Isolation and Identification of Dermatophytes Causing Tinea Capitis in the Jabalpur Region, Madhya Pradesh, India

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ABSTRACT

Fungal infections are common health problems, particularly in tropical and developing regions where warm and humid conditions favor their growth. The present study was conducted to investigate the occurrence and identification of fungal agents responsible for tinea capitis in the Jabalpur region of Madhya Pradesh, India. Dermatophytosis, commonly known as ringworm, is a superficial fungal infection caused by keratinophilic fungi that invade keratinized tissues such as skin, hair, and nails.

A total of 10 clinically suspected cases of tinea capitis were included in the study. Scalp scrapings were collected under aseptic conditions and cultured on Sabouraud Dextrose Agar (SDA) and Potato Dextrose Agar (PDA) media. The samples were incubated at 28°C for 7–14 days. Identification of fungal isolates was carried out using macroscopic observations of colony morphology and microscopic examination through Lactophenol Cotton Blue (LPCB) staining. KOH examination was also performed as a preliminary diagnostic method.

Out of the 10 samples, 7 cases (70%) were positive for fungal infection, while 3 cases (30%) were negative. The majority of the study population consisted of females aged 16–30 years. The predominant fungal isolates were dermatophytes such as *Trichophyton* spp. and *Microsporum* spp. In addition, non-dermatophyte fungi including *Aspergillus* spp. and *Rhizopus* spp. were also identified, indicating their role as opportunistic pathogens.

A strong correlation between KOH examination and culture results confirmed the reliability of these diagnostic techniques. The duration of infection ranged from 2 months to 4 years, with chronic cases showing higher positivity.

The study concludes that dermatophytosis is prevalent in the study area and requires early diagnosis, proper treatment, and improved hygiene practices for effective control.

Keywords - Tinea capitis, Dermatophytosis, Trichophyton, Microsporum, KOH examination

INTRODUCTION

Fungi are achlorophyllous, eukaryotic, heterotrophic organisms that reproduce both sexually and asexually through spores. Structurally, they exist either as unicellular yeasts or multicellular filamentous forms, with a cell wall primarily composed of chitin. Since fungi cannot synthesize their own food, they depend on external organic matter for nutrition. The study of fungi is known as *mycology*, derived from the Greek word *mykes* meaning mushroom. The branch dealing with fungal infections in humans is termed *medical mycology*, which includes the study of epidemiology, ecology, pathogenesis, diagnosis, and treatment of fungal diseases known as mycoses.

Fungal infections commonly occur in warm, moist areas of the body such as between the toes, groin, and skin

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folds. Individuals with conditions like obesity, diabetes, or weakened immunity are more susceptible due to favourable conditions for fungal growth. Dermatophytosis are superficial fungal infections affecting the skin, hair, and nails and are commonly referred to as *tinea* or ringworm. These infections are caused by keratinophilic fungi known as dermatophytes, which utilize keratin present in the outer layer of the skin, hair, and nails for growth and survival.

Dermatophytes are hyaline, septate molds comprising over 100 species, of which approximately 40 are associated with human infections. They are classified into three main genera based on morphological characteristics: *Trichophyton*, *Microsporum*, and *Epidermophyton*. *Trichophyton* species infect skin, hair, and nails; *Microsporum* species infect skin and hair; while *Epidermophyton* species infect skin and nails but not hair. Based on ecological habitat, dermatophytes are further categorized as anthropophilic (human-associated), zoophilic (animal-associated), and geophilic (soil-associated).

Dermatophytic infections primarily involve keratinized tissues of the epidermis, hair follicles, and nails. These infections are easily diagnosed through direct microscopic examination and culture of skin scrapings or hair samples. Clinically, dermatophytosis presents as circular, scaly lesions with central clearing and inflamed margins due to fungal invasion and host inflammatory response. Common clinical forms include *tinea capitis* (scalp), *tinea corporis* (body), *tinea pedis* (foot), *tinea manuum* (hand), *tinea faciei* (face), and *tinea unguium* (nails). Symptoms typically include itching, redness, scaling, and in some cases hair loss or nail deformity.

In addition to dermatophytes, non-dermatophyte fungi such as *Aspergillus* and *Rhizopus* are increasingly recognized as opportunistic pathogens, especially in immunocompromised individuals. Epidemiological studies indicate that dermatophytosis is highly prevalent in tropical and developing countries due to environmental and socio-economic factors. It is estimated that nearly 20% of the global population is affected by superficial fungal infections.

Early and accurate diagnosis using techniques such as KOH examination and fungal culture is essential for effective treatment. Antifungal therapies, including topical and systemic agents such as azoles and allylamines, are commonly used for management. Along with treatment, maintaining proper hygiene and avoiding shared personal items are important preventive measures. Thus, dermatophytosis represents a significant public health concern requiring increased awareness, timely diagnosis, and effective control strategies.

MATERIALS AND METHODS

The present study was conducted using standard microbiological techniques and laboratory equipment. Instruments used included a laminar airflow chamber, autoclave, hot air oven, incubator, freezer, and weighing balance. Glassware such as conical flasks, measuring cylinders, test tubes, glass rods, glass tubes, and Petri plates were utilized. Clinical samples were collected from patients suspected of tinea capitis, where scalp scrapings were obtained aseptically and placed on sterile black paper for proper handling and transport.

For fungal isolation, Sabouraud Dextrose Agar (SDA) and Potato Dextrose Agar (PDA) media were used. SDA consisted of peptone (10 g), dextrose (40 g), agar (20 g), and an antibacterial agent (0.25 g) with a pH of 5.5–5.7. PDA was prepared using potato (200 g), dextrose (20 g), agar (20 g), and an antibacterial agent (0.05 mg), maintaining a similar pH range. The media were prepared by thoroughly mixing the ingredients and adjusting the pH, followed by sterilization in an autoclave at 121°C for 15 minutes under 15 lbs pressure. After sterilization, antibacterial agents were added to prevent contamination. The media were then poured into Petri plates and test tubes to prepare slants and allowed to solidify.

The collected samples were inoculated onto PDA slants under aseptic conditions and incubated at 28°C for 7–14 days. A total of ten samples were processed in this study. Primary cultures were observed, and sub-culturing was carried out using an inoculating loop to obtain pure fungal isolates. The sub-cultured samples were further incubated for 7 days at the same temperature. Fungal colonies obtained were identified based on their morphological characteristics.

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Identification of fungal isolates was carried out through both macroscopic and microscopic examination. Macroscopic analysis involved observing colony characteristics such as color, texture, and growth pattern. Microscopic examination was performed using the Lactophenol Cotton Blue (LPCB) staining technique. In this method, a small portion of the fungal colony was placed on a glass slide containing a drop of LPCB stain, teased gently, and covered with a coverslip. The slide was then examined under a microscope. LPCB stain contains cotton blue, which stains chitin in fungal cell walls, phenol which kills organisms, lactic acid which preserves structures, and glycerol which acts as a mounting medium. This method enabled accurate identification of fungal species based on their structural features.

RESULTS

A total of 10 clinically suspected cases of tinea capitis were examined in the present study. Out of these, 7 cases (70%) showed positive results for fungal infection, while 3 cases (30%) were found to be negative based on KOH examination and culture methods. The study population consisted of female subjects within the age group of 16–30 years.

The fungal isolates identified from positive samples included *Trichophyton spp.*, *Microsporum spp.*, *Aspergillus spp.*, and *Rhizopus spp.*. Among these, dermatophytes such as *Trichophyton* and *Microsporum* were the most common causative agents. However, non-dermatophyte fungi like *Aspergillus* and *Rhizopus* were also observed, indicating their role as opportunistic pathogens.

Most of the positive cases showed concordant results in both KOH examination and culture techniques, confirming the reliability of these diagnostic methods. The duration of infection among patients ranged from 2 months to 4 years, with chronic cases showing higher positivity. These findings suggest that dermatophytosis is prevalent in the study area and requires early diagnosis and treatment for effective management.

Table 1: Summary of Results

Parameter	Observation
Total Cases	10
Positive Cases	7
Negative Cases	3
Age Group	16–30 years
Sample Type	Scalp

Table 2: Fungal Isolates Identified

S. No.	Patient Case	Age/Sex	Duration	KOH Result	Culture Result	Identified Organism
1	Case 1	23/F	1 year	Positive	Positive	Trichophyton spp.
2	Case 2	24/F	2 years	Positive	Positive	Microsporum canis
3	Case 3	20/F	3 months	Negative	Negative	Negative
4	Case 4	25/F	1 year	Positive	Positive	Aspergillus niger
5	Case 5	28/F	6 months	Positive	Positive	Rhizopus spp.
6	Case 6	16/F	2 months	Negative	Negative	Negative
7	Case 7	21/F	8 months	Positive	Positive	Aspergillus spp.
8	Case 8	27/F	7 months	Positive	Positive	Negative
9	Case 9	30/F	2 months	Negative	Negative	Trichophyton spp.
10	Case 10	21/F	4 years	Positive	Positive	Microsporum spp.

DISCUSSION

The present study was conducted to investigate the occurrence and identification of fungal agents responsible

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for tinea capitis in the Jabalpur region. The findings revealed that out of 10 clinically suspected cases, 70% were positive for fungal infection, indicating a relatively high prevalence of dermatophytosis in the study population. This observation is consistent with previous studies, which report that superficial fungal infections are common in tropical and developing regions due to favorable environmental conditions such as high humidity and temperature.

The predominance of dermatophytes, particularly *Trichophyton* and *Microsporum* species, observed in this study aligns with earlier reports identifying these genera as the major causative agents of tinea infections. These fungi possess the ability to utilize keratin as a nutrient source, allowing them to invade keratinized tissues such as skin, hair, and nails. The occurrence of *Microsporum canis* suggests possible zoonotic transmission, which may be associated with close contact between humans and domestic animals.

In addition to dermatophytes, the isolation of non-dermatophyte fungi such as *Aspergillus* and *Rhizopus* highlights their emerging role as opportunistic pathogens. Although traditionally considered contaminants or saprophytes, these organisms are increasingly being recognized as etiological agents, particularly in individuals with compromised immunity or prolonged infections. Their presence in the study indicates the need for careful interpretation of culture results and consideration of these fungi in clinical diagnosis.

The study also demonstrated a strong correlation between KOH examination and culture methods, confirming the reliability of these diagnostic techniques. KOH mount provides a rapid and cost-effective preliminary diagnosis, while culture methods allow for definitive identification of fungal species. The use of Lactophenol Cotton Blue staining further facilitated accurate microscopic identification based on fungal morphology.

The duration of infection among patients ranged from 2 months to 4 years, with chronic cases showing higher positivity rates. This suggests that delayed diagnosis and inadequate treatment may contribute to the persistence and spread of infection. Factors such as poor personal hygiene, environmental exposure, and underlying health conditions like diabetes may further increase susceptibility.

Overall, the findings of this study emphasize that dermatophytosis remains a significant public health concern in the study area. Early diagnosis, appropriate antifungal therapy, and improved awareness regarding hygiene practices are essential to control the spread of infection. Further large-scale studies are recommended to better understand the epidemiology and emerging trends of both dermatophyte and non-dermatophyte infections.

CONCLUSION

The present study provides valuable insights into the occurrence, identification, and distribution of fungal agents responsible for tinea capitis in the Jabalpur region, Madhya Pradesh. The findings revealed that 70% of the clinically suspected cases were positive for fungal infection, indicating a significant prevalence of dermatophytosis in the study population. This highlights the continued importance of superficial fungal infections as a public health concern, particularly in tropical regions where environmental conditions favor fungal growth.

The study confirms that dermatophytes, especially *Trichophyton* and *Microsporum* species, are the predominant causative agents of tinea capitis. Their ability to invade keratinized tissues such as skin, hair, and nails contributes to the persistence and spread of infection. The isolation of *Microsporum canis* further suggests the possibility of zoonotic transmission, emphasizing the role of close human–animal interaction in the epidemiology of dermatophytosis.

In addition to dermatophytes, the presence of non-dermatophyte fungi such as *Aspergillus* and *Rhizopus* indicates their emerging role as opportunistic pathogens. These findings suggest that non-dermatophytes should not be overlooked during diagnosis, particularly in chronic or recurrent infections. Careful laboratory evaluation is essential to differentiate true pathogens from contaminants and to ensure appropriate treatment.

The study also demonstrates that conventional diagnostic methods, including KOH examination and fungal culture, remain reliable and effective tools for the detection of fungal infections. The use of Lactophenol

Cotton Blue staining further enhances the accuracy of microscopic identification. The strong correlation between these diagnostic methods supports their continued use in routine clinical practice, especially in resource-limited settings.

The variation in duration of infection, ranging from a few months to several years, indicates that delayed diagnosis, lack of awareness, and improper treatment contribute to chronicity and recurrence. Predisposing factors such as poor hygiene, environmental exposure, and underlying health conditions like diabetes play a significant role in increasing susceptibility to infection.

In conclusion, dermatophytosis remains a widespread and persistent health issue in the study area. Effective management requires early diagnosis, appropriate antifungal therapy, and increased public awareness regarding hygiene and preventive measures. There is also a need for further large-scale and detailed studies to better understand the epidemiological patterns, risk factors, and emerging trends of both dermatophyte and non-dermatophyte infections. Such efforts will contribute to improved control strategies and better clinical outcomes.

REFERENCE

1. Agrawal A. Agrawal. S, Khanal B echomycosis in eastern Nepal. Nepal med coo J 2006:8 1-7.
2. Aly R: Ecology and epideomology of dermatophytes. J Am AcadDermatol 1994,31:21-5 .
3. AmaotH.Nassaiela M,EIBatauri MM,H Fangary,MHelmy AS, Shoieob S. Prevalance or non-dermatophytes molds in patients with abnormal nails. Egyptian dermatol online J:2006;2:11.
4. Arrese JE, Pierard GE, Pierard- Franchiment c: treatment and prophylyxis of tinea infection, Drugs 1996,52:209-24
5. Basak S, Das K, Ray S (2009). A study on superficial fungal infection from west Bengal: a brief report J life sciences 1(1): 51-55.
6. Bhavsar, H: Modi, D.J: sood, N;Shah, H 2012 . A Study of superficial mycoses with clinical mycological profile in tertiary care hospitalin ahmedabad: National jornal of medical research, 2(2): 150-164.
7. Beradar PM(2012), Reddy Kn, Shran TR, Srikanth BA, Epidemiological, clinical and cultural study of onychomycosis. Am.JDrmatol. Venerol. 1(3): 35-40.
8. Blanka, H:Kiktor A C and Markus F 2008. Epidermiologicaol trends in skin mycosis worldwide. Mycosis 51(4):2-15.
9. Borelli, D 1965. Microsporum racemosum nova species. Acta med Venez12 . 148-151.
10. Chi, c.c. wang, S.H. chou, M.C 2005. The causative pathogens of oncomycosis in sotherntawain mycoses vol-48:413-20.
11. C.L.Bayles, G.E.J Todwell, L. Towersey and R.aly, “The prevelance of dermatophyte infection in patients infected with human immunodeficiency virus” International journal of dermatology, vol-47, no.4, pp-339,2008.
12. Dahdah MJ, Sher RK, dermatophytes current fungal infection report 2008;2:81-86.
13. Albright J.L., Tukey , S.L. and Tuckey, G.T. (1967). Antibiotics in milk. A.B.J. Dairy Sci. 44 : 779.
14. Dimond A.E. and Horsfall, J.G. (1959). Plant Chemotherapy. A Rev. Pl. Physiol. 10 : 257. Gokayr, J. (1955). The effect of some dithiocarbamyl compounds on the metabolism of fungi. Physiol, Plantarum21 : 556. 572. Gottlied D. and Ramchandran, S. (1960). The nature of production of the glyoxylate pathway enzyme in germinating spores of Pencilliumoxalicum(F. 36). Mycologia52 : 599-607.
15. Hochstein, P.E. and Cox, C.E. (1956). Studies on the fungicidal action of N-trichloromethlthio-4-cyclohexene-1, 2-dicarboximide) (captan). Annual J. Bot. 43 : 437-441.
16. Rajak, R.K. and Agarwal. G.P. (1986) Effect of fungicides and antibiotics on endogenous respiration of Botryodiplodiatheobromae. Nat. Acad. Sci. Letters 9(2) : 65-67.
17. Umbreit, w.w., Burris, R.H. and Stauffer, J.F. (1964). Manometric Techniques and Tissue Metabolism, Techniques and Tissue Metabolism, 4th Ed. Burges Publishing Co,. Minneapolis. 305 pp.
18. Wakerm A.T. (1955). Germination and respiration responses of Myrotheciumto orgnic fungicides, Iowa State Coll. J. Sci. 30 :229-241.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XIII Issue IV April 2026

19. Alexandr. M. (1961). Introduction to Soil Microbiology, New York, Wiley
20. Barker, B.S. (1957). Preparation and Colorimetric determination of lactic acid, In methods of Enzymology. Vol. 3 (Eds. S.P. Colowick and N.N.O. Kapalan). Academic Press, N.Y., p. 241-246.
21. Bently, R. (1957). Etaconic acid enzymes. In Methods in Enzymology. Vol. 3 (Eds. S.P. Colowick and N.N.O. Kapalan). Academic Press, N.Y,. p. 593-597.
22. Bently, R. and Thiessen, S.P. (1957). J. Biol. Chem. 226 : 703
23. Chakrabarty, A.M. (1982). In Biodegradation and Detoxification of Environmental Pollutants (Ed. A.M. Chakrabarty), CRC Press, Inc., N.Y.,p. 128-129.
24. Clark, D.S. and Lentz, C.P. (1963). Colorimetric estimation of citric acid. Biotechnology and Bioengeineering5 : 193-199.
25. Cruickshank, R.,Duguid, J.P., Marmion. B.P. and Swain, R.H.A. (1975). Medical Microbiology. Churchill Livingstone, Edinburgh, London.
26. Dagley, S. (1971). Citrate, UV Spectrophotometric Determination. In Method in Enzymology. 3 (Ed. H.U. Bermeyer), VerlagChemie, Weinhein, p. 1562-1565.
27. EL. Zorgani, G.A. and Omer, M.E.H. (1974). Metabolism of endosulfan isomers by Aspergillusniger. Bull. Environ. Contam. Toxicol. 12 : 182-185
28. Friedkin. (1945). (Ed). Ind. Eng. Chem. Anal. 17 : 637.
29. Glooschenko, V., Holdrinet, M., Lott, J.N.A. and Frank, R. (1979). Bioconcentration of chlordane by green alga, Scendesmusuadricauda Bull. Environ. Contam. Toxicol. 21 : 515-520.
30. Gunter, Z.(1967). Analytical Methods for Pesticides, Plant Growth Regulator and Food Additives. Vol. V. Academic Press, New York, p. 59 63.
31. Hartman, J., Hiencke'w. andKanackmuss, H.J. (1979). Metabolism of 3-chloro and 3,5-dichloro-Banzoate by Pseudomonad. Appl. Environ. Microbial. 37 : 421.
32. Heckman, Charles, W. (1981). Long term effects of entensive pesticide applications on the aquatic community in orchard drainage clichés near Hamburgh, Germany. Arch. Environm. Contam. Toxicol. 10 : 393-402.
33. Kallma, B.J. and Andrews, A.K. (1963). Reductive dichlorination of DDT to DDD by yeast. Science 141 : 1050-1051.
34. Korte F., Ludwing, G. and Voegl, J. (1962). Um Wandlung Von aldrin (14c) and dieldrin (14c) durchmidroorganismen, leberhomogenate, und muskitolarven. Ann. Chem..656 : 135-140.
35. Krishnamurthy, C.R. and Matsumura, F. (1982). Biodegradation of Pesticides. (Plenum Press).
36. Larsen, H. (1957). Itaconic acid and related compounds. In Methods in Enzymology. 3 (Eds. S.P. Colowick and N.N.O. Kapalan). Academic Press, N.Y., p. 437-444.
37. Lec, H.B. (1982). In Analysis of Pesticides in Water. Vol. II. (Eds. A.S.Y. Chau, B.K. Alfan and J.W. Robinson), CRC Press, Boca Raton, Florida, p. 1-160.
38. Lichenstien, E.P. (1970). Fate and movement of insecticides in and from soils. In Pesticides in soil : Ecology, degradation and movement. Internet. Symp. On Pesticides in the Soil, East Lansing. Moisture and Soil types. J. Econ. Entomol. 53 : 192.
39. Mac Rac, I.C., Raghu, R. and Castro, T.F. (1957). Persistance and biodegradation of four common isomers of benzene hexachloride in submerged soil. J. AgricFd. Chem. 15 : 911.
40. Matsumura, F. and Benzet, J.H. (1978). In Pesticide Microbiology (Eds. I.R. Hill and S.J.L. Wright). Academic Press, London, p. 623-659.
41. Matsumura, F., Patil, K.C. and Boush, G.M. (1970). Formation of "Photodieldrin" by microorganisms. Science 170 : 1206-1207.
42. Maunder, de F., Egan, H., Godly, E,W,. Hammond, E.W., Roburnand and Thompson, J. (1969). Clean-up of Animal Fats and Dairy Products for the analysis of chlorinated pesticide residues. The Analyst. 89 : 168.
43. Murer, C and Poppendick, B. (1971). Determination with lactate dehydrogenase and APD. In Methods in Enzymology 3 (Ed. By H.O. Bergmeyer). VerlagChemie, Wienhien, p. 1472-1475.
44. Mendoza, C.E. and Shield, J.B. (1970). Secsitivity of Pig Lover esterase in detecting twelve carbonate pesticides on thin-layer chromatograms. J. Chromatog. 50 : 92.
45. NandanRatna and Polasa, H. (1985). Enhibition of Insecticides in Flooded Soil and in Aspergilli by some chlorinated hydrocalbons. Ind. J. Micro. 25 : 21-25.

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46. Sethunathun, N. (1973). Microbial Degradation of Insecticides in Flooded Soil and in Anaerobic Cultures. Residue Rev. 47 : 143-165.
47. Singh, Ratana, Iyenger, L. and Rao A.V.S.P. (1976). Utilization of heptachlor by fungi. Ind. J. Expt. Biol. 14 : 466-468.
48. Singh, Ratna, Iyenger, L. and Rao, A.V.S.P. (1977). Effect of chlorinated hydrocarvons (insecticides) on fermentation processes. J. ferment. Technol 55(3) : 281-284.
49. SubbaRao, R.V. and Alexander, M. (1980). Effect of DDT metabolites on soil respiration and on aquatic algal community. Bull. Environ. Contam. Toxicol. 25(2) : 215.