Bangladesh Med J. 2025 May; 54(2)
DOI: https://doi.org/10.3329/bmj.v54i2.89555

Original Article

Clinical Patterns and Mycological Profile of Onychomycosis in a Tertiary Care Hospital in Dhaka

Dey A[1], Afroz S[2], Roy S[3], Latif SR[4], Malick S[5], Haider SB[6], Acharya D[7]

Abstract

Onychomycosis is a common chronic fungal infection of the nails that significantly affects both physical health and quality of life. Accurate identification of clinical patterns and the fungi responsible is vital for effective treatment and prevention of recurrence. Its clinical presentation and etiological agents vary across geographical regions, necessitating region-specific data to guide diagnosis and management. This cross-sectional study was conducted in the Department of Dermatology and Venereology of a tertiary care hospital in Dhaka. A total of 139 clinically suspected cases of onychomycosis were included. A detailed clinical evaluation was performed to classify the types of onychomycosis. Nail specimens were collected and subjected to direct microscopy using a potassium hydroxide (KOH) mount and fungal culture for confirmation and identification of causative organisms. Data were analyzed using appropriate descriptive statistics and presented as frequencies and percentages. Among the 139 patients, the most common clinical type was distal lateral subungual onychomycosis (DLSO), observed in more than half (51.08%) of cases. Toenail involvement was more frequent (60.43%) than fingernail. The highest proportion of patients (33.81%) belonged to the 21–30 years age group, with a mean age of 45.02 ± 10.89 years, and a female predominance (61.15%). Direct microscopy by KOH mount was positive in nearly half (46.76%) of cases. Fungal culture demonstrated that dermatophytes were the predominant isolates (50.36%), followed by Candida spp. (7.91%). The remaining cases were either non-dermatophyte molds or culture-negative. These findings indicate a predominance of dermatophyte infections in this population, although non-dermatophyte organisms also contribute to the disease burden. Onychomycosis in this tertiary care setting is predominantly characterized by DLSO, toenail involvement, and a higher prevalence among young adults and females, with dermatophytes as the principal etiological agents. The moderate positivity rate of KOH microscopy highlights its utility as a screening tool, while fungal culture remains essential for definitive diagnosis. These findings underscore the importance of combined clinical and mycological evaluation for accurate diagnosis and effective management of onychomycosis.

Keywords: *Onychomycosis; clinical and epidemiological profile; mycological characteristics; dermatophytes; candida species.*

1. *Dr. Aditi Dey, Senior lecturer, Department of Microbiology, Dhaka Community Medical College. email: deyaditi19@gmail.com
2. Dr. Sadia Afroz, Professor, Department of Laboratory Medicine, National Institute of Traumatology and, Orthopaedic Rehabilitation, Dhaka.
3. Dr. Shuvro Roy, Assistant Surgeon, 250 Beded District Hospital, Brahmanbaria
4. Dr. Samah Binte Latif, Assistant Professor(c.c.), Department of Microbiology, Dhaka Community Medical College.
5. Dr. Shatabdi Mallick, Assistant Professor, Department of Microbiology, Khulna Medical College.
6. Dr. Sharmin Binte Haider, Assistant Professor, Department of Microbiology, Rangpur Medical College.
7. Dr. Debjani Acharya, Lecturer, Department of Microbiology, Mugda Medical College.

*For correspondence

INTRODUCTION

Nails are important appendages of the skin that serve both functional and cosmetic roles, contributing to the protection of distal phalanges, fine motor activities, and overall aesthetic appearance.[1] Fungal infections of the nail unit, collectively termed onychomycosis, represent a common clinical problem encountered in dermatological practice.[2] The term "onychomycosis" broadly refers to fungal infection of the nail, whereas more specific terminology may be used depending on the causative organism, such as *tinea unguium* for dermatophyte infections and candidal onychomycosis for infections caused by *Candida* species.[3]

Onychomycosis is classified into several clinical subtypes based on the pattern of nail involvement, including distal lateral subungual onychomycosis (DLSO), proximal subungual onychomycosis (PSO), white superficial onychomycosis (WSO), and total dystrophic onychomycosis (TDO).[4] Among these, DLSO is the most frequently encountered form, characterized by fungal invasion through the hyponychium with subsequent spread along the nail bed and plate.[5] WSO involves superficial layers of the nail plate and typically presents as well-demarcated white patches, while PSO begins at the proximal nail fold and may be associated with immunocompromised states.[5] TDO represents the end-stage of disease, marked by destruction and dystrophy of the nail unit.[5]

The etiology of onychomycosis includes three major groups of fungi: dermatophytes, yeasts, and non-dermatophyte moulds.[11] Dermatophytes are the predominant causative agents, accounting for the majority of cases, particularly those involving toenails. Among these, *Trichophyton rubrum* and *Trichophyton mentagrophytes* are most commonly implicated and responsible for over 90% of infections.[12, 13]

Yeasts, especially *Candida* species, and non-dermatophyte moulds contribute to a smaller but clinically significant proportion of infections.[14, 15] Although these organisms may act as primary pathogens, the occurrence of mixed infections remains difficult to ascertain due to limitations in diagnostic techniques.[16]

Onychomycosis is widely prevalent across populations and geographical regions, with epidemiological patterns influenced by environmental, occupational, and socioeconomic factors.[1, 3, 13] Studies from various regions, including India and Europe, have demonstrated differences in age distribution, gender predominance, and causative organisms.[1, 13, 14] Increasing age, male gender, diabetes mellitus, immunosuppression, peripheral vascular disease, nail trauma, and prolonged exposure to moisture are recognized risk factors that predispose individuals to infection.[2, 12] These factors contribute to alterations in nail integrity and local immunity, facilitating fungal colonization and invasion.

Clinically, onychomycosis typically begins as a discoloration of the nail, often yellowish or whitish, followed by progressive thickening, brittleness, and eventual onycholysis.[7,8] In advanced cases, significant dystrophy of the nail plate may occur, leading to discomfort, pain, and impairment of manual or ambulatory function.[9] Although often considered a benign condition, onychomycosis has important clinical implications, as it may act as a reservoir for recurrent fungal infections of the skin and may complicate underlying systemic conditions.[9] Furthermore, the cosmetic disfigurement associated with nail involvement can lead to considerable psychosocial distress and reduced quality of life.[10]

Accurate diagnosis of onychomycosis is essential for appropriate management, as clinical features alone are insufficient to distinguish fungal infection from other nail disorders reliably.[17] Laboratory confirmation typically involves direct microscopy using potassium hydroxide (KOH) preparation and fungal culture.[7,8] While KOH microscopy provides rapid results and is useful as a screening tool, culture remains the gold standard for identification of the causative organism.[7, 8] However, both methods have inherent limitations, including variability in sensitivity and specificity.[19, 23] Recent advances, such as fluorescent staining and molecular diagnostic techniques, have improved detection rates but are not widely available in resource-limited settings.[21, 24]

The epidemiological and mycological profile of onychomycosis varies significantly between regions, necessitating local studies to guide diagnosis and treatment strategies.[1, 13] In Bangladesh, data on the clinical patterns and etiological agents of onychomycosis remain limited, particularly in tertiary care settings. Understanding the distribution of clinical types and causative organisms is crucial for selecting appropriate antifungal therapy and improving patient outcomes.

Therefore, the present study was conducted to evaluate the clinical patterns and mycological profile of onychomycosis among patients attending a tertiary care hospital in Dhaka, Bangladesh.

MATERIALS AND METHODS

Study design and setting: This was a hospital-based cross-sectional descriptive study conducted over a period of one year, from July 2023 to June 2024, in the Department of Microbiology at Sir Salimullah Medical College (SSMC), Dhaka, Bangladesh. The study was carried out in collaboration with the Outpatient Department of Dermatology and Venereology of the same institution.

Study population: Patients with clinically suspected onychomycosis were included in the study. Clinical diagnosis was based on characteristic nail changes such as discoloration, thickening, dystrophy, and subungual debris.

Inclusion and exclusion criteria: Patients with any clinical variant of onychomycosis were enrolled irrespective of age and sex. Patients were excluded if they had received topical or systemic antifungal therapy within the preceding four weeks, had nail changes attributable to other dermatological conditions (e.g., psoriasis, lichen planus, eczema, or atopic dermatitis), or had nail discoloration due to cosmetic applications or occupational exposure to dyes.

Sample size and sampling technique: A total of 139 clinically suspected cases were included using a purposive sampling technique. All eligible patients during the study period who met the inclusion criteria were enrolled consecutively. A structured questionnaire and a checklist were used as tools for data collection.

Ethical considerations: The study protocol was approved by the Ethical Review Committee of Sir Salimullah Medical College. Written informed consent was obtained from all participants before sample collection, and confidentiality of patient information was strictly maintained.

Specimen collection procedure: After a detailed clinical evaluation, the affected nail area was cleaned with sterile cotton soaked in 70% ethyl alcohol and allowed to dry to minimize contamination. Nail clippings and subungual debris were collected aseptically using sterile nail clippers and scalpels from the most proximal diseased portion of the nail, particularly from the active margin of infection.

Laboratory procedures:

Direct microscopy (KOH mount): A portion of the specimen was placed on a clean glass slide with 20% potassium hydroxide (KOH) solution and covered with a coverslip. The preparation was allowed to stand until keratin digestion occurred. Slides were examined under light microscopy for fungal elements. The presence of septate branching hyphae was considered indicative of dermatophytes, while budding yeast cells with or without pseudohyphae suggested Candida species.

Fungal culture: All specimens were inoculated onto Sabouraud Dextrose Agar (SDA) supplemented with chloramphenicol and cycloheximide to inhibit bacterial and saprophytic fungal growth. The inoculated media were incubated at room temperature (25–27°C) and observed periodically for up to four weeks. Growth was assessed based on colony morphology, pigmentation, and rate of growth.

Identification of fungal isolates:

- **Lactophenol cotton blue (LPCB) staining:** Fungal colonies were examined microscopically using LPCB mounts to identify characteristic structures such as hyphae, macroconidia, and microconidia, and other accessory structures for dermatophytes.
- **Wet mount preparation:** Yeast isolates were examined using saline wet mounts to identify budding yeast cells and pseudohyphae, suggestive of Candida species.

Diagnostic reference standard: Fungal culture was considered the **gold standard** for confirmation of onychomycosis. The diagnostic performance of direct microscopy (KOH mount) was evaluated against culture results.

Outcome measures: The primary outcomes included (1) Clinical patterns of onychomycosis, (2) Distribution of etiological agents (dermatophytes, yeasts, non-dermatophyte moulds), and (3) Diagnostic accuracy of KOH microscopy.

Statistical analysis: Data were entered, cleaned, and analyzed using Microsoft Excel. Descriptive statistics were expressed as frequencies and percentages. Results were presented using tables and graphs where appropriate.

RESUTS

Table I shows the demographic characteristics of the study population. As shown, the majority of patients (33.81%) were between 21 - 30 years of age, followed by the 31 - 40 years (28.06%) and 51 - 60 years (19.42%) age groups. Of the 139 cases of clinical onychomycosis, 61.15% were females and 38.85% were males. Toenails were affected in 84(60. 43%) cases and fingernails were in 55(39.57%) cases.

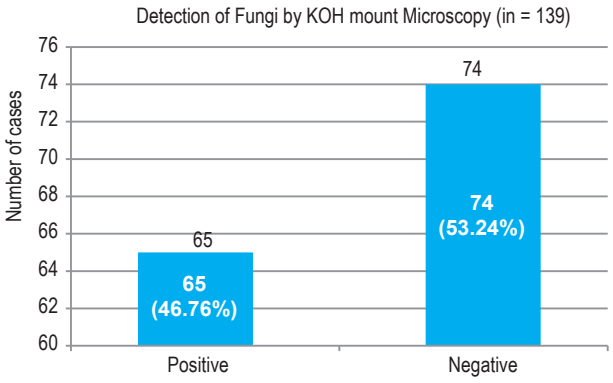
Table I: Demographic characteristics of the study population (n=139)

Variables	Number	Percentage
Age (years)		
1–10	4	2.88
11–20	10	7.19
21–30	47	33.81
31–40	39	28.06
41–50	7	5.04
51–60	27	19.42
>60	5	3.60
Gender		
Male	54	38.85
Female	85	61.15
Affected nails		
Toenails	84	60.43
Fingernails	55	39.57

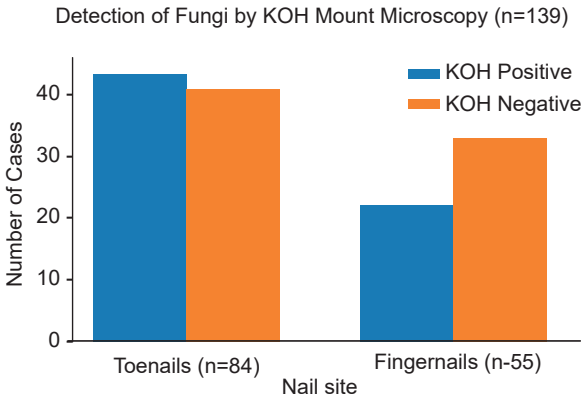
Table II displays the distribution of clinical types of onychomycosis according to affected nail site; among the 84 toenail cases, distolateral subungual onychomycosis (DLSO) was the most common presentation, observed in 57 (80.28%) cases, followed by total dystrophic onychomycosis (TDO) in 14 (93.33%) cases. Among the 55 fingernail cases, proximal subungual onychomycosis (PSO) was the predominant type, occurring in 23(74.19%) cases, while white superficial onychomycosis (WSO) was identified in 17 (77.27%) cases.

Table II: Distribution of clinical types of onychomycosis according to affected nail site (n=139)

Clinical types	Affected sites		Total n (%)
	Toenails n (%)	Fingernails n (%)	
DLSO	57 (80.28)	14 (19.72)	71 (51.08)
PSO	8 (25.81)	23 (74.19)	31 (22.30)
WSO	5 (22.73)	17 (77.27)	22 (15.83)
TDO	14 (93.33)	1 (6.67)	15 (10.79)
Total	84 (60.43)	55 (39.57)	139 (100)



(Figure 1a)



(Figure 1b)

Figure 1: Detection of fungi by KOH mount microscopy among clinically suspected cases of onychomycosis (n = 139).

Figure 1 illustrates the proportion of nail samples that tested positive and negative for fungal elements using KOH mount microscopy. Out of the total 139 specimens examined, 65 (46.76%) showed positive findings for fungal elements, while 74 (53.24%) were negative (Figure 1a). Among the 84 toenail specimens, 43 (51.19%) tested positive, while 22 (40%) of fingernail specimens showed positive findings (Figure 1b).

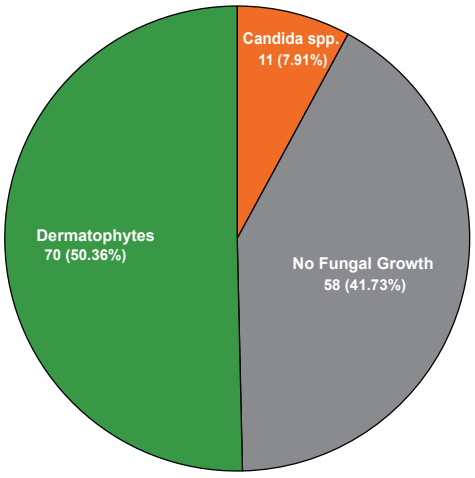


Figure 2: Detection of fungus from isolated nail samples by culture (139)

Figure 2 illustrates the distribution of fungi obtained through culture from clinical nail samples. A comprehensive analysis was conducted on 139 samples; of these, 58 (41.73%) exhibited no fungal growth, whereas fungal growth was observed in 81 (58.27%) cases. Among the 81 fungi identified in the nail samples, dermatophytes were recognized in 70 (50.36%) cases, and Candida spp. were found in 11 (7.91%) cases.

DISCUSSION

Onychomycosis is a chronic and progressively debilitating fungal infection of the nails that poses both clinical and cosmetic concerns, particularly in dermatological practice. The present study provides a comprehensive overview of the clinical patterns and mycological profile of onychomycosis in a tertiary care setting in Dhaka, highlighting important epidemiological and diagnostic insights.

The age distribution, with the highest proportion of cases in the 21–30 years age group (33.81%), is comparable to the findings of Sipra et al.[8] and Devi et al.[1], who reported 47% and 56.6% prevalence in similar age groups, respectively. This consistency suggests that young adults are more frequently affected, possibly due to increased occupational exposure, physical activity, and heightened cosmetic awareness, which may also influence healthcare-seeking behavior. The observed female predominance (61.15%) in this study is in agreement with Elsayed et al.[23], who reported an even higher proportion (82%) of female patients. This gender distribution may be explained by greater exposure to water and detergents during household activities, which can disrupt nail integrity and predispose to fungal infection. Additionally, women may be more likely to seek medical attention for nail disorders due to cosmetic concerns. However, sociocultural factors and healthcare access may also influence this observed pattern.

In this study of 139 clinically suspected cases, distal lateral subungual onychomycosis (DLSO) emerged as the predominant clinical type, accounting for 51.08% of cases. The predominance of DLSO (51.08%) in this study is consistent with findings reported by Makled et al.[21] and Gautam et al.[22], both of whom identified DLSO as the

most common clinical variant of onychomycosis. This pattern reflects the typical pathogenesis of fungal nail infection, where organisms invade the nail bed through the distal or lateral edges, particularly in individuals exposed to environmental and occupational risk factors.

Nail involvement was more frequently observed in the toenails (60.43%) compared to the fingernails (39.57%), indicating a clear predilection for lower extremity involvement. This trend has been attributed to factors such as repeated microtrauma, occlusive footwear, reduced peripheral circulation, and comparatively lower hygiene practices for feet. Additionally, toenails grow more slowly than fingernails, creating a favorable environment for persistent fungal colonization[23]. The higher frequency of toenail involvement (60.43%) compared to fingernails aligns with observations from multiple studies[21, 22]. This trend has been attributed to factors such as repeated microtrauma, occlusive footwear, reduced peripheral circulation, and comparatively lower hygiene practices for feet. Additionally, toenails grow more slowly than fingernails, creating a favorable environment for persistent fungal colonization[23].

Regarding the diagnostic perspective, KOH mount microscopy was positive in 46.76% of cases, while culture analysis revealed that dermatophytes were the predominant pathogens (50.36%), followed by Candida spp. (7.91%). These findings collectively emphasize that both clinical presentation and laboratory confirmation are essential for accurate diagnosis and management. The KOH positivity rate of 46.76% in this study is remarkably similar to that reported by Gautam et al.[22] (46.08%), supporting the reliability of direct microscopy as a rapid and cost-effective screening tool. However, variability in KOH positivity across studies, ranging from 52% (Makled et al.[21]), 57.6% (Haghani et al.[24]), 62.7% (Zhao et al.[25]), to 85.7% (Abdo et al.[26]), highlights differences in sample quality, operator expertise, and disease severity.

Culture findings in the present study revealed that dermatophytes were the predominant etiological agents (50.36%), consistent with Gautam et al.[22], who reported a higher prevalence of 60%. However, Makled et al.[21] documented a comparatively lower rate (31.6%), underscoring the geographical variability in fungal species distribution. The detection of Candida spp. in 7.91% of cases is also comparable to the findings of Husain et al.[16] (10%), suggesting that non-dermatophyte yeasts, although less common, remain clinically relevant pathogens.

This study provides valuable insight into the clinicomycological profile of onychomycosis in a tertiary care hospital in Dhaka, contributing region-specific data that are essential for guiding clinical practice. The combined use of clinical classification, microscopy, and culture enhances the diagnostic robustness of the study.

Limitations

The study was conducted in a single-center setting, which may limit the generalizability of the findings to other regions. The sample size, although adequate, may not fully capture the diversity of fungal pathogens. Additionally, advanced diagnostic techniques such as molecular identification methods were not utilized, which could have improved species-level identification.

CONCLUSION

In summary, this study demonstrates that onychomycosis in this setting is characterized by a predominance of DLSO, toenail involvement, younger age groups, and female patients, with dermatophytes as the leading causative agents. The findings underscore the importance of integrating clinical assessment with laboratory diagnostics to ensure accurate diagnosis and effective management. The higher involvement of toenails and younger adults indicates the need for preventive strategies, including improved foot hygiene, avoidance of prolonged moisture exposure, and education regarding early signs of infection. The observed female predominance further highlights the importance of awareness programs tailored to household and occupational risk exposures. Additionally, the moderate sensitivity of KOH microscopy reinforces its role as a screening tool.

REFERENCES

1. Devi B, Pamei D, Mutum S. Clinico-aetiological profile of onychomycosis at a tertiary care centre in northeast India. J Clin Diagn Res. 2018;12(10): DC10–DC17.
2. Kaur R, Kashyap B, Bhalla P. Onychomycosis: epidemiology, diagnosis and management. Indian J Med Microbiol. 2008;26(2):108–16.
3. Torres-Rodríguez JM, López-Jodra O. Epidemiology of nail infection due to keratinophilic fungi. Rev Iberoam Micol. 2000;17(3):122–35.
4. Lone R, Showkat HI, Bashir D, Khursheed S, Sarmast AH. Clinico-mycological pattern of onychomycosis: a single-center one-year study in Kashmir, North India. Eur J Gen Med. 2013;10(3):150–3.
5. Leung AK, Lam JM, Leong KF, Hon KL, Barankin B, Leung AA, et al. Onychomycosis: an updated review. Recent Pat Inflamm Allergy Drug Discov. 2020;14(1):32–45. doi:10.2174/1872213X13666191028103232
6. Culture in the diagnosis of onychomycosis. Pak J Med

Health Sci. 2012;6(1):143.

7. Bonifaz A, Ríos-Yuil JM, Arenas R, et al. Comparison of direct microscopy, culture and calcofluor white for the diagnosis of onychomycosis. Rev Iberoam Micol. 2013;30(2):109–11.
8. Sipra MW, Jillani ZM. Comparison of microscopy, culture and histopathology in the diagnosis of onychomycosis. Pak J Med Health Sci. 2017;11(1): 57–60.
9. Mashkoor A, Sanjay G, Satish G. A clinico-mycological study of onychomycosis. Egypt Dermatol Online J. 2010;6(1):4.
10. Lubeck DP. Measuring health-related quality of life in onychomycosis. J Am Acad Dermatol. 1998;38(5 Pt 3):S64–8.
11. Niranjan HP, Priyanka NP. Study of onychomycosis at a tertiary care hospital in South India. J Evol Med Dent Sci. 2012;1(5):823–9.
12. Al-Mutairi N, Eassa BI, Al-Rqobah DA. Clinical and mycologic characteristics of onychomycosis in diabetic patients. Acta Dermatovenerol Croat. 2010; 18(2):84–91.
13. Yenisehirli G, Bulut Y, Sezer E, Gunday E. Onychomycosis infections in the Middle Black Sea region, Turkey. Int J Dermatol. 2009;48(9):956–9.
14. Drakensjö IT, Chryssanthou E. Epidemiology of dermatophyte infection in Stockholm, Sweden: a retrospective study from 2005 to 2009. Med Mycol. 2011;49(5):484–8.
15. García-Doval I, Cabo F, Monteagudo B, Álvarez J, Ginarte M, Rodríguez-Alvarez MS, et al. Clinical diagnosis of toenail onychomycosis is possible in some patients: a cross-sectional diagnostic study and development of a diagnostic rule. Br J Dermatol. 2010;163(4):743–51.
16. Husain MA, Alam MN, Joarder Y, Ferdous M. Correlation between clinical and mycological diagnosis of onychomycosis. J Pak Assoc Dermatol. 2017;27(3):220–5.
17. Elewski BE. Onychomycosis: pathogenesis, diagnosis, and management. Clin Microbiol Rev. 1998;11(3):415–29.
18. Forbes BA, Sahm DF, Weissfeld AS. Bailey & Scott's Diagnostic Microbiology. 12th ed. St Louis: Mosby; 2007.
19. Taha M, Saleh HM, Fathy G, Hamed MA. Evaluation of fluorescence microscopy using acridine orange stain versus hematoxylin and eosin stain in the diagnosis of onychomycosis. J Egypt Womens Dermatol Soc. 2017;14(1):66–70.
20. Cheesbrough M. District laboratory practice in tropical countries. Part 2. 2nd ed. Cambridge: Cambridge University Press; 2005.
21. Makled AF, Ghonaim MM, Ali SA, El-Hefnawy SM, Sabal MS, El-Brolosy AM. Comparison of fungal fluorescent staining and ITS rDNA PCR-based sequencing with conventional methods for diagnosis of onychomycosis. J Pure Appl Microbiol. 2022;16(2):1337–49. doi:10.22207/JPAM.16.2.53
22. Gautam M, Shah N, Bhattar P, Nadkarni N, Patil S. Comparative evaluation of potassium hydroxide mount, fungal culture, and histopathology of nail clipping with periodic acid–Schiff stain in the diagnosis of onychomycosis. Indian J Dermatopathol Diagn Dermatol. 2021;8(1):6–12.
23. Elsayed N, Abdelhafiz M. The role of PCR in the diagnosis of dermatophytes in onychomycosis. Mycoses. 2014;57(10):640–6.
24. Haghani I, Shokohi T, Hajheidari Z, Khalilian A, Aghili SR. Comparison of diagnostic methods in the evaluation of onychomycosis. Mycopathologia. 2013;175(3–4):315–21.
25. Zhao Y, Yu Z, Yue X. Evaluating the accuracy and diagnostic value of calcofluor white and fluorescent brightener 85 in fungal infections. J Clin Lab Anal. 2021;35(8):e23934. doi:10.1002/jcla.23934
26. Abdo HM, Abd Elrahem SI. Clinico-mycological study of coexisting toenail onychomycosis and tinea pedis. Gulf J Dermatol Venereol. 2016;23(2):8–19.