

## Research Article



# INTERNATIONAL RESEARCH JOURNAL OF PHARMACY

[www.irjponline.com](http://www.irjponline.com)

ISSN 2230-8407 [LINKING]

## COMPARATIVE ASSESSMENT OF MYCOLOGICAL AND CLINICAL ASPECTS OF DERMATOPHYTOSIS IN DIABETICS AND NON-DIABETIC SUBJECTS

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How to cite: Banerjee K, Shailja S. Comparative assessment of mycological and clinical aspects of dermatophytosis in diabetics and non-diabetic subjects. International Research Journal of Pharmacy, 2021,12:3:31-35.

Doi:10.7897/2230-8407.1203130

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### ABSTRACT

**Background:** With rates of chronic and recurring infections rising quickly, dermatophytosis is a serious healthcare problem in India. The association between glycemic status and the development of dermatophytosis, as well as the comparison of developing species in diabetics and non-diabetics with dermatophytosis, is, however, poorly documented in the literature.

**Aim:** The current study's objectives were to compare the mycological and clinical features of dermatophytosis in people with and without diabetes. Additionally, two sets of culture isolates were compared in the study.

**Methods:** 756 participants with a clinical suspicion of dermatophytosis were evaluated for the research and split into two groups: 378 individuals with diabetes and 378 individuals without the disease. The study then evaluated and contrasted the fungal culture findings, clinical information, demographics, CW (calcofluor white), and KOH (potassium hydroxide) mount of every participant from both groups.

**Results:** Compared to the non-diabetic group, 756 people with diabetes had a substantially higher degree of involvement and a higher recurrence rate. When using CW staining instead of KOH staining, the overall rate of positive was greater in both diabetics and non-diabetics, occurring in 77.8% and 57.7% of participants, respectively. The most frequent isolate in both diabetics and non-diabetics was *Trichophyton mentagrophytes*, which was found in 47.6% of subjects—55% of whom had diabetes and 61.4% of whom did not—followed by *Trichophyton rubrum*. Using scrapings from at least two locations enhanced the positivity of fungal culture, CW staining, and KON staining to 100%, 95.7%, and 77.9%, respectively.

**Conclusion:** Compared to participants without diabetes, diabetics exhibited a more severe and persistent pattern of dermatophytosis, according to the current study. *T. mentagrophytes* is the most often isolated culture in dermatophytosis in both diabetics and non-diabetics. Because CW staining is so much better than traditional KOH preparations, it may be utilized as the first method of choice to detect dermatophytosis. The bias of false negative findings can be eliminated by routinely collecting scrapings from at least two locations.

**Keywords:** diabetes, CW staining, KOH mount, mycological, dermatophytosis

### INTRODUCTION

Dermatophytosis, which means tinea, is often used to describe a superficial fungal infection that can impact a person's skin, hair, and nails. Particularly in the last few years, with dangerously rising trends, tinea corporis has become a major and serious public health problem worldwide, including in India. This is especially true in cases of recurring and chronic dermatophytosis

infections.<sup>1</sup>

Unusual and widespread dermatophyte infections can result from a reduction in cellular immunity brought on by underlying immunosuppressive illnesses, endocrine abnormalities, and the use of immunosuppressive medicines. Fungal infections were found to be quite common in individuals with diabetes mellitus, as is evident from the majority of the data currently available in the literature. Resistance strains of the fungus have emerged as a result of inappropriate or inadequate usage of antifungal drugs, which has reduced the effectiveness of traditional therapy.<sup>2</sup>

The research currently lacks information on evaluating the relationship between the onset of dermatophytosis and the participants' glycemic state as well as comparing the shifting species patterns in dermatophytosis-afflicted diabetic and non-diabetic subjects.<sup>3</sup> Comparative evaluation of the mycological and clinical features of dermatophytosis in diabetics and non-diabetic people was the primary goal of the current investigation. Additionally, two sets of culture isolates were compared in the study.

## MATERIALS AND METHODS

A comparative evaluation of the mycological and clinical characteristics of dermatophytosis in diabetics and non-diabetic people was the goal of the current cross-sectional clinical investigation. Additionally, two sets of culture isolates were compared in the study. The research participants came from the Institute's Department of Dermatology. Prior to their involvement in the study, all individuals gave their written and verbal informed consent. 756 participants of both sexes with a clinical suspicion of dermatophytosis who reported to the Institute during the research period were evaluated.

The study's inclusion requirements were that participants be willing to participate, be between the ages of 18 and 80, and have a clinical suspicion of dermatophytosis. Participants with isolated scalp/nail lesions, pregnant and lactating women, those who had taken systemic antifungals within the previous three months, or those who had used topical antifungals within the previous four weeks, and those who did not provide their consent to participate in the study were all excluded.

Following the research participants' final inclusion, each subject's medical history was thoroughly documented, and a thorough examination was conducted. There were 378 participants in each of the two groups, with Group I consisting of diabetics with HbA1C  $\geq 6.5\%$  and Group II consisting of non-diabetics. The fungal culture, CW (calcofluor white) staining, KOH mount, clinical information, and demographics of the two groups were also further compared and examined in the study.

The collected data was statistically evaluated using the Student t-test, ANOVA (analysis of variance), Chi-square test, and SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA) for evaluating descriptive measures. The findings were presented as frequency, percentages, mean, and standard deviation. Statistical significance was defined as a p-value of less than 0.05.

## RESULTS

The goal of the current cross-sectional clinical investigation was to compare the mycological and clinical features of dermatophytosis in people with diabetes and those without the disease. The culture isolates in two groups were also compared in the study. 756 participants with a clinical suspicion of dermatophytosis were evaluated for the study. They were split into two groups: 378 individuals with diabetes and 378 individuals without the disease. Between the ages of 45 and 60, there were 162 people without diabetes and 166 people with diabetes. The duration of dermatophytosis was 7–12 months for 114 diabetics and 94 non-diabetics, and 1–6 months for 154 and 144 individuals, respectively, who had diabetes and did not. 42 non-diabetics and 168 diabetics experienced recurrence, respectively. Table 1 shows that 170 and 52 individuals, respectively, had >10% BSA participation.

When comparing KOH, CW, and culture in study participants with and without diabetes, it was shown that 83.6% (n=316) of the diabetics, 80.4% (n=304) of the non-diabetics, and 82% (n=620) of the individuals had positive cultures. A total of 77.8% (n=588) patients had positive CW staining, including 79.4% (n=300) diabetics and 76.2% (n=288) non-diabetics. KOH staining was positive in 57.7% (n=436) of the patients and 56.6% (n=214) and 58.7% (n=222) of the non-diabetics (Table 2). According to the study's findings, 16.4% (n=62) and 19.6% (n=74) of the non-diabetic and diabetic participants, respectively, and a total of 18% (n=136) of the subjects had negative culture isolates.

In 51.3% (n=194) non-diabetic subjects and 43.9% (n=166) diabetic subjects, *T. mentagrophytes* was the most frequently isolated. This was followed by *T. rubrum* in 24.9% (n=94) non-diabetics and 43.9% (n=166) diabetics, *T. tonsurans* in 3.7% (n=14) non-diabetics and 8.5% (n=32) diabetics, *T. violaceum* in 3.2% (n=12) non-diabetics and 2.1% (n=8) diabetics, and *T. schoenleii* in 0.5% (n=2) non-diabetics and diabetics each (Table 3).

Diagnostic accuracy was found to be 63.67% in KOH and 94.69% in calcofluor white subjects when CW and KOH diagnostic characteristics were compared to fungal cultures. In KOH, the negative predictive value was 24.36%, but in CW staining, it was 78.55%. In KOH, the positive predictive value was 95.43%, whereas in calcofluor white, it was 99.30%. With KOH, the specificity was 81.23%, while with calcofluor white, it was 97.04%.

Table 4 shows that the sensitivity was 94.17% with calcofluor white and 60.95% with KOH. According to the study's findings, the rate of positivity in investigations including scrapings from two or more locations was positive in calcofluor white, which was negative in 4.3% of participants (n=12) and positive in 95.7% of subjects (n=268). In KOH, it was positive in 77.9% (n=218) of the individuals and negative in 22.1% (n=62). There was no fungal culture seen. CW was negative in 32.8% (n=156) and positive in 67.2% (n=320) of the individuals in which scraping was not performed from at least two locations. KOH was positive in 45.8% (n=218) of the individuals and negative in 54.2% (n=258). 28.6% (n=136) and 71.4% (n=340) of the individuals had negative fungal cultures, respectively (Table 5).

## DISCUSSION

756 participants with a clinical suspicion of dermatophytosis were evaluated in this study. They were split into two groups: 378 individuals with diabetes and 378 individuals without the disease. Between the ages of 45 and 60, there were 162 people without diabetes and 166 people with diabetes. The duration of dermatophytosis was 7–12 months for 114 diabetics and 94 non-diabetics, and 1–6 months for 154 and 144 individuals, respectively, who had diabetes and did not. 42 non-diabetics and 168 diabetics experienced recurrence, respectively. In 170 and 52 patients, respectively, >10% BSA participation was seen. These findings were similar to those of earlier research by Singh BSTP et al. (2020) and Dass M et al. (2015), in which the authors evaluated participants using demographic information similar to that of the current study.

According to the research's findings, when comparing KOH, CW, and culture in study participants with and without diabetes, 83.6% (n=316) of the former had positive culture, 80.4% (n=304) did not, and 82% (n=620) did not. A total of 77.8% (n=588) patients had positive CW staining, including 79.4% (n=300) diabetics and 76.2% (n=288) non-diabetics. KOH staining was positive in 57.7% (n=436) of the patients and 56.6% (n=214) and 58.7% (n=222) of the non-diabetics. These findings were in line with those of Shwetha JV et al. (2017) and Attal RO et al. (2015), who reported similar results to the current study in their respective studies for comparing KOH, CW, and culture in diabetics and non-diabetic subjects with dermatophytosis.

It was observed that 16.4% (n=62) and 19.6% (n=74) of the non-diabetic and diabetic participants, respectively, and a total of 18% (n=136) of the subjects had negative culture isolates. The most frequent isolate was *T. mentagrophytes*, which was found in 51.3% (n=194) non-diabetic subjects and 43.9% (n=166) diabetic subjects. These were followed by *T. rubrum* in 24.9% (n=94) non-diabetics and 43.9% (n=166) diabetics, *T. tonsurans* in 3.7% (n=14) non-diabetics and 8.5% (n=32) diabetics, *T. violaceum* in 3.2% (n=12) non-diabetics and 2.1% (n=8) diabetics, and *T. schoenleii* in 0.5% (n=2) non-diabetics and diabetics each.

These results were in line with those of Nenoff P et al. (2014) and Mourad B et al. (2019), who likewise found that *T. mentagrophytes* was the most prevalent fungal isolate, followed by *T. rubrum*, among their dermatophytosis study participants.

The study's findings also shown that, when comparing the diagnostic parameters of CW and KOH to fungal cultures, the diagnostic accuracy for KOH was 63.67%, while for calcofluor white subjects, it was 94.69%. In KOH, the negative predictive value was 24.36%, but in CW staining, it was 78.55%. In KOH, the positive predictive value was 95.43%, whereas in calcofluor white, it was 99.30%. With KOH, the specificity was 81.23%, while with calcofluor white, it was 97.04%. The sensitivity was 94.17% with calcofluor white and 60.95% with KOH.

These findings aligned with those of Ramaraj V et al. (2016) and Manjunath M et al. (2016), who also reported diagnostic accuracy, negative predictive value, positive predictive value, specificity, and sensitivity in comparison to the current study. Additionally, it was shown that in research pertaining to scrapings from  $\geq 2$  locations, the rate of positivity was positive in calcofluor white, which was negative in 4.3% (n=12) and positive in 95.7% (n=268) of the participants. In KOH, it was positive in 77.9% (n=218) of the individuals and negative in 22.1% (n=62). There was no fungal culture seen. CW was negative in 32.8% (n=156) and positive in 67.2% (n=320) of the individuals in which scraping was not performed from at least two locations.

KOH was positive in 45.8% (n=218) of the individuals and negative in 54.2% (n=258). 28.6% (n=136) and 71.4% (n=340) of the individuals had negative fungal cultures, respectively. These results were in line with those of Pathania S et al. (12) and

Sardana K et al. (13), who stated that the rate of positive in their investigations about scrapings from at least two places was similar to the findings of the current study.

**CONCLUSIONS**

Taking into account its limitations, the current study comes to the conclusion that diabetes patients had a more severe and persistent pattern of dermatophytosis than non-diabetics. T. mentagrophytes is the most often isolated culture in dermatophytosis in both diabetics and non-diabetics. Because CW staining is so much better than traditional KOH preparations, it may be utilized as the first method of choice to detect dermatophytosis. The bias of false negative findings can be eliminated by routinely collecting scrapings from at least two locations.

**REFERENCES**

1. Verma S, Madhu R. The Great Indian Epidemic of Superficial Dermatophytosis: An Appraisal. *Indian J Dermatol* 2017;62:227–36.
2. Noronha TM, Tophakhane RS, Nadiger S. Clinico-microbiological study of dermatophytosis in a tertiary-care hospital in North Karnataka. *Indian Dermatol Online J* 2016;7:264–71.
3. Lakshmanan A, Ganeshkumar P, Mohan SR, Hemamalini M, Madhavan R. Epidemiological and clinical pattern of dermatomycoses in rural India. *Indian J Med Microbiol* 2015;33:134–9.
4. Singh BSTP, Tripathy T, Kar BR, Ray A. Clinicomycological study of dermatophytosis in a tertiary care hospital in eastern India: A cross-sectional study. *Indian Dermatol Online J* 2020;11:46–50.
5. Dass M, Vijayraj EV, Pavavni K, Pallam A. Comparison of KOH, Calcofluor white and fungal culture for diagnosing fungal onychomycosis in an urban teaching hospital, Hyderabad. *Indian J Microbiol Res* 2015;2:148–53.
6. Shwetha JV, Harsha TR, Shariq AK. Comparison of Chicago sky blue with Calcofluor white and potassium hydroxide mount for rapid diagnosis of dermatomycosis and onychomycosis in a tertiary care center. *Int J Curr Res* 2017;9:464–8.
7. Attal RO, Chaudhary RA, Deotale VS, Jain SP. A clinicomycological study of onychomycosis in a rural hospital in central India. *Int J Res Med Sci* 2015;3:1131–7.
8. Mourad B, Ismail M, Hawwam S, Msseha M, Hassan R. Evaluation of the efficacy of fluorescent staining and Chicago sky blue staining as methods for diagnosis of dermatophytosis in hair and nails. *Clin Cosmet Investig Dermatol* 2019;12:751–8.
9. Nenoff P, Krüger C, Schaller J, Ginter-Hanselmayer G, Schulte-Beerbühl R, Tietz HJ, et al. Mycology –An update part 2: Dermatomycoses: Clinical picture and diagnostics. *J Dtsch Dermatol Ges* 2014;12:749–77.
10. Ramaraj V, Vijayaraman RS, Rangarajan S, Kindo AJ. Incidence and prevalence of dermatophytosis in and around Chennai, Tamilnadu, India. *Int J Res Med Sci* 2016;4:695–700.
11. Manjunath M, Mallikarjun K, Dadapeer, Sushma. Clinicomycological study of dermatomycosis in a tertiary care hospital. *Indian J Microbiol Res* 2016;3:190–3.
12. Pathania S, Rudramurthy SM, Narang T, Saikia UN, Dogra S. A prospective study of the epidemiological and clinical patterns of recurrent dermatophytosis at a tertiary care hospital in India. *Indian J Dermatol Venereol Leprol* 2018;84:678–84.
13. Sardana K, Kaur R, Arora P, Goyal R, Ghunawat S. Is antifungal resistance a cause for treatment failure in dermatophytosis: A study focused on tinea corporis and cruris from a tertiary center? *Indian Dermatol Online J* 2018;9:90–5.

Features	Diabetics	Non-diabetics
<b>Total number</b>	378	378
<b>Age range (45-60 years)</b>	166	162
<b>Duration</b>		
1-6 months	154	144
7-12 months	114	94

<b>Recurrence</b>	168	42
<b>&gt;10% BSA involvement</b>	170	52

**Table 1: Demographic and clinical data in study subjects**

S. No	Investigation	Non-diabetic		Diabetic		Total	
		n	%	n	%	n	%
<b>1.</b>	<b>Culture</b>						
a)	Positive	316	83.6	304	80.4	620	82
b)	Negative	62	16.4	74	19.6	136	18
<b>2.</b>	<b>CW</b>						
a)	Positive	300	79.4	288	76.2	588	77.8
b)	Negative	78	20.6	90	23.8	168	22.2
<b>3.</b>	<b>KOH</b>						
a)	Positive	214	56.6	222	58.7	436	57.7
b)	Negative	164	43.4	156	41.3	320	42.3

**Table 2: Comparison of KOH, CW, and culture in diabetics and non-diabetic study subjects**

S. No	Fungal culture	Non-diabetic		Diabetic		Total	
		n	%	n	%	n	%
<b>1.</b>	<b>Negative</b>	62	16.4	74	19.6	136	18
<b>2.</b>	<b>T. schoenlenii</b>	2	0.5	2	0.5	4	0.5
<b>3.</b>	<b>T. tonasurans</b>	14	3.7	32	8.5	46	6.1
<b>4.</b>	<b>T. violaceum</b>	12	3.2	8	2.1	20	2.6
<b>5.</b>	<b>T. rabrum</b>	94	24.9	96	25.4	190	25.1
<b>6.</b>	<b>T. menatogrophytes</b>	194	51.3	166	43.9	360	47.6
<b>7.</b>	<b>Total</b>	38	100	378	100	756	100

**Table 3: Fungal culture isolates in diabetic and non-diabetic subjects**

S. No	Parameter	KOH (%)	Calcofluor white (%)
<b>1.</b>	<b>Diagnostic accuracy</b>	63.67	94.69
<b>2.</b>	<b>NPV</b>	24.36	78.55
<b>3.</b>	<b>PPV</b>	95.43	99.30
<b>4.</b>	<b>Specificity</b>	81.23	97.04
<b>5.</b>	<b>Sensitivity</b>	60.95	94.17

**Table 4: Diagnostic parameters of CW and KOH compared to fungal cultures**

S. No	Scrapings from $\geq 2$ sites	CW		KOH		Fungal culture	
		Negative n (%)	Positive n (%)	Negative n (%)	Positive n (%)	Negative n (%)	Positive n (%)
<b>1.</b>	<b>Yes</b>	12 (4.3)	268 (95.7)	62 (22.1)	218 (77.9)	0	0
<b>2.</b>	<b>No</b>	156 (32.8)	320 (67.2)	258 (54.2)	218 (45.8)	136 (28.6)	340 (71.4)

**Table 5: Assessing the rate of positivity in investigations concerning Scrapings from  $\geq 2$  sites**