HEME : Health and Medical Journal
pISSN : 2685 – 2772
eISSN : 2685 – 404x
Available Online at : https://jurnal.unbrah.ac.id/index.php/heme/issue/view/78

Onychomycosis with Green Nail Discoloration in an Immunocompromised Patient: A Case Report

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Abstract

Candida onychomycosis is an infection of the nails of the hands or feet caused by *Candida sp*. Green nail discoloration (GND) is a greenish discoloration of the nail due to bacterial infection, fungal infection or polymicrobial infection. Candida species fungi are fungal pathogens reported to be associated with GND. A 22-year-old female complained of greenish-yellow colored right thumb nail since 3 months ago. The patient has a history of systemic lupus erythematosus (SLE) since 1 year ago. Dermatological status examination of the digiti I manus dexter region showed onychodystrophy, subungual hyperkeratosis and greenish yellow discoloration of the nail plate. Based on the results of history, physical examination and supporting examination, the patient was diagnosed onychomycosis with GND. The diagnosis of onychomycosis can be established by history taking, physical examination and supporting examination in the form of dermoscopy, microscopic nail scraping with 20% KOH, fungal culture and nail biopsy with Periodic Acid-Schiff's (PAS) histochemical painting. Green nail discoloration is one of the clinical manifestations in cases of onychomycosis. *Candida sp.* is reported as one of the fungal pathogens associated with GND. Management of onychomycosis requires a long time and aims to eliminate fungal pathogens and improve nail condition.

Keywords *:* Onychomycosis, systemic lupus erythematosus, immunocompromised, *Candida albicans*

Abstrak

Onikomikosis kandida adalah infeksi kuku tangan atau kaki yang disebabkan oleh Candida sp. Perubahan warna kuku menjadi hijau (GND) adalah perubahan warna kuku menjadi kehijauan akibat infeksi bakteri, infeksi jamur, atau infeksi polimikroba. Jamur spesies kandida merupakan patogen jamur yang dilaporkan berhubungan dengan GND. Seorang perempuan berusia 22 tahun mengeluhkan kuku ibu jari kanan berwarna kuning kehijauan sejak 3 bulan yang lalu. Pasien memiliki riwayat lupus eritematosus sistemik (SLE) sejak 1 tahun yang lalu. Pemeriksaan status dermatologis pada regio digiti I manus dexter menunjukkan onikodistrofi, hiperkeratosis subungual, dan perubahan warna kuku menjadi kuning kehijauan. Berdasarkan hasil anamnesis, pemeriksaan fisik, dan pemeriksaan penunjang, pasien didiagnosis onikomikosis dengan GND. Diagnosis onikomikosis dapat ditegakkan melalui anamnesis, pemeriksaan fisik, dan pemeriksaan penunjang berupa dermoskopi, kerokan kuku mikroskopis dengan KOH 20%, kultur jamur, dan biopsi kuku dengan pewarnaan histokimia Periodic Acid-Schiff (PAS). Perubahan warna kuku menjadi hijau merupakan salah satu manifestasi klinis pada kasus onikomikosis. Candida sp. dilaporkan sebagai salah satu patogen jamur yang terkait dengan GND. Penatalaksanaan onikomikosis membutuhkan waktu yang lama dan bertujuan untuk mengeliminasi patogen jamur serta memperbaiki kondisi kuku.

***Kata kunci** : Onikomikosis, lupus eritematosus sistemik, immunocompromised, Candida albicans*

I. INTRODUCTION

Onychomycosis is a fungal infection of the nails of the hands or feet caused by various pathogens including dermatophytes, non-dermatophytes, and yeasts such as Candida species.[1] Clinical manifestations of onychomycosis include nail discoloration ranging from white or yellow-brown to violaceous, green, and black, along with onychodystrophy, onycholysis, and subungual hyperkeratosis.[2] Green nail discoloration (GND) is a specific clinical presentation characterized by greenish discoloration of the nail plate, which can vary from greenish-yellow and greenish-brown to bluish-green or greenish-black.[3] While traditionally associated with *Pseudomonas aeruginosa* infection, GND has been increasingly reported in cases of fungal infections, particularly those caused by Candida species, which can produce similar pigmentation patterns in the nail plate, a condition sometimes referred to as fungal viridionychia.[4]

Candida species, particularly *C. albicans* and *C. parapsilosis*, are increasingly recognized as primary pathogens in GND, especially in immunocompromised patients. Immunodeficiency exacerbates opportunistic fungal infections, enabling Candida colonization in damaged nails and promoting pigmentation through virulence factors like melanin production and pseudohyphae formation.[5,6] This case report aims to increase knowledge in diagnosing onychomycosis with a picture of green nail discoloration in immunocompromised patients, namely systemic lupus erythematosus (SLE), and provide appropriate management.

II. CASE REPORT

A 22-year-old woman presented with complaints of greenish-yellow colored right thumb nail since 3 months ago. Initially, the nail edge of the nail was yellowish white, then changed color to greenish-yellow, extending to part of the nail. The patient also complained that the nail surface became uneven and painful around the thumb of the right hand. The patient had a history of SLE since 1 year ago and was treated with oral methylprednisolone 4 mg/24 hours and oral cyclosporine 50mg/12 hours.

Nail of digiti I dexter shows onychodystrophy, subungual hyperkeratosis, and yellow-green discoloration of the nail plate (Figure 1). Dermoscopic examination revealed subungual hyperkeratosis, longitudinal striae, and greenish-yellow discoloration of the nail plate (Figure 1). Microscopic examination of nail scrapings with 20% KOH found no hyphae or pseudohyphae, while culture examination of fungal culture with sabouraud dextrose agar found Candida albicans positive with a culture picture in the form of white colonies. Biopsy with PAS histochemical staining, shows positively stained of fungal element structure and round structure and favored yeast in onychomycosis (Figure 2).

The patient was diagnosed with onychomycosis with GND. The management was oral fluconazole 300 single dose per week for 3 months. Liver function evaluation after the 3rd month of treatment was AST 12 u/l and ALT 5 u/l (normal) and repeat fungal culture showed negative nail fungus culture results.

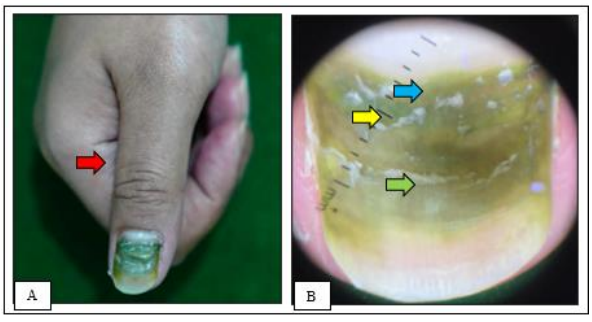

FIGURE 1. DERMATOLOGY STATUS (A) DIGITI I MANUS DEXTER SHOWED ONYCHODYSTROPHY, SUBUNGUAL HYPERKERATOSIS AND GREENISH YELLOW DISCOLORATION OF THE NAIL PLATE (RED ARROW) (B) DERMOSCOPIC EXAMINATION SHOWED SUBUNGUAL HYPERKERATOSIS (YELLOW ARROW), LONGITUDINAL STRIAE (GREEN ARROW) AND GREENISH YELLOW DISCOLORATION (BLUE ARROW).

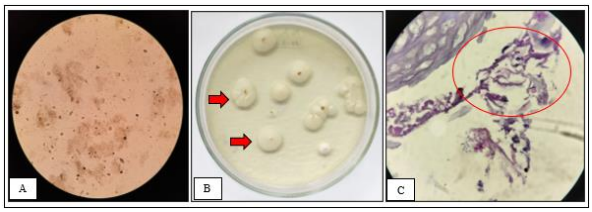

FIGURE 2. (A) MICROSCOPIC EXAMINATION OF NAIL SCRAPINGS WITH 20% KOH FOUND NO HYPHAE OR PSEUDOHYPHAE, (B) CULTURE EXAMINATION OF FUNGAL CULTURE ON SABOURAUD DEXTROSE AGAR TAKEN FROM NAIL PIECES FOUND CANDIDA ALBICANS POSITIVE WITH A CULTURE PICTURE IN THE FORM OF WHITE COLONIES (RED ARROWS), (C) HISTOPATHOLOGICAL EXAMINATION WITH PAS IMMUNOHISTOCHEMICAL PAINTING FOUND FUNGAL ELEMENT STRUCTURE, ROUND STRUCTURE PAINTED POSITIVE AND SUPPORT YEAST IN ONYCHOMYCOSIS (RED CIRCLE).

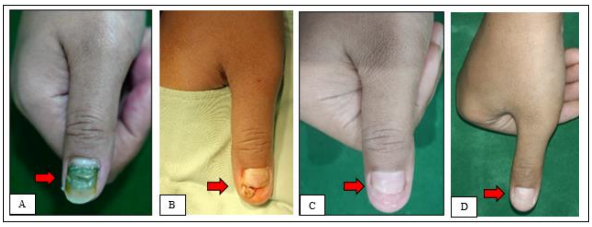

FIGURE 3. (A) CLINICAL FEATURES OF THE PATIENT'S NAILS AT THE FIRST VISIT, (B) FOLLOW-UP OF THE PATIENT IN THE 1ST MONTH AFTER THERAPY, (C) FOLLOW-UP OF THE PATIENT IN THE 2ND MONTH (D) FOLLOW-UP OF THE PATIENT IN THE 3RD MONTH, SHOWS CLINICAL IMPROVEMENT.

This case highlights educational clinical scenario, which the coexistence of GND and *Candida albicans* onychomycosis in an immunocompromised young woman with SLE. The rarity of Candida-induced GND emphasizes the need for heightened clinical suspicion and comprehensive diagnostic evaluation when encountering unusual nail presentations, especially in high-risk populations.

III. DISCUSSION

Green nail discoloration is most commonly caused by the pigment pyocyanin produced by *P. aeruginosa*, but fungal infection with Candida species can also lead to similar greenish nail changes, typically through the interaction of fungal metabolic byproducts with nail keratin and secondary pigments.[7] Epidemiological studies consistently show that GND is more frequently attributed to *P. aeruginosa*, with Candida found as the sole etiological agent in only rare cases of fungal viridionychia.[7] Nevertheless, clinicians should be aware that Candida onychomycosis can independently manifest as GND, particularly in cases where bacterial cultures are negative and fungal organisms are isolated as the exclusive pathogen.[7]

Onychomycosis caused by *Candida sp.* is more common in fingernails than toenails. It affects more immunocompromised patients.[8] Invasion through the proximal edge is more common in patients with immunodeficiency (proximal subungual onychomycosis).[8] In this case, the patient complained of a yellow-green right thumb nail that started at the edge of the nail and then spread to almost the entire nail surface.

Risk factors for onychomycosis include immunosuppression treatment in transplant patients and autoimmune diseases such as SLE and diabetes mellitus.[9] SLE is a chronic autoimmune disease with multisystem involvement, the main complication of which is infection.[10] In SLE, neutrophils have decreased phagocytosis and are hyporesponsive to interleukin-8, CD4+ lymphocytes, and T helper (Th) lymphocytes become dysfunctional. Hypocomplementemia and decreased natural killer cells and naive B lymphocytes also contribute to impaired immune defense in patients with SLE.[10] Defense mechanisms in patients with SLE are also impaired due to glucocorticoid therapy or immunosuppressant treatment. Obesity can also affect an individual's immunity. Excessive adipose tissue in the body inhibits immune function by altering leukocyte counts and cell-mediated immune responses.[4] In this case, onychomycosis occurred in a patient with grade 1 obesity and a history of SLE.

Onychomycosis due to *Candida sp.* can cause onycholysis and paronychia. Gai Ge et al. in 2019 in China reported Candida parapsilosis is a fungal species identified as causing GND.[11] Forouzan et al. in 2021 in America explained the clinical picture of GND has differences in each etiology (Table 1).[7]

TABLE 1. CLINICAL FEATURES OF GND ON EACH UNDERLYING ETIOLOGY.[7]

Etiology	Agent	Clinical Features
Bacteria	*Citrobakter braakii*	Green discoloration of the entire nail plate, distal onycholysis and abscess at the proximal nail fold
	Pseudomonas aeruginosa	Green discoloration of the subungual and distal onycholysis
	Pseudomonas oryzihabitans	Yellow-green discoloration without other symptoms on the nails
Yeast	*Candida albicans*	Yellow-green to bright green discoloration of the nail plate
	Parapsilosis Candida	Blackish-green and or green-brown discoloration with distal nail onycholysis
Combination	*Candida albicans* dan *Pseudomonas aeruginosa*	Nail discoloration to dark green or greenish brown, thickening and hyperkeratosis,
	Candida tropicalis dan *Pseudomonas aeruginosa*	Blue-green discoloration of the distal nail, distal onycholysis with subungual caseous and lateral and longitudinal nail ridges
	Fusarium solahi dan *Pseudomonas aeruginosa*	Green discoloration of half of the nail

The gold standard in diagnosing onychomycosis is fungal culture. The results of the fungal culture examination of this case with sabouraud dextrose agar media taken from nail pieces were positive for *Candida albicans* with a culture picture in the form of white colonies (Figure 2). A histopathological examination took a sample of the infected nail plate using PAS staining and found hyphae, pseudohyphae, spores, and yeast.[12] In this case, the fungal elemental structure as a round structure was stained positively and supportive of onychomycosis caused by yeast. The most common dermoscopic patterns found in onychomycosis are jagged proximal edges with spikes in the area of onycholysis, subungual hyperkeratosis, white to yellow longitudinal striae, leukonychia, chromonychia and discoloration with different colors from white, yellow to greenish or "aurora borealis".[13] This is consistent with this patient's findings of subungual hyperkeratosis, longitudinal striae, yellow-green discoloration in the nail plate on dermoscopic examination.

Combination therapy in onychomycosis with topical agents, periodic debridement, or chemical nail avulsion can provide better results than single treatment with systemic agents.[2] Fluconazole (FLZ) is a fungistatic anti-fungal agent used for topical or systemic treatment of candidiasis. The mycological effectiveness rate for fluconazole is about 48%.[14] A study by Hu Lu et al. in 2021 China and Canada explained that FLZ has potential effects and synergistic targets in treating *C. albicans* infection.[15] Fluconazole can be used in the treatment of candidiasis. Fluconazole inhibits the cytochrome P450 enzyme lanosterol demethylase (14α-demethylase). The dose of oral fluconazole for onychomycosis in children is 3-6 mg/kg once a week, and in adults, 150-300 mg once a week for 6-9 months for fingernails and 12-18 months for toenails.[2] A study by Falotico et al. in 2022 in the US described combined anti-fungal therapy with laser, debridement, and photodynamic therapy as a treatment option in patients with poor prognosis factors or failed monotherapy.[16]

SLE increases susceptibility to nail infections due to immune dysfunction and the use of immunosuppressive medications such as corticosteroids and cyclosporine, both of which weaken immune defenses against fungal pathogens like Candida.[10] In this case, the patient with SLE was taking methylprednisolone and cyclosporine, predisposing her to Candida onychomycosis with green nail discoloration; after three months of once-weekly oral fluconazole therapy, she achieved clinical and mycological cure with normal liver function, highlighting that effective treatment is possible despite underlying immunosuppression

The findings of this case highlight the importance of considering Candida species as causative agents in onychomycosis with green nail discoloration, especially in immunocompromised patients such as those with SLE. Recent studies have shown an increasing trend of Candida onychomycosis, with emerging species and varying antifungal susceptibility profiles, underscoring the need for accurate species identification and antifungal susceptibility testing to guide effective therapy[17]. The presence of green nail discoloration should prompt clinicians to perform comprehensive diagnostic workups, including culture and molecular testing, as the clinical presentation can overlap with bacterial infections such as *P. aeruginosa*.[18] Early and precise diagnosis is crucial for initiating appropriate antifungal therapy, which can prevent chronicity, recurrence, and complications, particularly in patients with underlying immunosuppression.[19,20]

This case report is inherently limited by its single-patient design, restricting the generalizability of findings to broader immunocompromised populations and preventing assessment of long-term outcomes beyond three months of therapy. Nonetheless, it underscores the importance of considering Candida species in green nail discoloration, particularly among patients with systemic lupus erythematosus, and demonstrates that weekly oral fluconazole can be a safe and effective treatment option with rapid clinical and mycological resolution.

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