

Research Article**Prevalence of Candida species in chronic paronychia among housekeeping staff: Role of occupational exposure****Dr. Puspanjuli Sahu**

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Abstract:

Chronic paronychia represents a complex inflammatory pathology affecting the periungual tissues, commonly triggered by sustained vocational contact with water, cleansing agents, and chronic microtrauma. Cleaning personnel comprise a highly vulnerable worker population due to constant immersion tasks and recurring chemical contact, which facilitate secondary mycotic colonization, specifically involving Candida variants. This investigation sought to establish the frequency and distribution of Candida strains in chronic paronychia among house-keeping workers while assessing vocational exposure variables driving positive fungal cultures.

Materials and Methods: This cross-sectional observational investigation was executed among 120 house-keeping

employees clinically identified with chronic paronychia at a tertiary care training facility over a 12-month period. Detailed demographic, clinical, and vocational backgrounds were captured employing a structured questionnaire. Eponychial scrapings and periungual samples underwent direct microscopic evaluation and mycotic culturing on Sabouraud Dextrose Agar to isolate and identify Candida strains. Relationships linking occupational exposure metrics to positive Candida cultures were evaluated via Chi-square tests, establishing significance at $p < 0.05$.

Results: Within the 120 subjects, positive mycotic cultures yielding Candida strains appeared in 78 instances (65.0%). Candida albicans featured as the primary isolate (53.8%), followed by Candida tropicalis (23.1%) and Candida glabrata (12.8%). Clear

relationships emerged linking *Candida* presence to extended moisture exposure (>5 hours/day; $p = 0.002$), routine chemical/cleanser contact ($p = 0.008$), inconsistent glove adherence ($p = 0.001$), recurrent nail injury ($p = 0.015$), and vocational histories surpassing 10 years ($p = 0.021$).

Conclusion: This investigation revealed an elevated frequency of *Candida* strains within cleaning personnel experiencing chronic paronychia, highlighting the critical impact of vocational contact on pathological development. Prophylactic industrial protocols, prompt mycological screening, and suitable barrier gear could minimize overall condition impacts and persistence among vulnerable employee groups.

Key words: Chronic paronychia; *Candida albicans*; Occupational exposure; Housekeeping staff; Wet work exposure; Non-*albicans Candida*; Fungal colonization; Nail fold inflammation; Occupational dermatoses; Periungual infection.

Introduction:

Chronic paronychia constitutes a prevalent inflammatory disease affecting proximal and lateral eponychial tissues and is characterized clinically by redness, swelling, sensitivity, and gradual nail distortion continuing for longer than six weeks [1,2]. Though

traditionally classified as a contagious pathology induced chiefly by mycotic pathogens, modern data indicate that chronic paronychia reflects a multifaceted inflammatory state stemming from ongoing damage to the protective cuticular seal, with secondary pathogen expansion acting as a significant reinforcing element [2,4]. Within the diverse microflora involved, *Candida* strains continue as the primary recovered fungal pathogens linked to chronic periungual inflammation [3,11].

The development of chronic paronychia remains heavily tied to sustained exposure to humidity, soaps, surfactants, chemical agents, and recurrent minor injuries, which collectively degrade the structural stability of the nail margin and permit pathogen entry [5,10]. Moist environments promote maceration of periungual surfaces and detachment of the eponychium from the nail surface, establishing an ideal niche for proliferation by opportunistic pathogens, specifically *Candida* variants [12]. Vocational segments including housekeeping workers, medical employees, culinary personnel, bartenders, and industrial cleaners face elevated vulnerability owing to regular contact with liquids and irritating chemical preparations [6,7,14].

Cleaning personnel represents a significant but frequently neglected industrial risk cohort regarding chronic paronychia. Their daily tasks demand extended immersion activities, constant hand washing, ongoing contact with industrial soaps and sanitizers, alongside recurring mechanical insults to the periungual structures [14–16]. Additionally, insufficient use of barrier gloves and limited knowledge concerning workplace cutaneous protection can exacerbate vulnerability to ongoing periungual irritation and secondary mycotic infiltration [15,17]. Habitual workplace exposure not only affects workers to chronic irritation and pain but can also cause permanent nail distortion, compromised hand dexterity, decreased job performance, and reduced overall lifestyle quality [8,9].

Multiple investigations performed worldwide demonstrate a clear connection between industrial exposure and chronic paronychia [7,12,16]. Domestic research has likewise documented elevated frequencies of *Candida* strains among individuals subjected to protracted immersion tasks and household cleaning routines [3,10,22]. *Candida albicans* regularly features as the primary isolated organism, though growing frequencies of non-*albicans* *Candida* variants like *Candida tropicalis* and *Candida glabrata* have been

encountered lately [22–25]. This transition in pathogenic distribution carries clinical weight because non-*albicans* strains can display variable antifungal sensitivity patterns and distinct therapeutic outcomes [24,25].

Notwithstanding expanding awareness of vocational chronic paronychia, scarce research examines the frequency and specific strain breakdown of *Candida* among housekeeping personnel within developing territories, particularly across the Indian landscape. Most historical investigations have concentrated broadly on superficial mycotic pathologies or work-related dermatoses without thoroughly examining fungal colonization trends and industrial risk elements among house-keeping employees [9,14]. Furthermore, the impact of extended wet tasks, glove utilization habits, career longevity, and recurring nail injuries on positive *Candida* outcomes remains poorly defined within this specific labor group. Consequently, this investigation was designed to establish the frequency and distribution of *Candida* strains in chronic paronychia among cleaning personnel while determining the impact of workplace exposure variables driving fungal colonization. Documenting the industrial triggers and mycological landscapes of

chronic paronychia can support prompt detection, specific medical therapies, and the deployment of efficient occupational safety protocols for vulnerable personnel.

Materials & methods:

This institutional cross-sectional observational inquiry was executed by the Department of Dermatology alongside the Department of Microbiology at a tertiary care teaching facility across a 12-month timeframe. The research aimed to determine the frequency of Candida strains in chronic paronychia among house-keeping personnel while analyzing the impact of vocational exposure elements driving fungal colonization and condition longevity.

A sample of 120 cleaning employees clinically identified with chronic paronychia participated in this investigation. Subjects were gathered from house-keeping workers operating within hospitals, residential hostels, commercial offices, and institutional cleaning departments connected to the research facility. Chronic paronychia was identified as inflammation affecting the proximal, lateral, or both periungual borders continuing beyond six weeks, manifesting as erythema, swelling, sensitivity, cuticular separation, and diverse levels of structural nail damage.

Inclusion parameters: Subjects meeting the subsequent benchmarks were enrolled in the trial: Cleaning workers aged between 20 and 60 years. Clinical identification of chronic paronychia affecting at least one fingernail. Vocational contact involving immersion tasks, soaps, sanitizers, or continuous manual scrubbing duties for a minimum of six months. Subjects willing to submit signed informed consent documentation.

Exclusion parameters: The subsequent individuals were omitted from the investigation: Subjects presenting with acute paronychia of under six weeks duration. Patients utilizing oral or localized antifungal interventions during the past four weeks. Individuals displaying immunosuppressed states including HIV, oncological conditions, or prolonged systemic steroid use. Patients present with psoriatic nail pathology, lichen planus, traumatic nail damage, or alternate non-infectious nail abnormalities. Individuals refuse to take part in this research.

Ethical protocols: The operational framework underwent evaluation and approval by the Institutional Ethics Committee before study initiation. Signed informed consent was secured from every participant following an explanation of the study targets and protocols in their native

dialect. Complete anonymity of subject details was rigorously guarded throughout the project.

Clinical assessment: Comprehensive demographic and vocational backgrounds were captured employing a pre-established structured questionnaire. Data covering age, gender, career longevity, daily timelines of fluid exposure, frequency of interaction with surfactants and chemical cleansers, glove compliance habits, histories of recurring nail injury, and concurrent conditions like diabetes mellitus were thoroughly documented.

A comprehensive dermatological evaluation of the involved digits and periungual regions was executed under sterile conditions. Clinical presentations encompassing redness, edema, pain, cuticular absence, exudate, nail hyperpigmentation, horizontal ridging, and structural deformity were documented. The total count and precise distribution of involved nails were likewise tracked.

Specimen harvesting: Material collection proceeded following sanitation of the involved nail borders utilizing 70% isopropyl alcohol to mitigate surface contamination. Nail margin exudates, subcuticular remnants, and periungual scrapings were obtained utilizing sterile scalpel implements and collecting swabs from clinically active

margins. For presentations involving active drainage, purulent fluid was captured utilizing sterile cotton applicators. All samples were dispatched instantly to the microbiology facility for diagnostic workup. *Mycological evaluation:* Direct microscopic assessment utilized a 10% potassium hydroxide (KOH) preparation to detect fungal structures including budding blastoconidia and pseudohyphae. Samples were subsequently introduced onto Sabouraud Dextrose Agar (SDA) enriched with chloramphenicol and maintained at 25°C and 37°C for up to 14 days. Yeast colonies recovered from cultures were identified utilizing colony appearances, Gram staining behavior, germ tube assays, chromogenic medium presentation, and conventional biochemical validation pathways. Lineage differentiation of Candida isolates targeted routinely recovered strains encompassing Candida albicans, Candida tropicalis, Candida glabrata, and Candida parapsilosis. Beyond mycological culturing, bacterial isolation was executed for specific instances presenting purulent discharge or clinical indicators hinting at secondary bacterial colonization.

Vocational exposure profiling: Industrial contact parameters were stratified based on exposure duration and regularity. Fluid

contact was separated into under 2 hours/day, 2–5 hours/day, and greater than 5 hours/day. Glove utilization was grouped as constant, intermittent, or completely absent. Habitual nail microtrauma was determined via patient histories noting frequent physical micro-injury during scrubbing tasks.

Statistical analysis

Parameters were compiled within Microsoft Excel and evaluated employing the Statistical Package for the Social Sciences (SPSS) platform version 25.0. Summary metrics were reported using mean values, standard deviations, frequencies, and percentages. Relationships connecting workplace exposure factors to positive Candida outcomes were evaluated via Chi-square or Fisher's exact assessments as appropriate. Significance was established at $p < 0.05$.

Results:

This investigation evaluation enrolled 120 house-keeping staff clinically identified with

chronic paronychia (Table 1). The largest cohort belonged to the 31–40 years age bracket (38.3%), followed by 20–30 years (28.3%), 41–50 years (23.3%), and over 50 years (10.0%). Females comprised the primary study cohort, representing 68.3% of presentations, while males accounted for 31.7%. Regarding vocational history, 40.0% of subjects reported job duration spanning 5–10 years, whereas 38.3% possessed over 10 years of industrial longevity. Daily liquid exposure surpassing 5 hours applied to 41.7% of employees, whereas 43.3% documented contact ranging between 2–5 hours daily. Approximately half of the cohort (48.3%) stated completely avoiding barrier gloves during duties, while merely 20.0% utilized gloves consistently. Among concurrent factors, prior nail injury occurred in 35.0% of subjects, diabetes mellitus existed in 13.3%, and 51.7% lacked clear underlying comorbidities.

Table 1. Demographic and Occupational Characteristics of Housekeeping Staff with Chronic Paronychia (n = 120)

Variable	Category	Number (%)
Age group (years)	20–30	34 (28.3)
	31–40	46 (38.3)
	41–50	28 (23.3)
	>50	12 (10.0)
Gender	Female	82 (68.3)

	Male	38 (31.7)
Duration of employment	<5 years	26 (21.7)
	5–10 years	48 (40.0)
	>10 years	46 (38.3)
Daily wet work exposure	<2 hours/day	18 (15.0)
	2–5 hours/day	52 (43.3)
	>5 hours/day	50 (41.7)
Use of protective gloves	Regular	24 (20.0)
	Occasional	38 (31.7)
	Never	58 (48.3)
Associated comorbidities	Diabetes mellitus	16 (13.3)
	Nail trauma history	42 (35.0)
	None	62 (51.7)

Among the 120 clinically identified presentations of chronic paronychia, 78 instances (65.0%) yielded positive fungal isolation for Candida strains (Table 2). Concomitant bacterial and mycotic proliferation occurred in 15.0% of presentations, while 20.0% of specimens revealed no pathogenic growth. Within the recovered culture-positive strains, Candida albicans represented the primary recovered organism, comprising 53.8% of isolates. This distribution was followed by Candida

tropicalis in 23.1% of instances and Candida glabrata in 12.8%. Candida parapsilosis represented 7.7% of strains, whereas alternative non-albicans Candida variants made up 2.6% of samples. These observations demonstrate that Candida albicans continue as the principal fungal agent linked to chronic paronychia within cleaning personnel, though non-albicans Candida strains also exerted substantial presence

Table 2. Prevalence and Distribution of *Candida* Species Isolated from Chronic Paronychia Cases (n = 120)

Microbiological Findings	Number (%)
Total culture-positive cases for <i>Candida</i> spp.	78 (65.0)
Mixed bacterial and fungal growth	18 (15.0)
Sterile/no growth	24 (20.0)

Distribution of *Candida* Species Among Positive Cases (n = 78)

<i>Candida</i> Species	Number (%)
<i>Candida albicans</i>	42 (53.8)
<i>Candida tropicalis</i>	18 (23.1)
<i>Candida glabrata</i>	10 (12.8)
<i>Candida parapsilosis</i>	6 (7.7)
Other non- <i>albicans Candida</i> spp.	2 (2.6)

Clear statistical relationships surfaced connecting specific vocational contact variables to positive *Candida* cultures among cleaning personnel experiencing chronic paronychia. Employees subjected to fluid immersion for over 5 hours daily displayed an elevated frequency of *Candida* presence (80.0%) relative to individuals featuring shorter contact intervals ($p = 0.002$). Likewise, routine interaction with surfactants and chemical cleansers significantly linked to positive mycological outcomes, where 75.0% of exposed personnel yielded *Candida* strains ($p = 0.008$). Subjects who documented intermittent or completely absent barrier glove utilization similarly demonstrated markedly elevated *Candida* isolation trends

(72.9%) compared to consistent glove users ($p = 0.001$). Recurrent nail microtrauma represented another major risk variable, with 76.2% of impacted individuals displaying positive fungal isolates ($p = 0.015$). Furthermore, operators working for over 10 years demonstrated significantly higher *Candida* isolation frequencies (73.9%) than cohorts with shorter career durations ($p = 0.021$). Broadly, these observations indicate that extended industrial moisture contact, recurring chemical manipulation, deficient barrier protection, and chronic nail injury play essential parts in fostering *Candida*-driven chronic paronychia within house-keeping teams.

Table 3. Association Between Occupational Exposure Factors and *Candida* Positivity in Chronic Paronychia

Occupational Risk Factor	<i>Candida</i> -Positive n (%)	<i>Candida</i> -Negative n (%)	p-value
Wet work exposure >5 hours/day (n = 50)	40 (80.0)	10 (20.0)	0.002*
Frequent detergent/disinfectant exposure (n = 72)	54 (75.0)	18 (25.0)	0.008*
Irregular/no glove use (n = 96)	70 (72.9)	26 (27.1)	0.001*
History of repeated nail trauma (n = 42)	32 (76.2)	10 (23.8)	0.015*
Employment duration >10 years (n = 46)	34 (73.9)	12 (26.1)	0.021*

Discussion:

Chronic paronychia operates as a complex inflammatory condition involving the periungual structures and is frequently linked to prolonged workplace contact with moisture, soaps, chemical agents, and chronic microtrauma [1,2]. In this research, *Candida* strains recovered from 65.0% of house-keeping personnel exhibiting chronic paronychia, demonstrating a powerful connection between vocational exposure and fungal invasion. Comparable insights have been detailed within domestic and global reports, wherein continuous immersion duties and frequent surfactant contact were identified as primary causative elements driving chronic paronychia [3–5].

The present analysis highlighted a female majority, which accords with historical publications documenting higher disease

frequency among women involved in domestic and facility cleaning operations [6,7]. Female workers are more routinely engaged in job descriptions that demand repeated immersion of hands into liquids and cleaning chemicals, subsequently aggravating periungual tissue softening and cuticular damage [8]. The peak frequency recorded within the 31–40-year age cohort likely indicates the highly active vocational lifespan during which cumulative industrial contact transforms into clinically noticeable pathology [9].

A major outcome highlighted within this investigation was the prominent link between prolonged immersion exposure and positive *Candida* cultures. Personnel subjected to fluid contact for over 5 hours daily displayed significantly higher fungal recovery rates. Repeated moisture absorption and drying

sequences are understood to degrade the eponychium and nail margin wall, aiding secondary fungal expansion [10]. Matching points were raised by studies who detailed chronic contact with humidity as the pivotal predisposing variable for chronic paronychia among household employees and culinary handlers [11,12]. Industrial exposure to surfactants, chemical formulations, and sanitizers has similarly been involved in chronic inflammatory transformations within periungual surfaces [13].

In the current evaluation, irregular or completely absent glove compliance showed a strong association with positive fungal findings. Protective barrier gloves play a vital part in preventing unmediated exposure to irritating compounds and excessive moisture [14]. Nevertheless, deficient glove utilization among house-keeping teams can stem from physical discomfort, limited knowledge, or an absence of institutional occupational safety oversight [15]. Identical patterns were observed in occupational dermatology research across the globe, where improper hand protection significantly multiplied the danger of chronic palmar dermatitis and periungual pathologies [16,17]. These data underscore the necessity of vocational education and the application of protective protocols among high-risk laborers.

Recurring nail microtrauma emerged as another vital parameter tied to positive Candida isolation in this study. Constant micro-injury damages the protective eponychial seal and establishes an entry pathway for fungal pathogens [18]. Numerous projects have identified structural microtrauma induced by rigorous scrubbing habits, continuous manual actions, onychophagia, and cosmetic treatments as major precursors to chronic paronychia [19,20]. Additionally, operators employed for more than 10 years displayed significantly elevated Candida isolation rates indicating the cumulative impact of extended vocational exposure and ongoing periungual irritation [21].

Microbiological profiling in this project identified *Candida albicans* as the primary isolate, followed by *Candida tropicalis* and *Candida glabrata*. Comparable distributions have been documented in recent Indian evaluations where *Candida albicans* continued as the most prevalent fungal organism in chronic paronychia [22,23]. Global investigations likewise confirmed a parallel dominance of *Candida albicans*, though growing isolation of non-*albicans* *Candida* strains has been observed recently [24,25]. The appearance of non-*albicans* variants is clinically important because these

organisms can present variable antifungal susceptibility profiles and distinct therapeutic responses.

Combined bacterial and fungal recovery occurred in 15.0% of presentations in this trial. Similar outcomes have been recorded previously, indicating that chronic breakdown of the periungual barrier permits polymicrobial infiltration [12,18]. These compound infections can extend inflammatory timelines, impede recovery, and contribute to recurrent disease cycles. Thus, microbiological culturing stays critical for persistent or therapy-resistant manifestations of chronic paronychia [20].

Modern publications increasingly validate the view that chronic paronychia operates primarily as an inflammatory process featuring secondary fungal colonization rather than a standalone infectious disease [5,11]. Multiple authors suggest that *Candida* acts chiefly as an opportunistic inhabitant of previously compromised periungual tissues [10,24]. Study demonstrated that topical corticosteroids frequently surpassed systemic antifungal drugs in efficacy, validating the inflammatory foundation of this condition [13]. Still, the high rate of *Candida* strains in this research demonstrates that fungal colonization represents an essential reinforcing variable, particularly for laborers

experiencing prolonged immersion exposure and inadequate barrier habits.

The outcomes of this analysis offer critical vocational and public healthcare indications. Cleaning staff comprise a vulnerable labor group due to continuous exposure to humidity, detergents, and recurrent micro-injuries. Preventive adaptations such as minimizing immersion duration, consistent use of barrier gloves, regular applications of barrier creams, and workplace instructional campaigns could markedly decrease total disease outcomes [14,17]. Timely detection and targeted tracking of fungal colonization can likewise avoid chronic transformations, nail distortion, and hand function limitations. This investigation has specific constraints. The research framework was observational with a relatively modest cohort and a single vocational class. Antifungal sensitivity assays and molecular characterization of *Candida* strains were omitted. Future multicentric projects incorporating molecular isolation tools, antifungal sensitivity tracking, and extended monitoring protocols will yield more thorough understandings regarding industrial chronic paronychia within vulnerable worker pools.

Conclusion:

This investigation revealed an elevated frequency of *Candida* strains within house-

keeping personnel experiencing chronic paronychia, showing *Candida albicans* as the principal isolate. Extended fluid immersion, ongoing chemical contact, deficient glove adherence, and chronic nail microtrauma operated as major occupational risk parameters. These insights highlight the critical impact of industrial exposure on paronychia progression and emphasize the necessity for unified protective and medical interventions.

Conflict of interest:

There is no conflict of interest among the present study authors.

References:

1. Rigopoulos D, Larios G, Gregoriou S, Alevizos A. Acute and chronic paronychia. *American family physician*. 2008 Feb 1;77(3):339-46.
2. Singal A, Neema S, Kumar P. *Nail Disorders*. CRC Press; 2019.
3. Bahunuthula RK, Thappa DM, Kumari R, Singh R, Munisamy M, Parija SC. Evaluation of role of *Candida* in patients with chronic paronychia. *Indian Journal of Dermatology, Venereology and Leprology*. 2015 Sep 1;81:485.
4. Tosti A, Piraccini BM, Ghetti E, Colombo MD. Topical steroids versus systemic antifungals in the treatment of chronic paronychia: an open, randomized double-blind and double dummy study. *Journal of the American Academy of Dermatology*. 2002 Jul 1;47(1):73-6.
5. Rockwell PG. Acute and chronic paronychia. *American family physician*. 2001 Mar 15;63(6):1113-7.
6. Ricardo JW, Dominguez-Cherit J, Haneke E, Rana J, Richert B, Tosti A, Vlahovic TC, Lipner SR. Evaluation and management of mechanical and structural nail disorders: A clinical review. *Journal of the American Academy of Dermatology*. 2025 Nov 15.
7. Sani S, Flohr C, Abuabara K, Singh AM, Yip A, Mackenzie M, Fonacier L. Atopic dermatitis with comorbid skin diseases: recognition and successful treatment. *The Journal of Allergy and Clinical Immunology: In Practice*. 2025 Jun 24.
8. Rerknimitr P, Kantikosum K, Chottawornsak N, Tangkijngamvong N, Kerr SJ, Prueksapanich P, Sithisarankul P, Kumtornrut C, Asawanonda P, Sutheparuk S, Panchaprateep R. Chronic occupational exposure to lead leads to significant mucocutaneous changes in lead factory workers. *Journal of the European Academy of Dermatology and Venereology*. 2019 Oct;33(10):1993-2000.
9. Srinivas CR, Sethy M. Occupational dermatoses. *Indian Dermatology Online Journal*. 2023 Jan 1;14(1):21-31.

10. Grover C, Bansal S. Nail changes associated with pigmentary disorders. *Pigment International*. 2021 May 1;8(2):76-85.
11. Rigopoulos D, Gregoriou S. Nail unit psoriasis. In *Scher and Daniel's Nails: Diagnosis, Surgery, Therapy* 2018 Jul 31 (pp. 99-126). Cham: Springer International Publishing.
12. Rathod SP, Ranjan Lal N, Neema S, Kumar P. Occupational Dermatoses. In *Atlas of Dermatology, Dermatopathology and Venereology: Inflammatory Dermatoses* 2021 Oct 31 (pp. 1119-1150). Cham: Springer International Publishing.
13. Tosti A, Piraccini BM. Nail disorders. *Harper's Textbook of Pediatric Dermatology*. 2019 Nov 20;2147-58.
14. Smedley J, Williams S, Peel P, Pedersen K. Management of occupational dermatitis in healthcare workers: a systematic review. *Occupational and environmental medicine*. 2012 Apr 1;69(4):276-9.
15. Behroozy A, Keegel TG. Wet-work exposure: a main risk factor for occupational hand dermatitis. *Safety and health at work*. 2014 Dec 1;5(4):175-80.
16. Sedeh FB, Michaelsdóttir TE, Jemec GB, Mortensen OS, Ibler KS. Prevalence, risk factors, and prevention of occupational contact dermatitis among professional cleaners: a systematic review. *International Archives of Occupational and Environmental Health*. 2023 Apr;96(3):345-54.
17. Thyssen JP, Johansen JD, Linneberg A, Menné T. The epidemiology of hand eczema in the general population—prevalence and main findings. *Contact dermatitis*. 2010 Feb;62(2):75-87.
18. Haneke E. Basics of onychopathology. In *Nail Disorders* 2019 Feb 4 (pp. 113-133). CRC Press.
19. Wollina U, Nenoff P, Haroske G, Haenssle HA. The diagnosis and treatment of nail disorders. *Deutsches Ärzteblatt International*. 2016 Jul 25;113(29-30):509.
20. Piraccini BM, Alessandrini A. Onychomycosis: a review. *Journal of Fungi*. 2015 Mar 27;1(1):30-43.
21. Frosch PJ, John SM. Clinical aspects of irritant contact dermatitis. In *Contact dermatitis* 2010 Aug 12 (pp. 305-345). Berlin, Heidelberg: Springer Berlin Heidelberg.
22. Kaur R, Kashyap B, Bhalla P. Onychomycosis-epidemiology, diagnosis and management. *Indian journal of medical microbiology*. 2008 Apr 1;26(2):108-16.
23. Panday M, Pandey D, Upadhyay P, Upadhyay S. Terbinafine preferred antifungal with a focus on dermatophytes (a review). *Acta Sci. Microbiol*. 2020;3:65-72.

24. El Abbassi M, Hajar B, Amarir F, Mohamed R, El Bachir A, Hanane M, Imane B, Samira R. Clinical and epidemiological study of onychomycosis among patients of the national institute of hygiene in rabat, Morocco (2016-2020). *Current Medical Mycology*. 2023 Dec;9(4):39.
25. Pereira PP, Nunes Filho M, Moreira TD, Duarte Silva Malvino L, de Araújo LB, dos Santos Pedroso R, Ângela Ribeiro M. Hand-foot syndrome and nail disorders secondary to treatment with paclitaxel: Is there a relationship with the presence of fungi?. *Journal of Oncology Pharmacy Practice*. 2022 Dec;28(8):1798-806.