



The Complication of Tinea Pedis to Onychomycosis On Disposal Officer

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ABSTRACT

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The most prevalent form of infection is superficial dermatomycosis, which affects 20-25% of the global population. Tinea pedis can induce onychomycosis and has been linked to it in 30 to 50 percent of cases. The investigation aimed to determine the relationship between Tinea pedis and onychomycosis in scavengers. A cross-sectional research methodology was employed for the analysis. Official scavengers from the Sukawinatan landfill in Palembang comprised the sample. The sampling methodology utilized a consecutive sampling technique for as many as 70 respondents. This study collected data from interviews, microscopic examination of skin scrapings, and fungal culture. Thirty-one respondents (44.3%) were found to have tinea pedis, while 39 respondents (55.7%) did not have tinea pedis. Seventy-eight percent of respondents had onychomycosis, while twenty-one percent did not. Onychomycosis and tinea pedis are closely related. The 95% confidence interval for the odds ratio of the Chi-Square test was 0.309. Onychomycosis is 0.309% more probable in patients with tinea pedis. In conclusion, a significant correlation existed between tinea pedis and onychomycosis in the disposal officer. Tinea pedis can be prevented and treated due to scavengers living close to the garbage and their poor personal hygiene.

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INTRODUCTION

Superficial dermatomycosis is the most common type of infection, which affects 20-25% of the world's population¹. The leading cause of superficial dermatomycosis is dermatophytes². Dermatophytes are a group of fungi that invade the skin's stratum corneum. Tinea pedis is present worldwide as the most common dermatophytosis. Tinea pedis infects about 10% of the world's population³. Tinea pedis can infect the heel area, between the toes and the soles of the feet. Tinea pedis infection can spread to other areas, including nails which can be a source of infection in other places.

The final Disposal Site (TPA) has become a source of livelihood for scavengers. The scavengers' work environment, which is directly in contact with garbage, can cause dermatophytes. Skin infection is one of the 6th ranked diseases suffered by scavengers at Sukawinatan TPA. One is a skin infection between the toes and soles of the feet caused by a fungus or Tinea Pedis or ringworm of the foot⁴. Tinea pedis can cause onychomycosis⁵ and has been associated with onychomycosis in 30 to 50% of cases. Fungal infections of the feet can be more widespread. The feet are a reservoir of fungi from which the fungus can spread to other sites. The study aimed to determine the relationship between Tinea pedis and the occurrence of onychomycosis on the Disposal officer.

METHODS

The cross-sectional analytic observational studied from October 2022 to January 2023. The research took place at Sukawinatan's final disposal field in Palembang City. The population of this study was respondents suspected of having Tinea Pedis and Onychomycosis. Permission clearance number obtained from the *Dinas Lingkungan Hidup dan Kebersihan*, 070/053/DLHK/2022. The number of samples used was 70 respondents according to the inclusion and exclusion criteria. Ethical clearance number obtained from the Faculty of Medicine Universitas Muhammadiyah Palembang, 015/EC/KBHKI/FK-UMP/XI/2022.



Figure 1. The skin scraping was performed in the scavenger's house. seventy specimens were prepared with KOH 20% before being confirmed with microscopical examination



Figure 2. Fungal culture was carried out at the Microbiology Laboratory. Over 70 specimens, only six can be cultured using the Media Sabouraud Dextrose Agar (SDA)

The inclusion criteria are official scavengers at Sukawinatan's TPA, residents of the work area, and willing to participate in the research by signing informed consent. The exclusion criteria were respondents who did not complete the questionnaire and received treatment in topical antifungals in the last week and oral antifungals in the last month; and a history of allergic contact dermatitis.

In this study, data were obtained using a questionnaire distributed to respondents. The Chi-Square test was carried out on each variable, significantly when a p-value ≤ 0.05 .

The univariate data obtained is primary data obtained through filling out a questionnaire. The bivariate analysis carried out aims to determine the relationship between the occurrence of Tinea Pedis and Onychomycosis in scavengers. The Chi-Square test was carried out on each variable, significantly when a p-value ≤ 0.05 . The sampling method was carried out using the consecutive sampling method. Media Sabouraud Dextrose Agar (SDA) was used on the microscopic examination to culture the specimen. The skin scraping was performed in the scavenger's house (figure 1), and further fungal culture was carried out at the Microbiology Laboratory, Faculty of Medicine, University of Muhammadiyah Palembang (figure 2).

RESULTS

Table 1. Characteristics of respondents, based on gender, age, education, Tinea pedis, and Onychomycosis incidence (n=70)

Variable	Number	Percentage (%)
Gender		
Men	40	58
Women	30	43
Age (in years)		
17-26	18	25,8
27-36	16	11,2
37-46	16	11,2
47-66	20	14
Education		
Elementary School/MI	29	20
Junior High School/MTS	24	17
Senior High/SMK/MA	7	5
Uneducated	10	7
Tinea Pedis		
Positive	31	44,3
Negative	39	55,7
Onychomycosis		
Positive	55	44,3
Negative	15	55,7

Table 2. The relationship between Tinea pedis and the occurrence of onychomycosis

Variable	Onychomycosis (+)		Onychomycosis (-)		P	CI		CR
	N	%	N	%		Lower	Upper	
Tinea Pedis (+)	21	38,2	34	61,8	0.49	0.093	1.029	0.309
Tinea Pedis (-)	10	66,7	5	33,3				

The number of male respondents was 40 (57.15%), and the number of female respondents was 30 (42.9%). Twenty-five percent of the respondents were between the ages of 17 and 26. There were 16 respondents aged 37-46 years among those aged 27-36 (11.2%). Sixteen respondents (11.2%) and 20 respondents aged 47-66 years comprised 14% of the sample. This study's

participants ranged in age from 47 to 66 years old, with as many as 20 participants (14%). Nail and epidermis fungal infections are more prevalent in adults. It is known that the respondent's last level of education was at the SD/MI level at most, namely 29 individuals or twenty percent. At the SMP/MTS level, 24 individuals (17%) were present. At the SMA/SMK/MA level, at least seven individuals (5%) and ten individuals (7%) are not in school. Due to the respondents' low socioeconomic status, most scavengers have an SD/MI level of education. There were 31 respondents (44.3%) who tested positive for tinea pedis and 39 (55.7%) who did not. Fifty-five respondents (78.5%) tested positive for onychomycosis, while 15 respondents (21%) tested negative (see Table 1).

Table 2 shows that 21 respondents (38%) had onychomycosis and *Tinea pedis*, and ten respondents (67%) did not have tinea pedis. Respondents without onychomycosis but experiencing tinea pedis were 34 respondents (62%) and those who did not experience Tinea. *Tinea pedis* had five respondents (33%). The Chi-Square test results show a p-value of 0.05 ($p = 0.001$). Onychomycosis and tinea pedis are strongly linked. The Chi-Square test yielded an Odds Ratio (95%=CI) of 0.309. This means that the Tinea pedis tends to 0.309 times greater to experience onychomycosis.

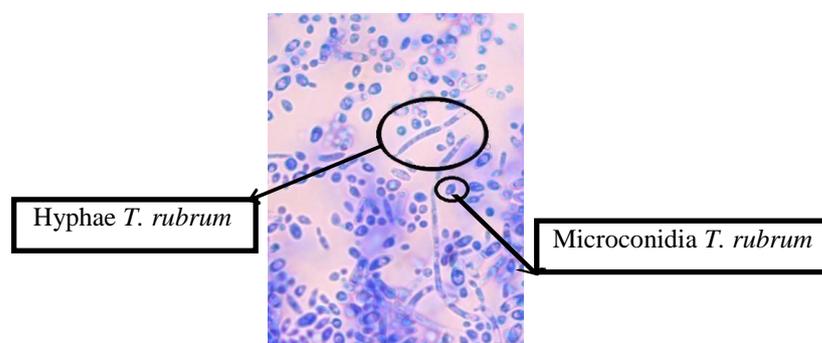


Figure 3. Microscopic results of *Trichopyhton rubrum*: hyphae and microconidia (100x magnification).

Figure 3 showed that the microscopic examination hyphae with branches belonging to *Trichopyhton rubrum* have small, thin-walled, and oval-shaped microconidia. Six respondents who were positive for tinea pedis and had their skin taken for culture were all positive. In contrast, no positive fungal culture was detected from respondents for onychomycosis.

DISCUSSION

Nails, hands, and feet require special attention to prevent infection. Injuries to the skin cause pain and significantly interfere with the respondent's ability to walk and support the weight. According to Noviadi,⁴ the hand is a limb from the wrist to the fingertips. Regular nails appear transparent, smooth, and convex, with a pink nail bed and a translucent white tip. Diseases can

change the shape, thickness, and curvature of the nails. Nails are dermal appendages that contain a horny layer found on the tips of the fingers and toes. The function of the nails is to protect the fingertips, to help the fingers hold, as a cosmetic.⁴ Germs can be transmitted through dirty hands, nails, and feet. Germs and worm eggs in dirty hands or fingernails are also swallowed and enter the body. Therefore, hands, nails, and feet must be kept clean.

Tinea corporis and *Tinea cruris* are examples of dermatophytosis, a fungal disease of tissues with horny substances⁶. The diagnosis is based on history, clinical picture, positive direct examination results, and culture. Treatment of this disease includes the administration of topical or systemic drugs. *Microsporum* infects hair and skin. *Trichophyton* attacks hair, skin, and nails. *Epidermophyton* affects the skin and rarely the nails.⁵ *Trichophyton rubrum* usually has teardrop-shaped microconidia along the sides of the hyphae. In some strains, these microconidia may be numerous. Microconidia are the most abundant spore form. Smooth-walled, pencil-shaped microconidia with blunt ends are usually rare. The use of different types of seeding is sometimes necessary to differentiate species. Microscopically, *Trichophyton rubrum* strains are smooth or granular. *Trichophyton rubrum* strains can be distinguished microscopically into smooth and granular types.⁷ Scavengers in this study acquire *Tinea pedis* or water lice. Scavengers' daily hygiene is linked to this.

Tinea pedis dermatophyte infections of the feet and toes, while onychomycosis is a fungal infection of the nail plates or beds. A history of fungal infections of the feet increases the risk of onychomycosis⁸, especially if left untreated or inappropriately treated. *Tinea pedis* can cause onychomycosis and has been associated with onychomycosis in 30-59% of cases. Fungal infections of the feet can become more widespread; the feet are a reservoir of fungus from where the fungus can spread to other places. The disease is often transmitted by autoinoculation, causing additional conditions such as *tinea manum*, *tinea inguinalis*, and *Tinea unguium*.⁹ *Tinea pedis* is the most common dermatophytosis. The most common causes are *Trichophyton rubrum*, *Trichophyton mentagrophytes*, and *Epidermophyton floccosum*. This group of fungi attacks the parts of the body that contain keratin, such as hair, skin, and nail infections. *Trichophyton rubrum* on culture will form velvety white colonies covered by aerial mycelium, giving a burgundy pigment seen from the reverse.¹⁰ Onychomycosis is a fungal infection of the toes or fingernails caused by dermatophytes, candida, and others. From the health and work safety perspective, scavenger work is at high risk of contracting various diseases due to a conducive and dirty working environment. Also, poor nutritional intake makes it easier for scavengers to contract infections such as coughs, colds, itching, diarrhea, and others.¹¹

The limitation of the research is the bias of respondents. The number of participants was only 70, still not enough to describe the factual conclusion. The research object is only focused on

scavengers living in one TPA Sukawinatan, where future research should also be carried out at other TPA to increase the number of respondents. In collecting respondent data, the researcher must explain the questionnaire more, thus obtaining more questionnaires while many respondents were unwilling because their working hours were used up during the interview.

CONCLUSION

There were 40 male and 30 female respondents at TPA Sukawinatan, Palembang City. Fungal culture results from six respondents with positive onychomycosis revealed *Tricopython rubrum*. 44% were infected with tinea pedis, and 78% were onychomycosis, suggesting a significant relationship between tinea pedis and the occurrence of onychomycosis in scavengers. The emergence of tinea pedis is due to the daily life of scavengers who live side by side with garbage and the lack of concern for personal hygiene which is not optimal, can be prevented and treated.

REFERENCES

1. Havlickova B, Czaika VA, Friedrich M. Epidemiological trends in skin mycoses worldwide. *Mycoses*. 2008;51(4):2-15. doi:10.1111/j.1439-0507.2008.01668.x
2. Ilkit M, Durdu M. Tinea pedis: the etiology and global epidemiology of a common fungal infection. *Crit Rev Microbiol*. 2015;41(3):374-388.
3. Noble SL, Forbes RC, Stamm PL. Diagnosis and management of common tinea infections. *Am Fam Physician*. 1998;58(1):163.
4. Noviadi P, Yolanda Siregar T, Shalila May Pratiwi W, Listriana L. Skin Health Disorders on Scavengers and Their Causative Factors At Sukawinatan Landfill of Palembang City. *J Kesehat Poltekkes Palembang*. 2021;16(2):111-118. doi:10.36086/jpp.v16i1.489
5. Sahoo A, Mahajan R. Management of tinea corporis, tinea cruris, and tinea pedis: A comprehensive review. *Indian Dermatol Online J*. 2016;7(2):77. doi:10.4103/2229-5178.178099
6. Leung AKC, Lam JM, Leong KF, Hon KL. Tinea corporis: an updated review. *Drugs Context*. 2020;9.
7. Artha D, Oktasaputri L. Identifikasi Jamur Dermatofita Pada Infeksi Tinea Unguium Kuku Kaki Petugas Kebersihan Di Daerah Sekitar Jalan Abd.Kadir Kota Makassar. *J Media Laboran*. 2020;10:43-47.
8. Sigurgeirsson B, Steingrimsson O. Risk factors associated with onychomycosis. *J Eur Acad Dermatology Venereol*. 2004;18(1):48-51.
9. Sitepu EH, Muis K, Putra IB. Dermatophytes and bacterial superinfections in tinea pedis patients at Haji Adam Malik Central Hospital, Medan-Indonesia. *Bali Med J*. 2018;7(2):452-456.
10. Anwar AND. Manfaat Daun Ketepeng Cina (Cassia alata L.) sebagai Antifungi pada Tinea Pedis Benefits Ketepeng Cina (Cassia alata L.) as an Antifungal on Tinea Pedis. *J Agromedicine Unila*. 2015;2(4):385-388.
11. Sari IK, Azrin M, Suyanto S. Gambaran Pengetahuan Pemulung Terhadap Aspek Kesehatan Keselamatan Kerja (K3) Dalam Pengelolaan Sampah Di Tempat Pembuangan Sementara (TPS) Kota Pekanbaru. *Jom*. 2016;3(1):1-10.