Cat Contact as A Risk Factor for Tinea Capitis Infection

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ABSTRACT

Background: Tinea capitis (TC) is common infection caused by dermatophytes on the scalp. Cat contact is one of the TC risk factors. *Microsporum canis* is the most abundant fungi in cats and humans as a zoophilic infection. Cats and carrier cats can infect humans, mostly children. **Purpose:** To evaluate cat contact as a risk factor for TC patients at the Dermatology and Venereology Outpatients Unit of Dr. Soetomo General Academic Hospital Surabaya in January 2017 - December 2018. **Methods:** A retrospective study by observation and recording data. The results obtained as a result of the data recap were then processed using tabulation to obtain conclusions. **Result:** The results obtained from TC cases in 2017 and 2018 are 20 patients. The results were cat contact in 9 patients (45%), aged > 5 years (55,6%), male (55,6%), and lived in Surabaya (88,9%), hair loss (88,9%), crust (100%), *M. canis* in culture (55,6%), Grey patch type (55,6%), combination of oral Griseofulvin and Ketoconazole 2% scalp solution (88,9%), and patients' follow up (44,4%). **Discussion:** More people keeping cats will increase the risk of being infected with feline dermatophytosis. Combination therapy is the best treatment for *M. canis*. It is important to educate parents to be careful with pet cats that can become carriers. **Conclusion:** Cat contact was positive in almost half patients, mostly in a male and > 5 years old. The most common signs and symptoms were crust and hair loss, and grey patch.

Keywords: Tinea capitis, risk factor, cat contact, tropical diseases.

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BACKGROUND

Tinea Capitis (TC) or scalp ringworm, is a common infection caused by dermatophyte fungi and predominantly affects children. Dermatophyte causes a superficial fungal infection of the skin of the scalp, eyebrows, and eyelashes, with a propensity for attacking hair shafts and follicles. Pathogen species are the genera *Trichophyton* and *Microsporum.* These fungi produce arthrospores, which are highly resistant, surviving in a dry environment for 12 months or more. In a humid environment, however, arthrospores are short-lived. High surviving in a dry environment for 12 months or more. In a humid environment, however, arthrospores are short-lived. High temperatures (100°C) quickly destroy them. Three genes, *SUB1*, *SUB2* and *SUB3* have been identified encoding serine proteases to trigger rapid secretion of IL-1β associated with fungal infection. Lesions are generally more inflammed and itchy. The scalp with dermoscopy shows dystrophic and elbow-shaped hair, and in addition, there are different height levels of broken hair.[3,4] *M. canis* infections in cats are of major importance as cats serve as a reservoir of this zoonosis, which is considered highly contagious and potentially pathogenic in humans, especially children. Dermatophyte transmission occurs upon contact with infected hair or fomites or from the environment (spores in soil), and in rural areas, up to 80% of all human fungal skin infections may be of animal origin.[11]

METHODS

This was a descriptive retrospective study which observed the number of cases, initial data, history taking, physical examination, additional examination, management, and follow up of tinea capitis new patients with cat contact at the Dermatology and Venereology Outpatients Unit of Dr. Soetomo General Academic Hospital Surabaya in January 2017 - December 2019. Factors that are observed in this study refer to previous research that was conducted by Venitarani in 2018. The medical record was analyzed by considering the type of tinea capitis, age, gender, manifestations, domicile, medication history, signs,

examination (potassium hydroxide (KOH), wood's lamp, culture), medication, and follow-up state. The obtained data was then processed using tabulation to obtain conclusions. This research has been reviewed and approved by the Ethics Committee at Dr. Soetomo General Academic Hospital Surabaya.

RESULT

We obtained 20 subjects, consisting of 9 with cat contact (45%) and 11 without cat contact (55%) patients treated at the Dermatology and Venereology Outpatients Unit of Dr. Soetomo General Academic Hospital Surabaya during January 2017 - December 2019. There is no subject that was excluded from this research. The most age group found with TC with cat contact as a risk factor was > 5 years old (55,6%) with 5 patients. Most patients with TC were male with 5 patients (55,6%), while the remaining 4 patients (44,4%) were female. There are two groups domicile of patient with the most common was Surabaya, with 8 patients (88,9%). There are five subclinically infected animals, mainly cats. Indirect contact may occur via contaminated collars, brushes, toys, and environments.[2,5]

Tinea capitis is the most common pediatric dermatophyte infection worldwide. The age predilection is believed to result from the presence of *Pityrosporumorbiculare* (*Pityrosporumovale*), which is part of normal flora, and the fungistatic properties of fatty acids of short and medium chains in postpubertal sebum. Inflammatory TC occurs predominantly in rural or suburban areas, and some factors (poor personal hygiene, crowded living condition, and low socioeconomic status) were associated with this increased frequency.[6,7]

Scalp scaling, alopecia, and cervical adenopathy are the classic triad of TC in children. Primary lesions include plaques, papules, pustules, or nodules on the scalp (usually in the occipital region). Secondary lesions include scales, alopecia (usually reversible), erythema, exudates, and edema. Scalp pruritus may be present. Fever, pain, and lymphadenopathy (commonly postcervical) may occur with inflammatory lesions. Gray patch is one of the clinical patterns of TC that has scaly and well demarcated lesions. The hairs within the patch break off a few millimeters above the scalp. Sometimes the lesions join to form larger ones.[8,9]

Feline dermatophytosis has clinical signs arthrospores adhere very strongly to keratin.[1,2] Cat contact is one of the risk factors of TC. Cats and carrier cats can infect humans, mostly children. Over 90% of feline dermatophytosis cases are caused by *Microsporum canis* which is included in ectothrix group. *M. canis* is the most abundant fungi. Hair loss was the most manifestation as a zoophilic infection. Ectothrix invasion is characterized by the development of arthroconidia on the exterior of the hair shaft. The cuticle of the hair is destroyed, and infected hairs usually fluoresce a bright greenish-yellow color under a Wood lamp's ultraviolet light. At least four types of manifestations occur in *Microsporum canis*, namely erythema, grayish scale, hair loss, pain, and pus.

Table 1. The profile of new cases tinea capitis at Dr. Soetomo General Academic Hospital Surabaya's Dermatology and Venereology Outpatients Unit from January 2017 - December 2018

	2017 n (%)	2018 n (%)	Total n (%)
RF(+)	5 (45,4)	4 (44,4)	9 (45)
RF(-)	6 (54,5)	5 (55,5)	11 (55)

RF: Risk Factor

Table 2. Distribution of tinea capitis patients with risk factor at Dermatology and Venereology Outpatients Unit of Dr. Soetomo General Academic Hospital Surabaya period January 2017 - December 2018

	2017 n (%)	2018 n (%)	Total n (%)		2017 n (%)	2018 n (%)	Total n (%)
Age				Domicile			
< 5 years	2 (40)	2 (50)	4 (44,4)	Surabaya	5 (100)	3 (75)	8 (88,9)
> 5 years	3 (60)	2 (50)	5 (55,6)	No	0 (0)	1 (25)	1 (11,1)
Gender				Medication History			
Male	3 (60)	2 (50)	5 (55,6)	Griseofulvin	1 (20)	0 (0)	1 (11,1)
Female	2 (40)	2 (50)	4 (44,4)	Miconazole 2% cream	1 (20)	0 (0)	1 (11,1)
Manifestations				Inerson cream	1 (11,1)	0 (0)	1 (11,1)
Erythema	3 (60)	2 (50)	5 (55,6)	Ketomed shampoo	1 (20)	0 (0)	1 (11,1)
Grayish scale	2 (40)	4 (100)	6 (6,7)	Bethametason cream	1 (20)	0 (0)	1 (11,1)
Hair loss	5 (100)	3 (75)	8 (88,9)	Minyak tawon	0 (0)	1 (25)	1 (11,1)
Pain	5 (100)	2 (50)	7 (77,8)	Fungiderm cream	0 (0)	1 (25)	1 (11,1)
Pus	3 (60)	0 (0)	3 (33,3)	Desonide cream	0 (0)	1 (25)	1 (11,1)
				Without	1 (11,1)	1 (25)	1 (11,1)

Hair loss was the most common manifestation. With 8 patients (88,9%). Some of the medical histories include Griseofulvin, Miconazole 2% cream, Inerson cream, Ketomed shampoo, Bethametason cream, wasp's oil, Fungiderm cream, Desonide cream, and without medication. Based on the medical record, there were some supporting examinations like KOH, wood's lamp, and culture. In culture examination, it was found that *Microsporum canis* is the most pathogenic of TC. 5 out of 9 patients' culture results were positive of *M. canis*. Thus, it can be concluded that *M. canis* (55,6%) is the most suspected pathogen causing TC related cat contact. The frequency distributions are presented in Tables 1, 2, and 3.

Tabel 3. The profile of tinea capitis patients with risk factor at Dermatology and Venereology Outpatients Unit of Dr. Soetomo General Academic Hospital Surabaya period January 2017 - December 2018

	2017 n (%)	2018 n (%)	Total n (%)
Signs			
Red macule	3 (60)	2 (50)	5 (56)
Gray macule	2 (40)	2 (50)	4 (44)
Alopecia	5 (100)	4 (100)	9 (100)
Crust	5 (100)	4 (100)	9 (100)
Pustule	1 (20)	0 (0)	1 (11)
KOH			
+	2 (40)	3 (75)	5 (56)
+ (with hifa)	0 (0)	1 (25)	1 (11)
-	1 (20)	0 (0)	1 (11)
No data	2 (40)	0 (0)	2 (22)
Wood's lamp			
+	4 (80)	2 (50)	6 (67)
-	1 (20)	0 (0)	1 (11)
No data	0 (0)	2 (50)	2 (22)
Culture			
Microsporum canis (+)	3 (60)	2 (50)	5 (56)
Microsporum audounii (+)	2 (40)	2 (50)	4 (44)
Type			
Grey Patch	2 (40)	3 (75)	5 (56)
Kerion	3 (60)	1 (25)	4 (44)
Medication			
Oral Griseofulvin	0 (0)	1 (25)	1 (11)
Oral Griseofulvin and Ketoconazole 2% scalp solution	5 (100)	3 (75)	8 (89)
Follow-up			
Yes	2 (40)	2 (50)	4 (44)
No	3 (60)	2 (50)	5 (56)

KOH = potassium hydroxide

DISCUSSION

Pronounced inflammatory reaction is a feature often seen in zoophilic infections or those spreads from animals to humans. Meanwhile, anthropophilic dermatophytosis spreads from human to human; lesions are often non-inflammatory and persistent. It was generally thought that subclinical *M. Canis* infections are very common in cats, especially in long haired animals over 2 years of age. Arthrospores are transmitted through contact with clinical findings like hair loss, papules, scales, crusts, erythema, follicular plugging, hyperpigmentation and changes in nail growth or appearance. Typically, lesions are asymmetrical. Pruritus is varying, but in general is minimal to absent. When pruritus is present, self-trauma can mimic areas of pyotraumatic dermatitis or ulcerative eosinophilic lesions present. Self-trauma can mimic areas of pyotraumatic dermatitis or ulcerative eosinophilic lesions in cats. Lesions tend to occur most commonly on the face, ears and muzzle of cats, and then progress to their paws and other body areas. The disease is transmitted via direct contact with another infected host or contaminated fomite (e.g *M. gypseum* and soil).[10]

More people keeping cats will increase the risk of being infected with feline dermatophytosis and increase number of TC cases, especially if there are carrier cats without clinical manifestation. Griseofulvin is the best therapy for *M. canis*. It is important to educate parents to be careful with pet cats that can become carriers.[11]

Cat contact was positive in almost half of the patients, mostly in male, and dominated in those > 5 years old. The most signs and symptoms were crust and hair loss. *Microsporum canis* was the most common pathogen found from culture examination. The most common combination of medications used as treatment was oral Griseofulvin and Ketoconazole 2% scalp solution.

Understanding health information related to cat contact as a risk factor for TC can decrease contact with cat especially cats that are not cared for and not vaccinated, as well as preventing TC. Cat owners must keep their cat clean and has periodic check up to the veterinary office. If there is one family member has tinea capitis, it must be treated immediately so it does not infect others. There are limitations to this study, such as data collection only at one hospital, so it cannot describe the overall tinea capitis profile. Therefore, we suggest future research to explore the limiting factors in this study that can influence the incidence for TC, find another risk factor of TC, and perform research in another hospital location to enrich epidemiological data.

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