JMCR | P-ISSN: 3063-4288 | E-ISSN: 3063-2366 | Vol. 1 No. 2 (2024) | OPEN ACCESS
https://doi.org/10.58740/jmcr.v1i2.283

Journal Of
Multidiscipline and Collaboration Research

Identification of Dermatophytes Causing Tinea Unguium in Fisherman in Tanah Lemo Subdistrict

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Article History:
Received: November 06, 2024
Revised: December 10, 2024
Accepted: December 16, 2024
Published: December 18, 2024

Keywords:
Dermatophytes, Fisherman, Nail Infection, Risk Factors, Tinea Unguium

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Abstract: Nail infection or tinea unguium is a disease caused by dermatophyte fungi and often occurs in fisherman due to their activities in wet environments without protection such as gloves or boots. Common symptoms found include nail damage, thickening, nail lifting, uneven broken nails, loss of shine, and discoloration to yellow, brown, or black. This study aims to identify the types of dermatophyte fungi that cause tinea unguium in fisherman in Tanah Lemo Village. This study used a qualitative approach with a fungal culture method using Saboraud Dextrose Agar (SDA) media and microscopic examination using 10% KOH solution. The study population was 115 fisherman, with samples of 25 people taken from their nails through macroscopic and microscopic examination methods. The results showed that a wet and dirty work environment is a major risk factor for fungal infections in fisherman's nails. The implication of this study is the importance of prevention efforts through education on the use of personal protective equipment, such as gloves and boots, to reduce the risk of fungal infections. Additional factors such as the length of exposure to wet environments also affect fungal growth, so better risk management of the work environment is needed.

INTRODUCTION

Dermatophytes are a group of fungi that live and grow on keratinized tissues such as human skin, nails, and hair (Supenah, 2020). Dermatophytosis is a significant global health problem. According to data from the World Health Organization (WHO) in a 2016 study, approximately 20% of the world's population suffers from dermatophytosis, with the most common forms being tinea corporis, tinea cruris, tinea pedis, and onychomycosis. In Asia, the prevalence of this infection reaches 35.6%, while in Indonesia, the figure increases to 65% due to poor personal hygiene (Hidayat, 2018). In the Makassar area, dermatophytosis is the second most common skin disease after dermatitis, with cases at Dr. Wahidin Sudirohusodo Hospital accounting for 69.33% of new cases during the period 2006–2010 (Anita et al., 2020). In Bulukumba Regency, the Health Service recorded 38 cases of dermatophytosis in 2023.

Dermatophytes, as the cause of tinea unguium, have a unique ability to digest keratin, the main protein found in nails, skin, and hair. The infection process begins when fungal spores attach to keratinized tissue and multiply under favorable conditions such as high humidity and warm temperatures. Fishermen in coastal areas often face these conditions

because they work in wet environments with exposure to seawater or wastewater. Previous studies have shown that dermatophyte infections not only reduce the quality of life for affected individuals but can also cause secondary complications, such as bacterial infections, which further worsen their health (Amanah et al., 2018). Therefore, understanding the specific characteristics of fungi that cause tinea unguium is essential for effective treatment.

One common form of dermatophytosis is tinea unguium, or onychomycosis, a fungal infection of the nails. This disease often begins with yellow or white spots under the tips of the fingernails or toenails, which then progress to nail damage such as thickening, nail lifting, uneven cracking, loss of shine, and discoloration to yellow, brown, or black (Amanah et al., 2018). Previous studies have indicated that 80–90% of tinea unguium cases are caused by dermatophytes, particularly Trichophyton rubrum and Trichophyton mentagrophytes, as well as other species such as Epidermophyton and Microsporum (Nurfadila & Hermansyah, 2021). This infection is often associated with wet work environments, poor personal hygiene, and prolonged exposure to high humidity.

Similar studies conducted in various coastal areas have evaluated the relationship between fishing occupations and the risk of fungal infections. For example, a study by Chairani et al. (2022) showed that workers in wet environments have a high prevalence of dermatophytosis, with symptoms varying based on the duration of exposure. The study also found that a lack of awareness regarding personal hygiene, minimal health education, and the absence of personal protective equipment significantly contributed to the high rate of infection. These findings suggest the need for preventive measures and ongoing education in fishing communities to reduce the risk of fungal infections.

Tanah Lemo Village, a coastal area in Bulukumba Regency, is predominantly inhabited by fishermen. Their activities often involve direct contact with water and wet environments without protective equipment such as gloves or boots. This condition increases the risk of dermatophyte nail infections, which are often unnoticed until the infection becomes severe. Based on an initial survey, many fishermen in Tanah Lemo Village neglect personal hygiene, including nail hygiene. Continuous exposure to humidity, the lack of personal protective equipment, and limited health education are the main factors contributing to the high incidence of fungal infections among fishermen.

Previous studies have demonstrated a relationship between personal hygiene and fungal infections. Zara and Yasir (2019) reported that 56% of fishing villages in Tanah Pasir District, North Aceh Regency, experienced dermatophytosis due to poor personal hygiene. Similarly, Wibisono et al. (2018) found that fishermen who maintained good personal hygiene were less likely to experience skin infections than those who did not, with a significance value of $p < 0.05$. These findings underscore the importance of personal hygiene in preventing dermatophytosis, particularly among high-risk populations such as fishermen.

Commonly used fungal identification methods include macroscopic and microscopic examinations. Sabouraud Dextrose Agar (SDA) is used to culture fungi, while a 10% KOH solution is employed to examine fungal spores microscopically. This method has proven effective for diagnosing dermatophyte infections with a high degree of accuracy.

Furthermore, it allows for the identification of fungal species responsible for the infection, aiding in the provision of appropriate treatment.

Based on this background, this study was conducted to identify the types of dermatophyte fungi that cause nail infections (tinea unguium) in fishermen in Tanah Lemo Village. The results are expected to provide scientific information about the fungi most commonly responsible for infections, serving as a foundation for education and prevention strategies. The implications of this study highlight the need for promotive efforts such as health education, the provision of personal protective equipment, and improved management of the work environment to reduce prolonged exposure to humidity.

METHOD

This study employed a qualitative descriptive design with a laboratory approach to identify the types of dermatophytes causing tinea unguium in fishermen in Tanah Lemo Village. The identification process involved fungal culture using Sabouraud Dextrose Agar (SDA) media and microscopic examination with a 10% potassium hydroxide (KOH) solution. The research was conducted at the Microbiology Laboratory of the Panrita Husada Bulukumba Health College Campus from March 19 to July 16, 2024. This laboratory was selected for its facilities, which support accurate fungal culture and microscopic identification processes.

The study population consisted of all fishermen working in Tanah Lemo Village, totaling 115 individuals. A sample of 25 respondents was selected using a purposive sampling technique, based on inclusion criteria: fishermen working in wet environments without personal protective equipment and willing to participate as respondents. Nail clippings were collected as samples for laboratory analysis. Exclusion criteria included fishermen with a history of non-infectious nail diseases or those undergoing antifungal treatment. This sampling method ensured that the study focused on individuals at high risk of developing dermatophyte infections.

Various laboratory equipment was utilized in the study, including nail clippers, petri dishes, autoclaves, droppers, microscopes, aluminum foil, hot plates, incubators, Erlenmeyer flasks, analytical balances, Bunsen burners, and inoculum needles. Materials used included nail clippings as the primary sample, 70% alcohol for sterilization, plastic clip bags for temporary sample storage, distilled water for solution preparation, 10% KOH solution for microscopic examination, SDA media for fungal cultures, chloramphenicol as an antibiotic in the media to prevent bacterial growth, and acetone for cleaning equipment.

The research procedure began with the collection of nail samples using sterile nail clippers. The clippings were stored in labeled plastic bags to avoid contamination. SDA media was prepared by mixing chloramphenicol to inhibit bacterial growth, sterilizing the mixture using an autoclave at 121°C for 15 minutes, and allowing it to cool. Nail clippings were then inoculated into the SDA media using sterile inoculum needles and incubated at 25–30°C for 7–14 days to allow fungal colonies to grow.

Macroscopic observations were conducted to assess the characteristics of the fungal colonies, including color, texture, and shape. For microscopic examination, fungal colonies were transferred onto glass slides using sterile inoculum needles, treated with 10% KOH

solution, and observed under a microscope at 10x and 40x magnifications to identify microscopic structures such as hyphae and conidia.

Data from macroscopic and microscopic observations were analyzed descriptively. The analysis focused on identifying the dermatophyte species responsible for nail infections and their growth characteristics. Results were presented as qualitative descriptions, providing insights into the types of fungi observed and their health implications for fishermen. This approach aims to offer relevant information for the prevention and treatment of dermatophyte infections in coastal environments.

RESULT AND DISCUSSION

This research was conducted in the Microbiology Laboratory of the DIII Health Analyst Program at Panrita Husada Health College, Bulukumba, from April 22 to April 26, 2024. The study aimed to identify the presence of dermatophyte fungi causing nail infections (tinea unguium) in fishermen from Tanah Lemo Village.

The results of macroscopic and microscopic examinations of nail samples collected from fishermen in Tanah Lemo Village, cultured on Sabouraud Dextrose Agar (SDA) media, are presented in the following table.

Table 1. Macroscopic and Microscopic Examination Results

Sample code	Macroscopic Examination Results	Microscopic Examination Results
A	Negative (-)	Negative (-)
B	Negative (-)	Negative (-)
C	Negative (-)	Negative (-)
D	Negative (-)	Negative (-)
E	Positive (+)	*Aspergillus Sp*
F	Negative (-)	Negative (-)
G	Positive (+)	*Aspergillus Sp*
H	Positive (+)	*Aspergillus Sp*
I	Negative (-)	Negative (-)
J	Negative (-)	Negative (-)
K	Positive (+)	Aspergillus Sp
L	Negative (-)	Negative (-)
M	Positive (+)	*Aspergillus Sp*
N	Positive (+)	*Aspergillus Sp*
O	Negative (-)	Negative (-)
P	Negative (-)	Negative (-)
Q	Negative (-)	Negative (-)
R	Negative (-)	Negative (-)
S	Negative (-)	Negative (-)
T	Positive (+)	*Aspergillus Sp*
U	Negative (-)	Negative (-)
V	Positive (+)	*Aspergillus Sp*
W	Negative (-)	Negative (-)
X	Negative (-)	Negative (-)
Y	Negative (-)	Negative (-)

The examination results table presents the distribution of macroscopic and microscopic analysis outcomes for 25 nail samples collected from fishermen in Tanah Lemo Village. Macroscopic examination was conducted to visually observe the growth of

fungal colonies, while microscopic examination aimed to identify fungal structures in the samples using a 10% KOH solution.

Out of the 25 samples tested, 8 samples showed positive results in the macroscopic examination, which were subsequently confirmed through microscopic analysis. All positive samples were identified as Aspergillus sp., a type of fungus capable of growing on keratinized tissue. These positive results were predominantly observed in individuals with a history of working in wet environments without the use of personal protective equipment.

The remaining 17 samples showed negative results in both macroscopic and microscopic examinations, indicating no growth of dermatophyte fungi on the tested nails. These negative findings suggest that not all fishermen working in wet environments are equally susceptible to fungal infections. Factors such as personal hygiene practices and the duration of exposure to humid conditions may play a critical role in determining susceptibility to infection.

Table 2. Characteristics of the Fungi Found

Genus	Macroscopic and microscopic characteristics
Aspergillus Sp	Colonies on the media are dark green, white and black, have a texture resembling flour, round conidia, septate hyphae, and have a fan-like shape.

After conducting research on the identification of dermatophyte fungi causing nail infections (tinea unguium) in fishermen in Tanah Lemo Village, it was found that macroscopic examination of 25 nail samples yielded 17 negative results (68%) and 8 positive results (32%). Microscopic examination of all positive samples revealed the presence of non-dermatophyte fungi, specifically Aspergillus sp.

The results indicated that out of 25 nail samples, 8 (32%) tested positive for dermatophyte fungi, while 17 (68%) were negative. Microscopic examination confirmed that the fungus identified in the positive samples was Aspergillus sp., an opportunistic fungus capable of infecting keratinized tissue, including nails. These findings align with previous research by Amanah et al. (2018), which identified Aspergillus sp. as a common fungus in wet environments, often associated with nail infections in high-risk populations such as coastal workers.

Positive cases were predominantly found in individuals who worked without personal protective equipment, such as gloves or boots, when exposed to wet environments. This condition facilitates fungal growth on damp, unclean nails. Aspergillus sp. has the ability to digest keratin, leading to clinical symptoms of tinea unguium, such as thickened, discolored nails that lift from the nail bed. Research by Zara and Yasir (2019) similarly reported a high prevalence of fungal infections in wet-environment workers with poor personal hygiene practices.

The 17 samples that tested negative in both macroscopic and microscopic examinations suggest that not all fishermen working in wet environments are infected with

fungi. These findings support Wibisono et al. (2018), who noted that factors such as personal hygiene, duration of exposure, and individual health conditions significantly influence infection risk. Fishermen who maintain nail hygiene and use personal protective equipment are less likely to contract fungal infections, even in high-risk environments.

The study emphasizes the importance of combining macroscopic and microscopic examinations for accurately diagnosing fungal infections. The 10% KOH method used in this research effectively identified fungal structures such as hyphae and conidia, which are not visible in macroscopic analysis. This supports Chairani et al. (2022), who noted that combining these diagnostic methods yields more accurate results for fungal infection detection.

The findings highlight the need for community-based interventions to improve fishermen's awareness of nail hygiene and the use of personal protective equipment in wet environments. Improved management of work environments, such as providing cleaning facilities for workers, could further reduce infection risks. This study also opens opportunities for future research to explore additional factors influencing susceptibility to fungal infections, such as age, duration of exposure, and nutritional status. Given the significant prevalence of positive cases, these results could serve as a foundation for developing health education programs and preventive strategies tailored to fishing communities. These efforts could ultimately improve health outcomes and quality of life for fishermen. Further studies are recommended to investigate other potential pathogens contributing to nail infections in coastal environments.

CONCLUSION

This study successfully identified that 32% of 25 nail samples from fishermen in Tanah Lemo Village were infected with non-dermatophyte fungi, specifically Aspergillus sp., as confirmed through microscopic examination. These findings highlight that working in wet and unhygienic environments without personal protective equipment significantly increases the risk of nail infections (tinea unguium) in fishermen. Conversely, the 68% of samples that tested negative underscore the influence of factors such as personal hygiene and duration of exposure, as supported by research from Wibisono et al. (2018) and Chairani et al. (2022). This study makes a meaningful contribution to addressing health challenges in fishing communities by identifying the specific fungi responsible for infections in coastal areas. Unlike previous research, such as Zara and Yasir (2019), which focused broadly on dermatophytosis, this study employed a combination of macroscopic and microscopic culture methods, achieving higher diagnostic accuracy. Additionally, the study uniquely targeted fishermen with distinct occupational and environmental characteristics, providing more targeted and relevant insights for high-risk populations. The findings emphasize the critical need for community-based interventions, including health education programs, to raise awareness about the importance of nail hygiene and the use of personal protective equipment among fishermen. These initiatives could mitigate infection risks and improve overall health outcomes. Furthermore, this study provides a strong foundation for the development of environmental health policies in coastal regions,

such as implementing proper hygiene facilities to reduce fungal infection risks. This study also opens avenues for future research to explore additional factors, including age, nutritional status, and immune conditions, that may contribute to susceptibility to fungal infections. By focusing on the specific characteristics of fungal infections in coastal populations, this research broadens the understanding of fungal pathogens and their impact on at-risk groups. Overall, this study not only corroborates previous findings by Amanah et al. (2018) and Zara and Yasir (2019) but also extends knowledge by offering practical recommendations for preventing and managing fungal infections. The insights gained here are particularly valuable for coastal communities, providing actionable steps to reduce infection prevalence and improve fishermen's quality of life.

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