e-ISSN: 2988-781X
p-ISSN: 2345-6789

Journal of Medical Studies

Original research article DOI: 10.22437/joms.v5i2.40683

Relationship Between the Use of Boots and the Incidence of Tinea Pedis in Motor Vehicle Wash Employees in Jambi City

Fitra Husni Mubarak Hasibuan[1], Hanina[2], Wahyu Indah Dewi Aurora[3], Lipinwati[2], Citra Maharani[4]

[1]Bachelor of Medicine Program, Faculty of Medicine and Health Sciences, Universitas Jambi
[2]Department of Microbiology & Parasitology, Faculty of Medicine and Health Sciences, Universitas Jambi
[3]Department of Public Health and Family Medicine, Faculty of Medicine and Health Sciences, Universitas Jambi
[4]Department of Biochemistry and Medical Biology, Faculty of Medicine and Health Sciences, Universitas Jambi
*Correspondence: fitrahusni18@gmail.com

Received: August 1, 2025/ Revised: August 4, 2025/ Accepted: December 4, 2025/ Published online: December 5, 2025

ABSTRACT

Background: Tinea pedis is a fungal infection of the skin of the feet characterised by peeling skin, itching and watery skin. Risk factors for this disease include working in wet environments and wearing closed-toe shoes for extended periods, as seen among motor vehicle wash service workers. The purpose of this study was to examine the association between the use of boots and the incidence of tinea pedis among motor vehicle wash employees in Jambi City. **Objective:** This study aims to determine the relationship between the use of boots and the incidence of tinea pedis in motorbike wash employees in Jambi City. Methods: This quantitative analytical research type uses a cross-sectional method. The research sample comprised motor-vehicle wash employees in Jambi City. Cluster sampling was used; researchers selected groups within each sub-district of Jambi City according to the research criteria, yielding 96 samples. Data were obtained using questionnaires, physical examinations and KOH examinations. The data obtained were then processed using SPSS. **Results:** In this study, it was found that there was a significant relationship between the length of work and the incidence of tinea pedis, the length of use of boots and the incidence of tinea pedis and foot hygiene and the incidence of tinea pedis. Representatively, p-value less than 0.005 (p=0.016) (p=0.000) (p=0.000). **Conclusion:** The longer a person works in a humid place, the longer they wear boots, and the worse their foot hygiene, the greater the risk of getting tinea pedis

Keywords: tinea pedis, length of work, length of use, foot hygiene

INTRODUCTION

In recent years, the incidence of infectious diseases has increased and become a global concern. [1,2] Tinea pedis or athlete's foot is a superficial fungal infection of the skin of the feet caused by dermatophytes. The most common dermatophytes are *Trichophyton rubrum, Trichophyton mentagrophytes, and Epidermophyton floccosum*.[3] Tinea pedis

usually presents with a common appearance and symptoms. Among other things, it appears as flaky skin accompanied by itching, is watery, and often has an odour.[4]

The estimated global prevalence of tinea pedis is around 10%.[5] In Indonesia, dermatophytosis ranks second after tinea versicolor, accounting for 52%, with the majority of cases occurring in tinea pedis and tinea cruris. Its prevalence during 2010-2014 was 65% and has continued to increase since then. In addition, based on 2020 data from the Jambi City Health Office, the prevalence of tinea pedis across all Puskesmas in Jambi City was 227 cases. Tinea pedis is often associated with occupational exposure and is therefore referred to as occupational dermatophytosis.[6]

Age is a risk factor for many diseases.[7] Even in tinea pedis, the disease is also age-related. The peak incidence occurs in individuals of productive age, between 16 and 45 years, during which they are actively engaged in activities. This condition is more common in tropical countries such as Indonesia.[8] In addition, prevalence varies by occupation. People who work in wet environments, such as car wash service providers, farmers, and garbage collectors, or who wear closed-toe shoes every day, are at increased risk of tinea pedis.[6]

Shoes come in various types and models tailored to their intended use. Field workers, such as motor-vehicle wash workers, typically wear leather boots with metal-coated uppers and thick, strong rubber soles. These are used as personal protective equipment to enhance worker safety, particularly for the feet.[9]

Motor vehicle wash service workers typically wear boots to protect their feet from hazards such as sharp objects and chemicals. But prolonged use of boots, especially in humid conditions, is a risk factor for tinea pedis.[4] Thus, it is not uncommon for boots intended to enhance worker safety to cause health problems, including fungal infections such as tinea pedis.

Given the high incidence of tinea pedis and the limited research on the association between footwear use and tinea pedis, particularly in Jambi City, further research is warranted. Therefore, based on the description above, the researcher intends to research “The Relationship between the Use of Boots and the Incidence of Tinea pedis in Motor Vehicle Washing Employees in Jambi City”.

METHODS

This study employs quantitative analysis using a cross-sectional method. The research sample was drawn using cluster sampling, whereby the researcher selects a group (cluster) in each region that matches the research criteria. The research was conducted at motorised-vehicle washing facilities in Jambi City, specifically in 11 sub-districts, with data collection conducted from September to

November 2024. The study population comprised motor-vehicle wash workers in the Jambi City area. The sample in this study was calculated using the lemeshow formula with an unknown N value. Inclusion criteria for this study were workers at a car wash in Jambi City aged 16-45 years, employed in the washing department, and permanent employees. Exclusion criteria in this study were using immunosuppressant drugs, having a history of HIV disease, having a history of diabetes mellitus, and not wearing boots while working.[10,11]

RESULTS

The study identified 103 respondents who met the inclusion criteria; however, 7 respondents met the exclusion criteria. Therefore, a total of 96 respondents were included in the final analysis (**Table 1**).

Table 1. Distribution of respondent characteristics (n = 96)

Variables	n	%
Age (years)		
16-25	51	53.1
26-35	26	27.1
36-45	19	19.8
Sex		
Male	96	100
Female	0	0
Tinea pedis		
Yes	22	23
No	74	77
Length of work		
Short	64	67
Long	32	33
Duration of boot use		
Short	73	76
Long	23	24
Foot hygiene		
Poor	31	32
Good	65	68

A total of 96 respondents were included in the study. Most respondents were aged 16–25 years (51 participants, 53.1%), followed by those aged 26–35 years (26 participants, 27.1%) and 36–45 years (19 participants, 19.8%). All respondents were male (96 participants, 100%).

Regarding clinical and occupational characteristics, tinea pedis was identified in 22 respondents (23%), while 74 respondents (77%) did not have tinea pedis. Most respondents had a short work length (64 participants, 67%), whereas 32 respondents (33%) had a long work length. Similarly, the majority reported short boot use (73 participants, 76%), whereas 23 respondents (24%) reported long-term boot use.

Regarding foot hygiene, most respondents (65; 68%) had good foot

hygiene, whereas 31 (32%) had poor foot hygiene.

Table 2. Association between length of work and tinea pedis

Length of work	*Tinea pedis*				Total	p value	Prevalence Ratio
	Yes		No				
	n	%	n	%			
Short	10	15.6	54	84.4	64	0.016	3.2
Long	12	37.5	20	62.5	32		

Based on **Table 2**, a total of 32 respondents were classified as having a long length of work, of whom 12 were diagnosed with tinea pedis. Among the 64 respondents with a short length of work, 10 were affected by tinea pedis. The association between length of work and the incidence of tinea pedis was analyzed using the chi-square test. The results showed a statistically significant association between length of work and tinea pedis ($p = 0.016$, $p < 0.05$), indicating that longer work duration is significantly associated with the incidence of tinea pedis among motor vehicle wash workers in Jambi City.

Table 3. Association between duration of boot use and tinea pedis

Duration of boot use	*Tinea pedis*				Total	p value	Prevalence Ratio
	Yes		No				
	n	%	n	%			
Short	10	13.7	63	86.3	73	0.000	6.9
Long	12	52.2	11	47.8	23		

Based on **Table 3**, a total of 23 respondents reported a long duration of boot use, of whom 12 were diagnosed with tinea pedis. Among the 73 respondents with a short duration of boot use, 10 were affected by tinea pedis. The association between duration of boot use and the incidence of tinea pedis was analyzed using the chi-square test. The results showed a statistically significant association between duration of boot use and tinea pedis ($p < 0.001$), indicating that a longer duration of boot use was significantly associated with an increased incidence of tinea pedis among motor vehicle wash workers in Jambi City.

Table 4. Association between foot hygiene and tinea pedis

Foot hygiene	*Tinea pedis*				Total	p value	Prevalence Ratio
	Yes		No				
	n	%	n	%			
Poor	20	64.5	11	35.5	31	0.000	57
Good	2	3.1	63	96.9	65		

Based on **Table 4**, among the 31 respondents with poor foot hygiene, 20 respondents (64.5%) were diagnosed with tinea pedis, while 11 respondents (35.5%) did not have tinea pedis. In contrast, among the 65 respondents with good foot hygiene, only 2 respondents (3.1%) were affected by tinea pedis, whereas 63 respondents (96.9%) did not have the condition. The association between foot hygiene and the incidence of tinea pedis was analyzed using the chi-square test. The results showed a statistically significant association between foot hygiene and tinea pedis ($p < 0.001$), indicating that poor foot hygiene was significantly associated with a higher incidence of tinea pedis among motor vehicle wash workers in Jambi City.

DISCUSSION

This study involved 96 motor vehicle wash employees in Jambi City with ages between 16-45 years. This age group is divided into three groups. The first group, 16-25 years old, had as many as 51 respondents (53.1%). The second group, 26-35 years old, comprised 26 respondents (27.1%), and the third group, 36-45 years old, comprised 19 respondents (19.8%). This is because the incidence of tinea pedis is higher among adolescents and adults than among prepubertal children.[8,12]

Tinea pedis (athlete's foot), also known as athlete's foot, refers to a superficial infection of the skin of the feet.[8,12] The most common sites of skin infection are the spaces between the toes, the soles of the feet, and the lateral aspects of the feet.[8] The primary means of transmission of this disease in humans is contact with infected individuals, animals, objects, and soil.[12,13] In addition, the use of items such as shoes and socks that are not kept clean and are worn for extended periods increases the risk of contracting this disease.[14]

Boots are a type of personal protective equipment (PPE) that protects the employee's feet and lower legs from workplace hazards that may cause accidents and occupational diseases.[15,16] PPE cannot fully protect the body, but it can reduce the risk of injury. The use of rubber boots that cover the entire foot during prolonged use can cause excessive sweating, making the feet and surrounding areas damp and a favourable environment for fungal growth. Long-term use of footwear is a risk factor for tinea pedis.[17]

Broadly speaking, 3 factors drive tinea pedis: predisposing, enabling, and reinforcing.[18] These factors are then broken down into foot conditions while wearing footwear (temperature, humidity, ventilation, heat conduction, footwear design, footwear structure and materials), then human physical factors (concomitant diseases, physiological characteristics and human body structure) and finally, environmental factors outside of footwear (local climate and environment).[14]

The data indicate a relationship between tinea pedis and work duration. The group with the highest incidence of tinea pedis was a group with a long working category, comprising 12 people (54.5%), followed by a group that did not work long, comprising 10 people (45.5%). This is consistent with research by Muhtadin (2019) on fishermen on Panggang Island, Thousand Islands, North Jakarta, who work in closed shoes/boots. Among fishermen who had worked for 3 years, 8 individuals were found to have tinea pedis. His research was then calculated with the chi-square statistical test and obtained a p-value of 0.039. Because the p-value <0.05, it is concluded that there is a significant relationship between tinea pedis and the length of work.[19]

The work environment can affect workers' health. So, the health of the work environment must be considered. Environmental health is a balance between humans and their environment.[20] Factors that can affect workers' health include physical, chemical, and biological agents. The work environment can cause occupational diseases, including occupational dermatophytosis. In general, fungi thrive in humid environments and can adapt to their surroundings. The longer the contact between the environment that is a risk factor for fungal infection and the workers who work there, the higher the risk of infection. This can cause skin inflammation or irritation, resulting in skin disorders. This condition will be exacerbated if workers neglect their personal hygiene.[6,19,21]

Motor vehicle washers are one example of occupations that work with water daily, using closed-toe shoes for extended periods. The scope of their work also extends to hot and humid areas. These are risk factors for fungal infection of the feet (tinea pedis).[6,19]

The data indicate a relationship between tinea pedis and the duration of boot use. The group with the most tinea pedis is the long category, with 12 participants (54.5%), followed by the not long category, with 10 participants (45.5%). This is consistent with Hajar's (2022) research, which found that wearing boots for 7-8 hours (65.2%) was associated with a higher incidence of tinea pedis than wearing them for 5-6 hours (31.8%). This is due to prolonged exposure of boots to water and high temperatures, as well as to sweat and humidity, which promote increased growth and colonisation of tinea pedis.[22]

This is supported by research by Rinto Siregar (2018), which found that wearing shoes for more than 6 hours increases the risk of tinea pedis by 3.4 times compared with wearing boots for ≤ 6 hours. Another study by Muhtadin (2019) reported that wearing boots for> 6 hours/day was associated with tinea pedis 2.5 times more frequently than wearing boots for <6 hours/day.[19] Prolonged shoe wear can cause fungal infections. This can be prevented by minimising the time spent

wearing boots per day, as reinfection can occur when fungal spores survive for extended periods in shoes and socks.[22]

The data indicate a relationship between tinea pedis and foot hygiene. The group most affected by tinea pedis was those with poor foot hygiene, with as many as 20 people (91%), followed by those with good foot hygiene, with as many as 2 people (9%). This is consistent with Hajar's (2022) research on the risk of tinea pedis among oyster seekers in Baitussalam District, which found that poor foot hygiene and the use of poor-quality boots increase the risk of tinea pedis. Poor use of boots includes taking turns wearing them with friends or family; poor foot hygiene (rarely cleaning feet with soap after work, not regularly washing boots, using socks that are not clean and do not absorb sweat when worn, and rarely drying feet and wearing boots for extended periods). These conditions will increase foot moisture and increase fungal colonisation. [22]

Factors that contribute to tinea pedis include prolonged footwear use and wearing unclean socks. These two factors will increase moisture and create foot odour that can stimulate fungal growth. Fungal spores attached to the transmission medium (boots and socks) will adhere to keratin and produce keratinase that will hydrolyse the keratin, causing fungal growth in the stratum corneum. The possibility of infection is also strongly associated with re-exposure. Thus, people who work in boots and are exposed to water daily are at greater risk of infection. Wearing narrow shoes can increase the risk of moisture because the fungus thrives on feet confined in tight shoes. In addition, tight shoes prevent air from circulating freely within the footwear, making the toes feel cramped and hot. The skin of the feet needs air because the feet will produce sweat, so if there is no air coming in, it will make the feet hot and humid, which will facilitate the growth of mould between the toes.[22]

Bad foot hygiene is also a precipitating factor for tinea pedis; infrequent foot cleaning, failure to keep the feet dry, and failure to rub the feet during cleaning increase moisture around the feet, thereby supporting fungal growth. Sartiwi (2018) reports that poor foot hygiene increases the risk of tinea pedis by 4-fold. According to Santriani (2020), many factors can cause Tinea pedis, including personal hygiene, particularly skin, hand, and clothing hygiene.[23]

CONCLUSIONS

Most respondents were young adult males, and nearly one-quarter had tinea pedis. A longer duration of boot use and longer working duration were significantly associated with a higher incidence of tinea pedis. In addition, poor foot hygiene practices increased the risk of tinea pedis among motorbike wash workers in Jambi City.

RECOMMENDATIONS

Future studies should include larger sample sizes to improve the accuracy and generalizability of the findings. In addition, further research should consider incorporating additional variables that may influence the incidence of tinea pedis among motorbike wash workers.

REFERENCE

1. *Hanina, h., humaryanto, h., gading, p. W., aurora, w. I. D. & harahap, h. Peningkatan pengetahuan siswa pondok pesantren nurul iman tentang infeksi staphylococcus aureus di kulit dengan metode penyuluhan. Medical dedication (medic): jurnal pengabdian kepada masyarakat fkik unja 5, 426–430 (2022).*
2. *Baiti, m., elfrida, s. & lipinwati, l. Pengaruh pemberian ekstrak ethanol biji buah pinang (areca catechu l.) Terhadap pertumbuhan staphylococus aureus secara in vitro. Jambi medical journal: jurnal kedokteran dan kesehatan 6, 10–19 (2018).*
3. *Ward, h., parkes, n., smith, c., kluzek, s. & pearson, r. Consensus for the treatment of tinea pedis: a systematic review of randomised controlled trials. Journal of fungi vol. 8 (2022).*
4. *Utami, t. N. Hubungan lama pemakaian sepatu boot dengan keluhan tinea pedis sampah di tempat pembuangan sampah perumnas mandala. (2022).*
5. *Turkistani, o. A. Et al. Epidemiology, evaluation and management of tinea pedis. Int j community med public health 9, 332 (2021).*
6. *Hidayat, r. Hubungan kebersihan diri (personal hygiene) dengan kejadia penyakit dermatofitosis di desa lereng wilayah kerja puskesmas kuok. (2018)*
7. *Hanis, n. F. H. A., mayani, g. & hanina, h. Gambaran perbaikan visus serta komplikasi intraoperasi atau pascaoperasi pada pasien operasi katarak senilis di rsud h. Abdul manap kota jambi periode januari 2021 â€“desember 2021. Journal of medical studies 3, 22–38 (2023).*
8. *Biologi, j., sains dan teknologi, f. & alauddin makassar, u. Review: tinea pedis. Http://journal.uin-alauddin.ac.id/index.php/psb. (2021)*
9. *Basuki, d. A. Teknologi dan produksi sepatu. Citra media, yogyakarta (2013).*
10. *Fadilah, i. Gambaran paru-paru pada pemeriksaan radiografi thorax pasien covid-19 terkonfirmasi di ruang perawatan icu covid-19 dan non-icu covid-19 rsud raden mattaher jambi. Journal of medical studies 4, 105–110 (2024).*
11. *Maharani, c. & puspasari, a. Peran variasi gen fto pada obesitas. (2021)*
12. *Leung, a. K. C., barankin, b., lam, j. M., leong, k. F. & hon, k. L. Tinea pedis: an updated review. Drugs in context vol. 12 preprint at https://doi.org/10.7573/dic.2023-5-1 (2023).*
13. *Humaryanto, h., hanina, h. & tarawifa, s. Identifikasi kasus toksoplasmosis dengan uji aglutinasi latek di puskesmas tahtul yaman. Medical dedication (medic): jurnal pengabdian kepada masyarakat fkik unja 3, 37–40 (2020).*
14. *Sasagawa, y. Internal environment of footwear is a risk factor for tinea pedis. Journal of dermatology 46, 940–946 (2019).*
15. *Aurora, w. I. D. Efek indoor air pollution terhadap kesehatan. Electronic journal scientific of environmental health and disease 2, 32–39 (2021).*
16. *Rini, w. N. E., aurora, w. I. D. & kusmawan, d. Pendekatan structural equation modeling kelelahan kerja pada pekerja perkebunan kelapa sawit. Window of health: jurnal kesehatan 633–641 (2022).*
17. *Arizandy, r., rahmawati, y. T. & sandhi, t. A. N. Analisis faktor risiko tinea pedis pada pengguna sepatu boots. Comphi journal: community medicine and public health of indonesia journal 4, (2023).*

18. *Mayasari, o. P., ikalius, i. & aurora, w. I. D. Faktor-faktor yang berhubungan dengan perilaku masyarakat dalam pencegahan covid-19 di wilayah kerja puskesmas kenali besar kecamatan alam barajo. Medical dedication (medic): jurnal pengabdian kepada masyarakat fkik unja 4, 146–153 (2021).*
19. *Muhtadin, f. & latifah, i. Hubungan tinea pedis dengan lamanya bekerja sebagai nelayan di pulau panggang kepulauan seribu jakarta utara. Jurnal ilmiah kesehatan 10, 103–109 (2019).*
20. *Darmawan, a., maria, i., aurora, w. I. D., kusdiyah, e. & nuriyah, n. Jamban sehat dan penyakit berbasis lingkungan di muara kumpe. Jambi medical journal: jurnal kedokteran dan kesehatan 11, 26–31 (2023).*
21. *Halim, r., wulandari, p. S. & ekaputri, t. W. Identifikasi genus bakteri klebsielladan citrobacter hasil isolasi dari air minum isi ulang kota jambi. Jambi medical journal 418–427 (2022).*
22. *Hajar, s. Risiko tinea pedis akibat pemakaian sepatu boots pada pencari tiram di kecamatan baitussalam. Kedokteran syiah kuala 22, 31–37 (2022).*
23. *Santriani hadi. Faktor yang berhubungan dengan kejadian tinea pedis pada mahasiswa tamta di resimen induk kodam vii wirabuana makassar. Medical journal 5, (2020).*