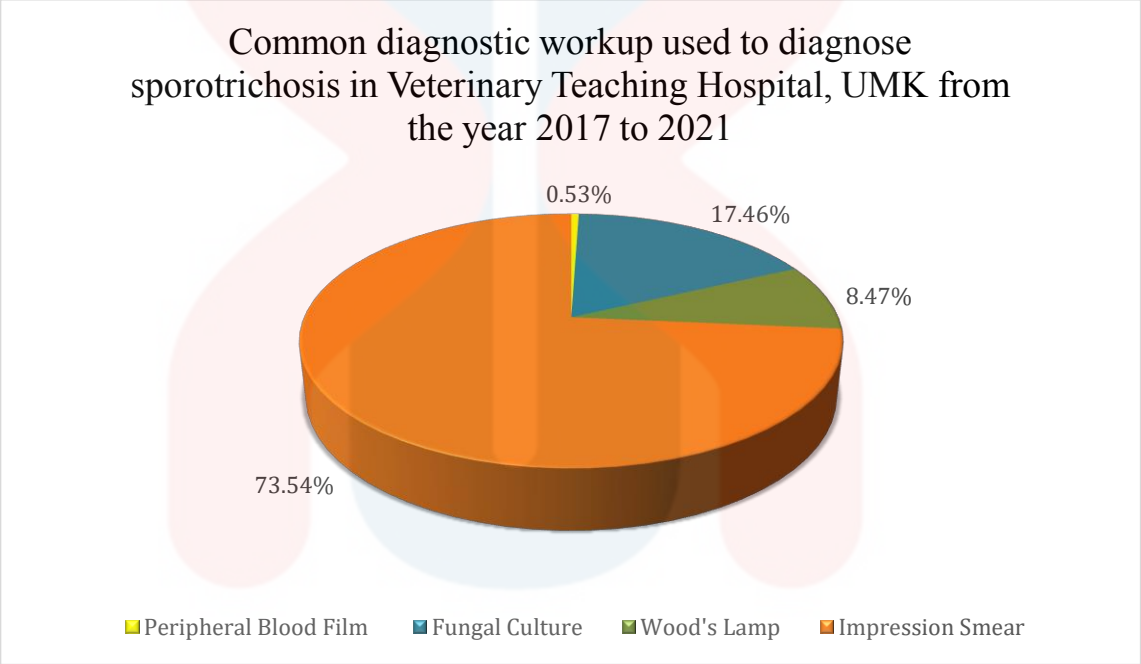

Figure.2 Common diagnostic workup used to diagnose sporotrichosis in Veterinary Teaching Hospital, UMK from year 2017 to 2021.

Figure 3 shows that the common drugs used to treat sporotrichosis was Itraconazole 103 (53%) and the least frequent drug administered was Tolfidine with a total number of 1 (1%) patient.

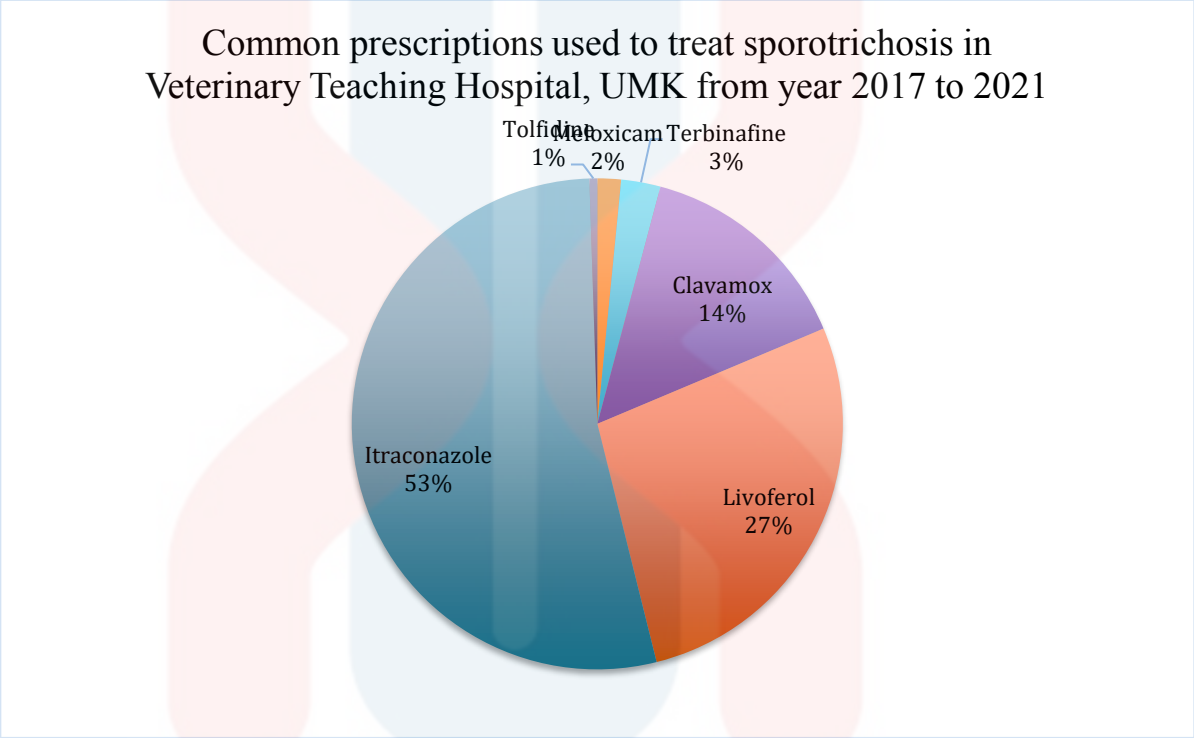

Figure 3 Common prescriptions used to treat sporotrichosis in Veterinary Teaching Hospital, UMK from year 2017 to 2021.

4.3 Risk factors associated with the occurrence of sporotrichosis in companion animals from the year 2017 to 2021 in Veterinary Teaching Hospital, UMK.

The association between risk factors such as sex, management, age, species, season and breed was calculated by using the Chi-square test. As tabulated below, the results show that the independent variables such as management, age, species, and breed, are all significant ($P< 0.05$) except the sex and season ($P> 0.05$).

Table 1: Risk factors associated with the occurrence of sporotrichosis in companion animals from the year 2017 to 2021 in Veterinary Teaching Hospital, UMK.

	Risk Factors	Prevalence (%)	P-value
Sex	Male	60.70%	0.142
	Female	39.30%	
Management	Indoor; Multi household	13.60%	0.001
	Indoor; Single household	3.60%	
	Outdoor; Multi household	56.40%	
	Outdoor; Single household	2.90%	
	Semi-indoor; Multi household	20.00%	

	Semi-indoor; Single household	3.60%	
Age	Kitten (up to 1 year old)	43.60%	0.001
	Young Adult Cat (1-6 years old)	51.40%	
	Mature Adult Cat (7-10 years old)	5.00%	
	Puppy (up to 1 year old)	0.00%	
	Adult Dog (1-8 years old)	0.00%	
	Senior Dog (9-12 years old)	0.00%	
	Geriatric Dog (>12 years old)	0.00%	
Species	Canine	0.00%	0.001
	Feline	100%	
Season	Rainy	41.40%	0.102
	Sunny	58.60%	
Breed	Domestic Short Hair	56.40%	0.001
	Domestic Long Hair	12.90%	

Unspecified	30.70%

5.0 DISCUSSION

The study showed the prevalence of sporotrichosis among companion animal in Veterinary Teaching Hospital, UMK in Kelantan for five years duration from the retrospective analysis data collected from Veterinary Teaching Hospital, UMK and Bacteriology Laboratory, UMK. Based on the analysed data, the overall prevalence for positive sporotrichosis cases (N=140) from the suspected sporotrichosis cases (N=349) from 2017 to 2021 was 40.11%. This prevalence is considered high, compared to a study conducted by Han, (2020) where the prevalence of cats died infected from a clonal strain of *S. schenckii sensu stricto* was 12%.

With a total of 140 cases of sporotrichosis presented for 5 years, the average number of cases were 28 yearly. There were 15 cases in the span of 5 years that were presented to Veterinary Teaching Hospital, UMK with suspected sporotrichosis due to non-healing wound and they have resulted to be confirmed for rhinitis, dermatophytosis and cryptococcosis. Sporotrichosis is diagnosed in companion animals in Malaysia which is a tropical country because, they tend to grows more frequently in tropical, subtropical, and temperate climates compared to cold climates (MacKay, 2014). According to Verma *et al*., 2012, *Sporothrix schenckii* is known to thrive at high humidity of 92–100% and a mean temperature ranging between 25°C–37°C where this is the temperature observed in Kelantan state.

The highest number of sporotrichosis cases presented to Veterinary Teaching Hospital, UMK was in year 2019, where the total number of cases presented in feline was 53 while the lowest number of cases was seen in year 2021 and 2020 which were 16 and 20 respectively. This could be due to few reasons which are, the country experienced a global pandemic Covid-19 with movement restriction order in the year 2020 and 2021 that could have restricted the pet owners to bring forward their infected pets to be diagnosed or treated. Besides that, in the mid of 2020, the location of Veterinary Teaching Hospital, UMK which was known as Veterinary Clinic UMK has changed from Padang Tembak, Kota Bharu to Bachok which is an extra 30 minutes' drive. This would have caused the existing clients to find other veterinary clinics nearby to their

area for their pets to be treated. Moreover, in this era of self-diagnosing via google and online procurement, pet owners tend to diagnose and purchase over-the-counter medication from the net. This statement is supported by pet owner surveys in the Packaged Facts where online shopping rates for pet medications notched up in the wake of COVID-19 by Packaged Facts, (2021) who are a group of statistical analysis who conducted the survey. Besides that, there are other veterinary clinics that are available which would have been the go-to choice for the pet owners that has limited the data to be collected and analyzed for study.

From the data that was collected, it shows that the owners are not compliant and do not return for follow-up and stop once sporotrichosis is diagnosed as there few very few follow-ups that were seen in the records and system. Incomplete data recorded made it more difficult to obtain a proper view on the risk factors and recovery state in the feline patients that were diagnosed with sporotrichosis.

Attempts to collect more data from other veterinary clinics in Kelantan was made, however, due to the improper data keeping and unavailability of the diagnostic tool used to diagnose sporotrichosis, those data were excluded from the study.

The common diagnostic methods used to diagnose sporotrichosis in Veterinary Teaching Hospital, UMK in the span of five years is impression smear (73.5%) of the skin ulcer and staining via diff quick because it is a rapid and immediate method to determine the presence of cigar-shaped, oval or rounded budding yeast-like organism with a single round pink nucleus surrounded by blue cytoplasm and non-staining cell wall, within the macrophage and extracellular membrane (Jessica et al., 2015). While the least common diagnostic workup done was peripheral blood film (0.5%) as it is not an accurate diagnostic workup to confirm sporotrichosis.

The common treatment approach used was itraconazole (53%) which is an anti-fungal treatment followed by livoferol (27%) which acts as a liver supplement and appetite stimulant. The reason why itraconazole and livoferol should be administered together is because, intake of itraconazole for a long period of time would result in mild-to-moderate serum elevations and can lead to clinically apparent acute drug-induced liver

injury (Itraconazole, 2017).

From all the 140 patients, in total of 30 felines that were diagnosed with sporotrichosis were euthanised. This is most likely due to client incompliance due to the zoonotic factor and long-term therapy or due to severe case of sporotrichosis that has impaired multiple system function.

Risk factors such age, management, species and breed have shown significant association (P-value <0.05) between the occurance of sporotrichosis amongst companion animals in Kelantan while sex and season has no significant association (P-value >0.05).

Based from American Animal Hospital Association (AAHA) guideline by Quimby, (2021), the feline age were classified into Kitten (up to 1 year) and Young Adult Cat (1-6 years old). The age factor showed significant association and this could be due to their developing immune system and lack in specific acquired immunity with the exposure to sporotrichosis. Not only that, Young Adult Cat have shown to be more predisposed to sporotrichosis with the mean of 2 to 3 years Vin, (2022) and this could be probably due to their active years and their free roaming nature leading to them to be in contact with the infected soil or other infected cats.

Outdoor and multiple household cats showed more predisposed to getting infected with sporotrichosis. This is because they are more prone to other infected cats and soil. According to Vin, 2022 the infection usually happens due to fights (71%), having contact with infected animals (22.3%) either during mating season or territorial fights or by iatrogenic transmission (5.6%). The breed factors showed significance as common moggie that are extensive in Kelantan are Domestic Short Hair (DSH) and Domestic Long Hair (DLH).

However, there is a room for speculation for breed as a risk factor as sporotrichosis is not known for breed predisposition (Han, 2020).

Based on the analyzed data, sporotrichosis is more prevalent in cats than dogs as the prevalence of sporotrichosis in canine species reported at 0% in the span of five years as it is a poorly reported disease, and the majority of cases are from Rio de Janeiro, Brazil (Boechat *et al*., 2020). While for feline on the other hand, it showed a prevalence of

1.28% over the five years and this could be due to their free-roaming and inter-species aggression (Han, 2020).

There is no significant association (P-value>0.05) with sex factor wherelse there are other studies that reported intact male cats had more occurance of sporotrichosis (Han, 2020). Hence, there is still room for speculation as for sex to be included as risk factor for sporotrichosis as study showed that this disease occurs more often in sexually intact male due to their free roaming nature (Spickler, 2017).

Kelantan, Malaysia geographically is located at the northeast of the peninsular and the only seasons that are experienced in is rainy and sunny. According to the Laman Web Rasmi Jabatan Meteorologi Malaysia, (2014), the northeast monsoon season occurs from November to March and it has been reported that higher temperatures, heavy rainfall, and flooding are associated with an increase in emerging zoonotic diseases (Rodrigues et al., 2022). However, there is no significant association of sporotrichosis with season in Veterinary Teaching Hospital, UMK in the span of five years as this could be due to the duration of the cat being inoculated with the fungus and being brought to the veterinarian could be delayed.

6.0 CONCLUSION

In conclusion, the overall prevalence of sporotrichosis amongst companion animals in Veterinary Teaching Hospital, UMK from 2017 to 2021 is 40.11%, which is considered high. The most common diagnostic approach used to diagnose sporotrichosis is by conducting impression smear by using diff quick stain as it is a high quality with a rapid turnaround time staining kit used in cost-conscious laboratory environment. The common treatment approach used was by administering itraconazole tablets followed by liver supplementation. The risk factors that are significantly associated with sporotrichosis are the age, breed, management and the species.

The significance of this study is to provide valuable insights and educate the community as sporotrichosis is an emerging zoonosis worldwide. With proper selection of diagnostic approach and early detection of sporotrichosis will help to combat the emergence of the disease. Despite the availability of various drugs that can be used to treat, it must be used adequately and cautiously due to their adverse effect and to prevent resistance of drug and toxicity that would harm the pets. All these data in the research will help to provide useful knowledge that benefits the community and veterinarians on improving the animal health care and welfare. This information could also be beneficial for research to develop more potent drugs with lesser adverse effect that could act as a prophylactic agent against sporotrichosis.

7.0 RECOMMENDATIONS

Data should be obtained from various veterinary clinics in Kelantan as it would help to give more precise result with different diagnostic approach. However attempt was made to retrieve data from private clinics, but due to improper data keeping, no accurate data was obtained. Obtaining data from various source throughout Malaysia with complete records would give a wholesome picture of sporotrichosis in Malaysia, where a study of prevalence in each state and their preferred diagnostic method and choice of treatment can be studied.

Besides that, neuter status of the patients should have been taken as it could be a part of risk factors associated with sporotrichosis as study shows, intact male cats tend to be more predisposed to sporotrichosis due to their inter-animal aggression to prevent the inter-cat or inter-dog transmission (Han, 2020).

Not only that, in order to identify the association of sporotrichosis with its zoonotic aspect amongst companion pets such as cat and dog owners, a prevalence study of sporotrichosis reported among pet owners in Kelantan should be done.

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APPENDIX A

Data Collection Form

Patient Signalment	
Patient ID	
Address	
Date presented	
Species	
Breed	
Age	
Sex	
Management	
History	
Purpose of visit	
Clinical presentation	
Duration of the clinical sign presentation	

Pre-existing conditions and duration	
Diagnostic approach used	Physical examination finding Complete blood count Serum biochemistry Biopsy Fungal culture/ identification Histopathology
Definitive Diagnosis	
Treatment	Itraconazole Ketoconazole Potassium iodide Antibiotic List: Other :

Status of patient	Relapsed No : Cured Dead Date of death- Cause of death-