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Clinical Patterns and Demographic Characteristics of Dermatophytosis in Surabaya

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Abstract

Dermatophytosis, the most common fungal infection in humans, significantly impacts quality of life due to its clinical and cosmetic effects. Its high prevalence underscores the need to evaluate patient profiles to improve management strategies. This study aim is to identify the most prevalent type of dermatophytosis, patient demographics, clinical characteristics, laboratory investigations, and therapy in dermatophytosis into the clinical and epidemiological characteristics of dermatophytosis in a tropical, high-burden region. This descriptive retrospective study used total sampling of medical records of dermatophytosis patients from January 2017 to December 2022. Tinea corporis and tinea cruris was the most common, while tinea manuum is the least common dermatophytosis. Female adults were the most affected group. Common clinical features for each type included alopecia for tinea capitis, erythematous macules for other types, and nail dystrophy for tinea unguium. *Trichophyton mentagrophytes* was the commonest pathogen in 2017. Most of the therapies followed Clinical Practice Guidelines with extensive use of griseofulvin and ketoconazole cream. Further research should explore therapeutic outcomes, preventive measures, and factors influencing recurrence and adherence to treatment.

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INTRODUCTION

Mycoses are divided into 3 forms: superficial, involving the stratum corneum, hair, and nails; subcutaneous, involving the dermis and/or subcutaneous tissue; and systemic, showing hematogenous spread from the stratum corneum, hair, and nails. subcutaneous tissue; and systemic, which shows hematogenous spread of opportunistic pathogens in immunocompromised hosts. Superficial dermatomycosis is a fungal infection that is limited to the body surface, such as the stratum corneum, hair, nails, and the mucous membrane surfaces of the oral cavity and vulva.[1]

Dermatophytosis superficial fungal infections affect 20-15% of the world's population and are the most common fungal infections in humans.[2] Dermatophytosis is an infection by dermatophyte fungi that attack tissues with keratin, such as the stratum corneum of the epidermis, hair, and nails.[3] Dermatophytosis is caused by dermatophyte fungi, which are keratinolytic fungi classified into three genera, which are *Microsporum*, *Trichophyton*, and *Epidermophyton*.[3] Dermatophytosis develops primarily in keratinized areas of the body, including the scalp (tinea capitis), body skin (tinea corporis), groin skin (tinea cruris), feet (tinea pedis), hands (tinea manuum), and nails (tinea unguium).[5]

In the last two decades, there has been a significant escalation in human dermatophytosis cases as a consequence of socioeconomic problems, immigration from tropical countries, and contact with animals, particularly pets.[4] Age and the usage of immunosuppressant drugs are also predisposing factors for mortality due to dermatophytosis in humans.[6] One of the risk and predisposing factors for tinea infection is a humid environment. Other risk factors include diabetes mellitus, hypertension, atherosclerosis, usage of occlusive footwear, use of public bathing facilities or public sports facilities, and repeated trauma on the hands, usually related to occupation.[7]

Indonesia is a tropical country with year-round sunshine. On the other hand, most of Indonesia's territory is mostly water, hence Indonesia has a high rate of rainfall. This condition causes Indonesia to have a humid environment. In tropical and subtropical regions, where humidity levels are consistently high, dermatophytosis is more prevalent. Dermatophytes thrive in high humidity environments, typically above 60% relative humidity.[35] Combination of high temperatures (around 35°C) and high humidity (95%-100%) creates the most favorable conditions for dermatophyte penetration into the skin.[36] This is attributed to the ideal conditions for fungal growth during periods of increased sweating and moisture on the skin. [20-21]

Dermatophytosis can be both clinically and cosmetically disruptive, thereby decreasing the quality of life. Psychosocial issues such as embarrassment, decreased self-esteem, anxiety, and depression are often more prevalent in dermatophytosis patients rather than physical symptoms.[8] The large number of dermatophytosis cases each year indicates that there is still a need for ongoing evaluation of these cases. This study is a continuation of the previous study on the profile of dermatophytosis at Dr. Soetomo General Academic Hospital Surabaya.

MATERIALS AND METHODS

This research is a descriptive retrospective study using the total sampling method. The research instrument used was the medical records of dermatophytosis patients in the

dermatology and venereology Outpatient Unit at Dr. Soetomo General Academic Hospital Surabaya for the period January 1, 2017 to December 31, 2022. the variables of this study consisted of age, gender, occupation, domicile, classification of dermatophytosis, chief complaint, clinical presentation, predisposing factors, laboratory examination, and management of dermatophytosis.

The inclusion criteria of this study were patients with a diagnosis of dermatophytosis who examined themselves at the dermatology and venereology Outpatient Unit at Dr. Soetomo General Academic Hospital Surabaya from January 2017 to December 2022 with appropriate medical record data, that includes patient identification, medical history, diagnosis, treatment, and laboratory results. It should ensure consistency between electronic medical records (EMR) and manual records in the outpatient unit. The study was conducted at the Dermatology and Venereology Outpatient Unit and Information and Communication Technology Installation of Dr. Soetomo General Academic Hospital Surabaya from September 2023 to February 2024. This research has been reviewed by the Ethics Committee at Dr. Soetomo General Academic Hospital.

RESULTS AND DISCUSSION

A total of 1100 dermatophytosis patient data were obtained from 2017 to 2022, however, only 864 patients were eligible according to the inclusion criteria. A total of 236 other patients were excluded from the study due to missing medical records, inappropriate diagnosis data, or discrepancies between electronic medical records and paper-based records. Multiple cases of dermatophytosis were found in some patients, resulting in a total of 930 cases of dermatophytosis.

The number of new cases of dermatophytosis was 281 (32.52%) in 2017, 184 patients (21.30%) in 2018, 172 patients (19.91%) in 2019, 88 patients (10.19%) in 2020, 80 patients (9.26%) in 2021, and 59 patients (6.83%) in 2022.

Patient Demographics

According to the demographic data of the patients as shown in Table 1, the most common age group was the adult group with 678 patients (72.9%), followed by the pediatric age group with 109 patients (11.7%). Tinea facialis, tinea corporis, tinea cruris, tinea pedis, tinea manuum, and unguium were dominated by the adult age group. However, tinea capitis was dominated by the child age group with 46 patients (4.9% of all dermatophytosis cases, 95.8% of tinea capitis cases).

Overall, there were more female patients than male patients. Tinea facialis, tinea corporis, tinea cruris, tinea pedis, and tinea unguium were dominated by female patients. However, for tinea capitis and tinea manuum, male patients outnumbered female patients.

Occupational classification was based on the International Standard Classification of Occupations (ISCO). The most common occupation was private employees, with 297 patients (31.9%). Meanwhile, the most common occupational classification was others, totaling 744 patients (80.0%) followed by the professional group as many as 16 patients (3.5%).

Regarding the domicile of the patients, most of the patients originated from Surabaya. The ratio of male to female patients was 1:1.26. Tinea facialis, tinea corporis, tinea cruris, tinea pedis, and tinea unguium were dominated by female patients. There were however more male

patients than female patients for tinea capitis and tinea manuum.

In this study, it was found that most of the patients with dermatophytosis were adult patients. This may be since the adult age group has the largest age range among other age groups. Besides that, adults are often more physically active, leading to increased sweating. Many adults work in warm, humid environments, such as outdoor jobs, which promote fungal infections due to increased perspiration. Adults also may be more likely to seek medical attention for persistent symptoms like itching or discomfort compared to children. This increased awareness and response to symptoms can lead to a higher reported incidence of dermatophytosis among adults. [3,10,23]

In addition, in this study also found that the least age groups were neonates, infants, and children. This is due to the division of Outpatient Unit of RSUD Dr. Soetomo Surabaya. There is a separate pediatric polyclinic from the dermatology and venereology polyclinic. Infant and child patients tend to come to the pediatric polyclinic so the number of infants and children who come to the dermatology and venereology outpatient unit are few.

The higher prevalence of tinea capitis in children and the male sex, in addition to prepubertal factors such as fungistatic fatty acid levels, is most likely also due to hormonal factors and low levels of progesterone, which cause steroid-mediated inhibition of dermatophyte growth. Rare cases of tinea capitis in adults may be due to the fungistatic characteristics of long-chain fatty acids in post-pubertal sebum, hair follicle maturation, and the immune system after adulthood which can protect the body from fungal invasion.[9]

Housewives are increasingly found to have active infections. The heated kitchen environment with increased sweating supports the growth of dermatophyte fungi, making housewives more vulnerable.[10] In several other studies, an increase in the frequency of dermatophytosis was found in student groups. School and sports activities and the use of school uniforms and footwear for a long time may be contributing factor to the occurrence of dermatophytosis in students.[11-13]

Tinea pedis is common in athletes, especially those who often walk barefoot or in people with occupations that use occlusive footwear for long periods, such as military personnel). Prolonged exposure to moist environments, use of occlusive footwear, and shared communal spaces, creates ideal conditions for fungal growth. Additionally, inadequate foot drying and minor skin trauma further compromise the skin barrier, increasing susceptibility to infection. [14-15] In this study, different results were obtained. Tinea pedis was not found in the military personnel occupational groups, and athletes did not appear as one of the occupational groups with dermatophytosis. Several possibilities can cause these results, including the type of work that is less explored in the anamnesis or there are indeed epidemiological differences in patients who are the subject of the study. patients who became the subject of the study.

Although RSUD Dr. Soetomo Surabaya is a referral hospital, patients from Surabaya still outnumber patients from cities other than Surabaya. Dermatophytosis is a disease of general practitioners' competence to perform clinical management, such as the ability to correctly identify, diagnose, manage, and monitor diseases or medical conditions, to provide appropriate treatment.

Table 1. Dermatophytosis patient in Mycology Division Dermatology and Venereology Outpatient Unit Dr. Soetomo General Academic Hospital Surabaya from January 2017-December 2022 demographics

Variable	Tinea capitis (n=48)	Tinea facialis (n=26)	Tinea corporis (n=423)	Tinea cruris (n=386)	Tinea pedis (n=17)	Tinea manuum (n=6)	Tinea unguium (n=24)
Age							
Infant	0 (0.0%)	0 (0.0%)	1 (0.2%)	2 (0.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Child	46 (95.8%)	9 (34.6%)	31 (7.3%)	20 (5.1%)	3 (17.6%)	0 (0.0%)	0 (0.0%)
Adolescent	1 (2.0%)	3 (11.5%)	30 (7.1%)	33 (8.5%)	0 (0.0%)	0 (0.0%)	1 (4.1%)
Adult	1 (2.0%)	14 (53.8%)	326 (77.1%)	302 (78.2%)	11 (64.7%)	5 (83.3%)	19 (79.1%)
Elderly	0 (0.0%)	0 (0.0%)	35 (8.3%)	29 (7.5%)	3 (17.6%)	1 (16.7%)	4 (16.7%)
Gender							
Male	26 (54.2%)	10 (38.5%)	173 (40.9%)	179 (46.4%)	8 (47.1%)	5 (83.3%)	11 (45.8%)
Female	22 (45.8%)	16 (61.5%)	250 (59.1%)	207 (53.6%)	9 (52.9%)	1 (16.7%)	13 (54.2%)
Occupation (classification based on International Standard Classification of Occupations)							
Professionals	0 (0.0%)	1 (3.8%)	21 (4.9%)	7 (1.8%)	2 (11.7%)	0 (0.0%)	2 (8.3%)
Managers	0 (0.0%)	0 (0.0%)	17 (4.0%)	12 (3.1%)	0 (0.0%)	1 (16.6%)	1 (4.1%)
Skilled agricultural,	0 (0.0%)	0 (0.0%)	4 (0.9%)	4 (1.0%)	1 (5.8%)	0 (0.0%)	0 (0.0%)
Plant and machine	0 (0.0%)	0 (0.0%)	4 (0.9%)	2 (0.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Elementary occupations	0 (0.0%)	0 (0.0%)	2 (0.5%)	2 (0.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Service and sales workers	0 (0.0%)	0 (0.0%)	1 (0.2%)	1 (0.2%)	0 (0.0%)	1 (16.6%)	0 (0.0%)
Armed forces	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (0.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Clerical support workers	0 (0.0%)	0 (0.0%)	1 (0.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Others	42 (87.5)	22 (84.6%)	328 (77.5%)	324 (83.9%)	9 (52.9%)	4 (66.6%)	15 (62.5%)
Domicile							
Surabaya	36 (75%)	13 (50%)	265 (62.6%)	243 (62.9%)	7 (41.1%)	4 (66.65)	18 (75%)
Others	12 (25%)	10 (38.4%)	141 (33.3%)	129 (33.4%)	7 (41.1%)	2 (33.3%)	6 (25%)
Total	48 (5.2%)	26 (2.8%)	423 (45.5%)	386 (41.5%)	17 (1.8%)	6 (0.6%)	24 (2.6%)

Classification of Dermatophytosis

As presented in Table 2, dermatophytosis with the most frequent cases was tinea corporis, with 358 cases (41.4%), followed by tinea cruris with 324 cases (37.5%). Dermatophytosis with the least number of cases was tinea manuum with 6 cases (0.7%), as well as tinea corporis et facialis, tinea corporis et capitis, and tinea cruris et unguium, each with only 1 case (0.1%).

This study shows the same results as previous research which was conducted at RSUD Dr. Soetomo Surabaya. Tinea corporis and tinea cruris are the types of dermatophytosis with the highest incidence rate in the study of 2011-2016. In previous studies, it was also found that tinea manuum is tinea with the lowest incidence rate. Different results were obtained in 2011-2013, which was found as many as 2 patients who experienced tinea barbae, while in 2014-2016 there were no tinea barbae patients at all.[16-17] Another study conducted in Africa obtained similar results. Tinea corporis was found to be the most common dermatophytosis, especially in adulthood.[18]

Table 2. Distribution of dermatophytosis classification in Mycology Division Dermatology and Venereology Outpatient Unit Dr. Soetomo General Academic Hospital Surabaya from January 2017-December 2022

Classification of Dermatophytosis	n	%
Tinea corporis	358	41.4
Tinea cruris	324	37.5
Tinea corporis et cruris	61	7.1
Tinea capitis	47	5.4
Tinea facialis	25	2.9
Tinea unguium	21	2.4
Tinea pedis	17	2.0
Tinea manuum	6	0.7
Tinea corporis et unguium	2	0.2
Tinea corporis et facialis	1	0.1
Tinea corporis et capitis	1	0.1
Tinea cruris et unguium	1	0.1
Tinea barbae	0	0.0

CHIEF COMPLAINTS

The most common chief complaint was itching in 608 cases (65.4%), followed by red patches in 499 cases (53.7%). Some of the complaints were found only in specific types of dermatophytosis, for example, complaints on nails (damaged nails, yellowing nails, white nails, thickening nails, and blackish nails) were only found in tinea unguium. In addition, complaints such as hair loss, baldness, and dandruff are only found in tinea capitis. Details of chief complaints of dermatophytosis patients are shown in Table 3.

Table 3. Distribution of dermatophytosis chief complaints in Mycology Division Dermatology and Venereology Outpatient Unit Dr. Soetomo General Academic Hospital from January 2017-December 2022

Chief complaint	n	%
Itching	608	65.4
Red patches	499	53.7
Black patches	83	8.9
White patches	11	1.2
Patches	66	7.1
Brown patches	4	0.4
Hair loss	29	3.1
Dandruff	1	0.1
Damaged nails	15	1.6
Yellowing nails	1	0.1
White nails	1	0.1
Thickening nails	1	0.1
Wounds	7	0.8

The results of this study are in line with research conducted at Dr. Soetomo Hospital Surabaya in the previous period. In the period 2014-2016, the most common complaint was itching, followed by red patches. The study also found that the most common complaints of tinea capitis were baldness.[16] Itching is more common complained than spotting because itching causes a disturbing sensation, so that it can reduce quality of life. In addition, itching is also more associated with allergic or infectious diseases, so it attracts more attention so that patients tend to seek treatment immediately. Persistent itching may also lead to irritation or infection secondary to scratching. This finding aligns with other studies showing that itching is the primary symptom of dermatophytosis, significantly affecting quality of life and driving patients to seek prompt medical care due to its impact on daily activities and productivity. [22]

Clinical Appearance

The most common clinical features of tinea capitis were alopecia and thin scales (n=29, 60.42%) followed by erythematous macules (n=2, 27.08%). Among the patients with tinea faciei (n=26), the most common clinical features were erythematous macules (n=21, 80.77%), followed by thin scales (n=15, 57.69%), and active margins (n=12, 46.15%). In tinea corporis (n=358), the most common clinical features were erythematous macules (n=304, 71.87%), followed by macules with active margin (n=274, 64.78%) and thin scales (n=240, 56.74%). In patients with tinea cruris, there were more various clinical features than other types of tinea. The most common clinical appearance was erythematous macules (n=274, 70.98%), followed by active marginal lesions (n=234, 60.62%) and thin scales (n=226, 58.55%). The most common clinical feature in tinea pedis was erythematous macules (n=11, 64.71%), followed by thin scales (n=9, 52.94%). Among tinea manuum patients, the most common symptoms were erythematous macules and thin scales (n=4, 66.67%). Among the 26 patients with tinea unguium, the most common clinical feature was dystrophy (n=9, 37.50%), followed by dyschromia and hyperkeratosis (n=8, 33.33%). Particular details of the clinical appearance of each type of dermatophytosis are presented in Table 4. Most patients had overlapping symptoms, so data could not be fully accumulated.

Table 4. Distribution of tinea capitis clinical appearance in Mycology Division Dermatology and Venereology Outpatient Unit Dr. Soetomo General Academic Hospital from January 2017-December 2022

Clinical presentation	n	%
Tinea capitis		
Alopecia	29	60.42%
Thin scales	29	60.42%
Erythematous macule	23	27.08%
Poorly demarcated margin	6	12.50%
Gray patch	4	8.33%
Crust	4	8.33%
Well-defined lesion margin	4	8.33%
Others	17	35.42%
Tinea facialis		
Erythematous macule	21	80.77%
Thin scales	15	57.69%
Active margin	12	46.15%
Polycyclic	11	42.31%
Central healing	9	34.62%

Others	15	57.69%
Tinea corporis		
Erythematous macule	304	71.87%
Active margin	274	64.78%
Thin scales	240	56.74%
Central healing	176	41.61%
Polycyclic	173	40.90%
Well-defined lesion margin	80	18.91%
Hyperpigmented macule	73	17.26%
Poorly demarcated margin	36	8.51%
Erythematous and hyperpigmented macule	21	4.96%
Papules	11	2.60%
Others	40	9.46%
Tinea cruris		
Erythematous macule	274	70.98%
Active margin	234	60.62%
Thin scales	226	58.55%
Polycyclic	190	49.22%
Central healing	167	43.26%
Hyperpigmented macule	79	20.47%
Well-defined lesion margin	76	19.69%
Others	101	26.17%
Tinea pedis		
Erythematous macule	11	64.71%
Thin scales	9	52.94%
Polycyclic	8	47.06%
Others	17	100%
Tinea manuum		
Erythematous macule	4	66.67%
Thin scales	4	66.67%
Active margin	2	33.33%
Others	6	100%
Tinea unguium		
Dystrophy	9	37.50%
Dyschromia	8	33.33%
Hyperkeratosis	8	33.33%
Onycholysis	2	8.33%
Others	12	50%

Predisposing Factors

The most prevalent predisposing factor was warm humid conditions (n=182,19.6%), followed by frequent friction and maceration in warm climates (15.1%). The predisposing factor of warm and humid conditions was found to be the most prevalent in patients with tinea corporis, while friction and frequent maceration in warm climates were most common in patients with tinea cruris. In tinea capitis, the most common predisposing factor found was infected pets (n=27, 2.9%). The distribution and percentage of predisposing factors are presented in Table 5 below.

Microsporum canis, which originates from cats, is one of the most common causative agents of zoophilic infections leading to tinea capitis.[24] The transmission of *Microsporum canis* from cats to humans typically occurs through direct contact with an infected animal's fur or by touching objects that have come into contact with the cat's spores.[25] In tinea manuum and tinea pedis, the most common predisposing factor was excessive sweating.

People who work outdoors in a hot and humid environment are more susceptible to being infected with dermatophyte fungi. Outdoor workers are at heightened risk of fungal infections due to prolonged exposure to warm, humid environments, increased sweating, and limited hygiene facilities. Factors such as tight-fitting, non-breathable clothing and footwear exacerbate moisture retention, creating ideal conditions for fungal growth and skin maceration, which facilitates fungal penetration. [10,20,26]

Table 5. Dermatophytosis predisposing factors in Mycology Division Dermatology and Venereology Outpatient Unit Dr. Soetomo General Academic Hospital from January 2017-December 2022

Predisposing factor	n	%
Warm and humid conditions	200	21.5
Frequent friction and maceration in warm climates	140	15.1
Wearing tight clothing	80	8.6
Excessive sweating	78	8.3
Infected pets	67	7.2
Contact with patients	33	3.5
Immunocompromised	25	2.7
Immunosuppressant consumption	21	2.3
Lack of hygiene	14	1.5
Tinea pedis co-infection	1	0.1
Persistent use of socks and shoes	1	0.1
Use of towels or objects infected with fungus	1	0.1
Obesity	1	0.1

In addition, the use of tight clothing that causes skin to become damp also increases the prevalence, recurrence, and chronicity of dermatophytosis.[10] This is in line with the results of this study, namely the most predisposing factor is a warm humid environment. Underlying chronic conditions are also a predisposing factor for dermatophytosis. predisposing factors of dermatophytosis, including diabetes mellitus, patients who received immunosuppressant therapy, chronic hepatitis C infection, and HIV.[18]

Laboratory Examination

Microscopic examination with 10-20% KOH is used to diagnose dermatophytosis which involves the nails, hair, or fingernails. Findings from the microscopic examination using 10-20% KOH can include hyphae, blastophores, and septa. Some patients were also found to be negative for the KOH microscopic examination, so the diagnosis of dermatophytosis was established based on favorable clinical findings. Microscopic examination using 10-20% KOH findings details as shown in Table 6.

Table 6. Microscopic examination using 10-20% KOH results in Mycology Division Dermatology and Venereology Outpatient Unit Dr. Soetomo General Academic Hospital from January 2017-December 2022

Diagnosis	Positive result (%)						Negative result	n (%)
	Hyphae	Blastospore	Septa	Hypha + Blastospore	Hypha + Arthroconidia	Hypha + Septa		
Tinea corporis	341 (36.7%)	1 (0.1%)	7 (0.8%)	5 (0.5%)	13 (1.4%)	1 (0.1%)	45 (4.8%)	423 (45.5%)
Tinea cruris	311 (33.4%)	1 (0.1%)	4 (0.4%)	3 (0.3%)	10 (1.1%)	1 (0.1%)	41 (4.4%)	386 (41.5%)
Tinea capitis	27 (2.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (0.4%)	0 (0.0%)	14 (1.5%)	48 (5.2%)
Tinea faciei	19 (2.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.1%)	0 (0.0%)	5 (0.5%)	26 (2.8%)
Tinea unguium	11 (1.2%)	1 (0.1%)	0 (0.0%)	0 (0.0%)	1 (0.1%)	0 (0.0%)	7 (0.8%)	24 (2.6%)
Tinea pedis	8 (0.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (0.2%)	0 (0.0%)	2 (0.2%)	17 (1.8%)
Tinea manuum	5 (0.5%)	0 (0.0%)	1 (0.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (0.6%)

The most common result of microscopic examination with 10-20% KOH was visible hyphae (n=722, 77.6%). The least examination results found were blastopores, which were in 3 patients (0.3%) and hyphae with septa in 2 patients (0.2%). Of all dermatophytosis patients, there were some patients in whom no data were found from the microscopic examination with 10-20% KOH (n=38, 4.1%).

Wood's lamp fluorescence examination is an additional examination for tinea that occurs at the location of the hair pads so it can only be applied on tinea capitis and tinea barbae. Wood's lamp examination showed positive results (fluorescent greenish-yellow) in 21 patients with tinea capitis (43.8%) and showed negative results in 2 patients (4.2%). In the other 25 patients with tinea capitis, no data was obtained on the results of the Wood's lamp fluorescence examination.

Data of species causing dermatophytosis or culture results were only obtained in 2017, as shown in Table 7. Culture examination is not routinely done, so only a small number of patients were examined for fungal culture. The most common species of dermatophytosis was *Tricophyton mentagrophytes*. *Tricophyton mentagrophytes* was found in cases of tinea corporis, cruris, and capitis. *Tricophyton rubrum* was found in tinea cruris and tinea corporis. *Tricophyton ferrugineum* was found in tinea capitis and corporis. *Epidermophyton floccosum* is found in tinea cruris, *Microsporum canis* was found in tinea capitis, *Tricophyton veruccosum* was found in tinea corporis, and *Microsporum audouinii* was found in tinea capitis.

KOH examination is performed for rapid identification of dermatophytosis. In dermatophytosis involving skin, hair and nails, septa and hyphae are visible on microscopic examination with 10-20% KOH. In dermatophytosis, the hyphae are long and branched. Since microscopic examination with KOH can present false-negative results in up to 15% of cases, patients suspected of dermatophytosis based on clinical findings should be treated.[19]

Table 7. Dermatophytosis culture results in Mycology Division Dermatology and Venereology Outpatient Unit Dr. Soetomo General Academic Hospital on 2017

Species	n	%
Tricophyton mentagrophytes	7	2.5
Tricophyton rubrum	5	1.8
Tricophyton ferrugineum	2	0.7
Epidermophyton floccosum	3	1.1
Microsporum canis	2	0.7
Tricophyton veruccosum	1	0.4
Microsporum audouinii	1	0.4

Wood's lamp fluorescence examination is an examination performed on dermatophytosis involving hair-bearing areas, such as the head of hair and beard. Examination with Wood's lamp will fluoresce greenish yellow in several types of ectotrics dermatophyte fungi such as *Microsprosum canis, Microsporum audouinii, Microsporum distortum, and Microsporum ferrugineum*, while endotrics organisms will not fluoresce.[19]

Data on the species causing dermatophytosis or culture results were only obtained in 2017. This shows that improvements need to be made to the registration and archiving of patient medical records data in the Mycology Division of Dermatology and Venereology

Outpatient Unit of Dr. Soetomo Surabaya Hospital so that further research can be more accurate results with better medical record data. Culture examination is also not a routine examination so that only a small proportion of patients are examined for fungal culture.

Treatment

Systemic therapy given to patients with tinea capitis in the Mycology division of the Dermatology and Venereology Outpatient Unit of RSUD Dr. Soetomo Surabaya in the period January 2017 to December 2022 consists of griseofulvin and ketoconazole while topical therapy given consists of ketoconazole shampoo and 2% ketoconazole cream. In tinea capitis, topical therapy is only an adjunct to systemic therapy. The provision of therapy in patients with tinea capitis is mostly following the 2021 PERDOSKI Clinical Practice Guidelines. [27]

The most frequent systemic therapy given to patients with tinea faciei was griseofulvin (n=19, 73.1%). Topical therapy was also given to patients with tinea faciei, and the most commonly given to patients was 2% ketoconazole cream (n=5, 19.2%). In patients with tinea faciei, the systemic therapy that was mostly given was griseofulvin. The most commonly prescribed systemic therapy is different from that listed in the 2021 PERDOSKI Clinical Practice Guidelines. Although terbinafine, itraconazole, and fluconazole are considered more effective and have better pharmacokinetic profiles, griseofulvin is also effective for dermatophytosis, including tinea faciei. Griseofulvin is likely to be preferred based on drug availability and lower cost compared to newer antifungal drugs such as terbinafine, itraconazole, and fluconazole. Griseofulvin is an effective treatment, it has a higher cost per mycologically cured infection compared to terbinafine and itraconazole. However, griseofulvin remains a viable option due to its availability and established use in clinical practice, particularly in cases where cost is a significant concern for patients or healthcare systems.[30]

The most common systemic therapy given to patients with tinea corporis is also griseofulvin, while the most common topical therapy given is ketoconazole cream. The most common topical therapy given was 2% ketoconazole cream (n=37, 8.7%), followed by 10% urea cream which was given to (n=22, 5.2%). In patients with tinea corporis in the Mycology Division of Dermatology and Venereology Outpatient Unit RSUD Dr. Soetomo Surabaya from January 2017 to December 2022, the topical and systemic therapies most commonly given were alternative therapies. The drug that is the main choice based on 2021 PERDOSKI Clinical Practice Guidelines, namely terbinafin, is a newer drug with a broader spectrum and can be given in a shorter treatment duration. However, it is more expensive than griseofulvin so it is less of an option at RSUD Dr. Soetomo Surabaya.

Griseofulvin is classified as a fungistatic agent, meaning it inhibits the growth and reproduction of fungi rather than killing them outright. This mechanism is particularly effective against dermatophytes that cause tinea infections, including *Trichophyton*, *Microsporum*, and *Epidermophyton* species. [28] Griseofulvin also has extensive experience contributes to its continued use in practice, as clinicians are familiar with its dosing regimens and potential side effects.[33] Griseofulvin is generally well-tolerated, with mild side effects such as gastrointestinal upset or headache being the most common. While resistance to antifungal medications is a growing concern, griseofulvin has not seen

the same level of resistance development as some other antifungals like terbinafine in certain populations. [28]

The most common systemic therapy given to patients with tinea cruris is the same as most other tinea, which is griseofulvin. A total of 300 tinea cruris patients (77.7% of all tinea cruris patients) received griseofulvin therapy. The most common topical therapy was ketoconazole 2% cream, which was given to 49 patients (12.7%). In patients with tinea cruris, several types of therapy were different from the Clinical Practice Guidelines, namely 2% ketoconazole shampoo, 10% urea cream, and sodium fusidate. Urea cream is used to moisturize dry skin and reduce irritation, possibly given in tinea cruris in cases of dry, scaly skin, or hyperkeratosis in the area of tinea cruris infection. Sodium fusidate is a topical antibiotic used for bacterial infections, can be given if there is secondary infection due to bacteria in the tinea cruris area.

The most common therapy given to patients with tinea pedis is systemic therapy in the form of griseofulvin (n=6, 35.3%), followed by ketoconazole (n=4, 23.5%). The most common topical therapy given was 10% urea cream (n=3, 17.6%). Most systemic and topical therapies given to patients with tinea pedis are following the 2021 PERDOSKI clinical practice guidelines.

In patients with tinea manuum, systemic therapy of griseofulvin and itraconazole was given, as well as topical therapy of 2% ketoconazole cream. The most commonly given systemic therapy is different from the 2021 PERDOSKI Clinical Practice Guidelines, namely the griseofulvin tablets. The choice of griseofulvin rather than terbinafine tablets is also likely based on considerations of drug availability and cost while maintaining treatment effectivity.

Different from other tinea, the most common systemic therapy given to tinea unguium was itraconazole (n=9, 37.5%). The most common topical therapy given was 10% urea cream (n=5, 20.8%). Based on the 2017 PERDOSKI Clinical Practice Guidelines, the preferred therapy for tinea unguium is terbinafine tablets and alternative therapy is itraconazole tablets. In patients with tinea unguium, the systemic therapy given was in accordance with the 2017 PERDOSKI PPK. In tinea unguium, urea cream is not directly given to treat fungal infections, but as a supporting therapy to soften hard nails due to infection. Thus, it will facilitate the penetration of antifungal drugs into the infected nail area.

STRENGTH AND LIMITATION

The strength of this study was comprehensive data collection over six years, providing a solid foundation for understanding dermatophytosis trends and patterns. It also examined a wide range of variables, such as demographics, clinical characteristics, diagnostic findings, and treatments, offering a holistic perspective on the disease. Furthermore, the study assessed adherence to Clinical Practice Guidelines, ensuring the therapies followed established standards of care.

The limitation of this study was eliance on medical records may introduce information bias or missing data, which affect the accuracy of the findings. The lack of results of fungal culture during the years 2018-2022 narrows potential identification of etiological agents and their resistance patterns over this period. Apart from being a single-center study, the findings may also not be generalizable in other settings or regions in the healthcare system. Lastly, the study did not evaluate treatment outcomes or rates of recurrence, which would be important in determining long-term effectiveness of the therapies.

CONCLUSIONS

Tinea corporis and tinea cruris was the most common, while tinea manuum is the least common dermatophytosis. Female adults were the most affected group. Common clinical features for each type included alopecia for tinea capitis, erythematous macules for other types, and nail dystrophy for tinea unguium. *Trichophyton mentagrophytes* was the commonest pathogen in 2017. Most of the therapies followed Clinical Practice Guidelines with extensive use of griseofulvin and ketoconazole cream. Further research should explore therapeutic outcomes, preventive measures, and factors influencing recurrence and adherence to treatment.

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CONFLICT OF INTEREST

All authors have no conflict of interest

AUTHOR CONTRIBUTION

All authors have contributed to all processes in this research, including preparation, data gathering and analysis, drafting, and approval for publication of this manuscript.

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