

Etiology of Clinically Failure Cases of Onychomycosis in a Tertiary Care Hospital in India.

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Abstract: Onychomycosis is often associated with chronicity, therapeutic difficulties and recurrence after healing leading to clinical failure and such cases are increasing in very rapid pace. In this background the present retrospective, observational study aimed to have an etiological review of such cases. The "study group" consisted of non-repeating, consecutive 92 patients who were diagnosed cases of onychomycosis and developed persistent lesions or recurrence after use of oral and / or topical antifungal agents continuously or intermittently for a period of > 12 months in toe nail infections and 6 months in finger nails. A control group was also formed with those who came for the first time with suspected onychomycosis and never applied any medicine. In history age, sex, literacy level, occupations, site of lesions, mode of using antifungal medicines and comorbid conditions were enquired about. Standard laboratory procedures were performed for phenotypic identification of fungi. The highest number of cases (22.83%) were reported in 41-50 years age group. The maximum number of females (15.22%) were in 21-30 years and males (14.13%) were in 41-50 years group. The highest number of patients had middle school level educational qualification and housewives were highest occupational group. Only two female patients had psoriasis of nails and one male patient was diabetic and none had fungal infection in other parts of the body. 34 patients followed the direction of dermatologists strictly and rest 58 patients used medicines inappropriately. Out of 92 isolates culture positive cases were 70 and of that 35 were dermatophytes and rest 35 were non dermatophyte moulds and candida species. *Trichophyton violaceum* was most prevalent dermatophyte, *Fusarium solani* as NDMs, *Candida albicans* among yeasts and *bipolaris* and *curvularia* in phaeoid group.

Key words: dermatophytes, non-dermatophytic molds, non response, onychomycosis, recurrences,

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I. Introduction

Onychomycosis is a disease of nail involving nail plate, nail bed and nail matrix caused by dermatophytes, non-dermatophyte fungi (NDM) and candida spp¹. It affects approximately 5% of the population worldwide and represents around 30% of all superficial mycosis and 50% of nail disorders¹. In India the incidence of it ranges from 0.5% to 5% in the general population².

Onychomycosis is often associated with chronicity, therapeutic difficulties, recurrence after healing and serves as reservoir for infection leading to clinical failure³. The arthroconidia, formed in many species, have been shown to be more resistant to antifungals and thus, may remain in the nail bed as a reservoir for recurrent disease. There are other factors that may contribute to the high rate of fungal nail infection recurrence or non-healing. Patient's compliance to therapeutic schedule, innate resistance of some fungi to antifungal agents, exposure to moist and warm environment in cases of toe nail infection commonly seen in occlusive footwear users, diabetes, immunocompromised state of patients etc. contribute to persistence or frequent recurrences of lesions after completion of therapy. Patients, who are diabetic or immunocompromised are likely to experience relapse and may never achieve a permanent cure⁴. Thus, a patient not only needs to treat the infection but also break the cycle of re-infection⁴.

Dermatophytes are mainly related to onychomycosis. Among these, the most common organism reported is *Trichophyton rubrum* (53% cases) followed by *T. mentagrophytes var. interdigitale* (13%), *Epidermophyton floccosum* (1.2%) and *Microsporium species*^{4,5}. Non-dermatophytes were considered as the contaminants but in recent days the prevalence of non-dermatophytic onychomycosis are increasing. The non-dermatophytic moulds such as *Fusarium spp.*, *Scytalidium spp.* and *Acremonium* as the most frequently identified moulds account for approximately 4% of onychomycosis⁵. *Candida spp.* are more related to paronychia but incidence of onychomycosis caused by this agent is also showing rising

trends. *Candida albicans* the most common yeast responsible (8%) followed by *C. parapsilosis*. Although it is debatable as to whether most NDMs actually cause nail infection or they are mere laboratory contaminants or secondarily invade already damaged nails, the accumulating evidence highly suggests that some NDMs can be true primary invaders⁵. Dermatophytoses of the fingernails and toenails, in contrast to those at other body sites, are particularly difficult to eradicate with drug treatment⁶. Among NDMs *Fusarium spp.* and others are mostly insensitive to standard onychomycosis treatment with topical agents as well as with oral terbinafine and itraconazole⁷.

Now a days we are observing that number of cases of onychomycosis which recur or show therapeutic non response after treatment with anti-fungal agents like Griseofulvin, ketoconazole, itraconazole, fluconazole or terbinafine orally and terbinafine, ciclopirox and amorolfine as topical agents is increasing in rapid pace.

Nail grows at an average rate of 0.1 mm/day (1 cm every 100 days). Finger nails require 3 to 6 months to re-grow completely while toe nails require 12 to 18 months⁸. Aberrant interaction of host, agent and / or environment results in either non-response, recurrence or extension of infections. So aims & objectives of this study are (1) screening of patients showing recurrences, persistence or extension of lesions after using oral and/or topical anti-fungal agents for more than 6 months in finger nail infections and 12 months in toe nails, (2) collection of etiological data, (3) patients' compliance, (4) phenotypic characterization of the fungi in such patients and (5) to study any change in mycological profile comparing the prevalent fungi isolated in study group with the same obtained from controlled group.

II. Material and Methods

Study period - a period of two years from January 2016 to December 2017.

Study area - Department of Microbiology, Medical College, Kolkata

Study population - Patients sent from dermatology OPD

Study design - a retrospective observational study.

Inclusion criteria -

1] patients diagnosed as having onychomycosis in nail/nails of hand /s and/or foot/feet and treated with antifungal agents orally or locally for >than 6 months in fingernail infections and > 12 months in toe nails or complaining of recurrences were selected.

2] The history of antifungal used and duration of therapy were the key point, noted along with several demographic data like age, sex, literacy, occupations, extent of involvements and comorbid conditions.

Exclusion criteria -

1] those with nail changes due to psoriasis, anaemia or onycholysis and other chronic diseases were excluded from study.

2] the group of patients who never used antifungal agents in suspected onychomycotic nails were excluded from study & considered as "control" group.

Dermatophytic onychomycosis were those cases where these were isolated in pure culture from infected nails irrespective of positive or negative direct microscopy. Non-dermatophytic moulds (NDMs) are considered as causative agent when direct microscopy was positive for fungal hyphae at least once and with isolation of same NDM twice in culture from the same nail in absence of any dermatophyte in any occasion. Onychomycosis with *Candida* are those cases where nail sample is positive for yeasts in direct microscopy irrespective of positive or negative culture⁹.

2.1] History of use antifungal medicines: The patients were enquired about the name of the medicines used, duration of therapy, adherence to advice of dermatologists, nature of self -therapy, use of medicines procured over the counter, use of fixed drug combinations containing steroids.

2.2] Demographic data like age, sex, literacy, occupations, extent of involvements and comorbid conditions were recorded.

2.3] Sample collection:

Firstly 70% alcohol was used to clean the site from where the sample to be collected. Nail clippings were obtained from pathological regions of nails. Full thickness of the nail was taken in distal and lateral nail lesions. In case of proximal superficial onychomycosis scrapings were collected by discarding uppermost layer of the nail apparatus. Nail sample were collected with sterile blades and kept in sterile brown paper or in sterile dry containers. In cases where NDM were isolated in pure culture from samples second time specimen was collected from the same nails to confirm NDM as causative agent and not a mere contaminant.

2.4] Direct Microscopy:

Preparation of KOH mount: A small quantity of the specimen was transferred into the 20% KOH and kept dissolved for several hours; preferably overnight. Then small amount of KOH solution was transferred on a clean grease free glass slide, a clean grease free cover slip was placed over the drop gently so that no air bubble is trapped inside. The observation was done under 10X and 40X objectives of optical microscope for fungal elements e.g. hyphae, yeast cells etc.

2.5] Culture in medium:

Inoculation :to isolate fungus in the artificial medium the sample was inoculated in Sabouraud's dextrose chloramphenicol agar medium .Two inoculation tubes for each sample were used and kept in an incubator for incubation at a temperature of 28⁰C and 37⁰c. The media were checked every day for growth of colony. The macroscopic features of obverse and reverse side of the colony was studied. Then lacto phenol cotton blue tease mount was prepared from colonies to study microscopic features. For growth of dermatophytes, subculture in dermatophyte test medium (DTM) was done. In cases of Candida colonies, germ tube & Dalmat test, subculture in candida chrome agar and other standard laboratory methods were undertaken. NDMs were confirmed as causative agents by following the protocol mentioned before.

III. Results

Figure:1

Out of selected 92 isolates of "study group" no fungal growth was seen in 22 isolates and growth was seen in 70 nail isolates (Figure 1). Another 90 patients who had suspected onychomycotic lesions but never used antifungal agents were in "control group". In study group 35 isolates were dermatophytes, 35 were non-dermatophytes and candida species (Figure 1). In control group dermatophytes were isolated in 50, candida species & non-dermatophytic moulds were 20 (Figure 1). No growth was seen in 20 samples. Figure:1

Figure:2 Age wise gender distribution in "study group"

In age group 1-10 no patient reported. The highest number of female patients, 15.22% (n=14) were seen in 21-30 years age group and male patients (n=13) were maximum 14.13% in 41-50 years age group. The record shows that in 21-30 years, 31-40 years and 41-50 years age group the reported cases are 20 (21.74%), 19 (20.65%) and 21 (22.83%) respectively. Figure:2

Table:1 & 1a Site wise distribution of lesions in "study group"

Table:1 & 1a showed that lesions in upper limbs and lower limbs were seen in 71 and 21 patients respectively. The right hand was seen to be more affected (n=44) than left hand (n=24). Both hands were affected in 3 patients. In lower limb lesions left leg was seen to be more (n=12) affected than right (n=8). Both legs were seen to be affected in 1 patient.

Table 2: History of occupation of "study group"

In Table :2 within "study population" the highest number of patients were housewives (30.43%), followed by students (25%), service persons (23.91%), farmers (5.43%), businessmen (4.35%), retired persons & teachers 3.26% each and professor and labour 1.1% each.

Table3: Literacy level of "study group"

In Table:3 it is observed that out of 92 patients 3.26% were highly qualified post graduates; 18.47% were graduates and 14.03% were in college levels. The school level (22.83%), drop out after class 5 (31.53%) and illiterate patients were only 9.78%. Thus clinically non-responding patients are literate in majority and are able to understand the directions given by clinicians about the use of anti-fungal agents.

Table:4 The compliance of the patients in "study group" to advice of Dermatologists

We found that in study population only 34 out of 92 patients strictly adhered to the recommendations of dermatologists and among them 19 patients became culture positive and 15 were culture negative. Rest 58 patients did not follow the directions properly and either self-medicated with fixed drug combinations containing steroids or applied medicines intermittently & irregularly. Among them 51 patients became culture positive and 7 were culture negative. Chi square value of this contingency table proves proper treatment schedule prescribed by dermatologists and adherence to that is strongly associated with culture positivity (p < .005). Griseofulvin, Itraconazole, Fluconazole, ketoconazole and Terbinafine for oral use and Terbinafine, Amorolfine and Ciclopirox for topical use were prescribed in different combinations by Dermatologists during the course of disease but many patients applied fixed drug combinations containing steroids either prescribed by general physicians or sold over the counter.

Table:5 Relation of direct microscopy of KOH mount and culture of samples from "study group"

Out of 70 culture positive isolates 68 were KOH positive showing fungal elements as well as culture positive. 2 were KOH negative but culture positive. Among 22 culture negative isolates 7 were KOH positive i.e. fungal element were seen but no fungus grew in artificial medium. 15 isolates were KOH negative & culture negative.

Table:6a Types of Dermatophytes isolated in "study group"

Out of 35 dermatophytic isolates *Trichophyton violaceum* was most prevalent 14.29% followed by *Trichophyton mentagrophyte var mentagrophyte* 12.86%, *T. verrucosum* 10%, *T. rubrum* 8.57%, *T. schoeleinii* 2.86% and *T. soudanense* 1.43%.

Table :6b Types of hyaline hyphae isolated in "study group"

Among hyaline hyphae isolated (n=26) on two consecutive occasions from same patient, same sites *Fusarium solani* was most prevalent 8.57%, followed by, *Aspergillus flavus* 4.29%, *A. fumigatus* 4.29%, *A. niger* 2.86%, *A. nidulans* 2.86%, *A. calidoustus*, *onychocola* and *Acremonium* 1.43% each. From above table it is evident that *Candida albicans* were commonest 7.14% and *Candida parapsilosis* was isolated in one patient (1.43%) only.

Table: 6 Types of Phaeoid fungi isolated in “study group”

Nine phaeoid fungi were isolated from the nail samples. Though these are commonly associated with subcutaneous mycosis but in our study *Alternaria*, *Bipolaris*, *Curvularia* and *Fonsecaea* spp. were isolated in two consecutive occasions from same nail/s and were considered as the causative agent of onychomycosis.

Table: 7 Fungal isolates in “control group”.

In control group highest number of isolates were *Trichophyton mentagrophyte varmentagrophyte* and lowest number were *T. schoenleinii* and *Fusarium species*.

Regarding history of comorbid conditions only 2 patients had psoriasis and one patient was diabetic. Not a single patient was immunocompromised or suffering from any other superficial skin lesions.

IV. Discussions

Onychomycosis is never a life threatening condition but it is common cosmetic nuisance. The patients seek treatment to get rid of this ailment. The increasing trend of clinical failure with antifungal agents has led the clinicians as well as patients in great trouble. Hence this study aimed at understanding the etiological factors related to such conditions.

In the present study 92 consecutive non-repeating nail samples were collected from the diagnosed but persistent, expanding or recurrent cases of onychomycosis over a period of two years in a tertiary care hospital. Out of these 92 samples 68 were both KOH positive and culture positive. 2 isolates showed no fungal element but fungal growth appeared in cultured medium. The rest 22 were KOH negative & growth negative isolates. Though all the samples were confirmed cases of onychomycosis and were getting treatment with either oral or topical or both types of antifungal agents continuously or intermittently, these patients might have been cured at that point of time and hence the sample showed no fungal growth.

In ‘study group’ 35 (50%) dermatophytes, 29 (41.43%) non-dermatophytic moulds and 6 (8.57%) candida species were isolated. In control groups (n=70) the dermatophytes isolated were 50 (71.42%), non-dermatophytes were 8 (11.42%) and candida species were 12 (17.14%). It is evident in our study that number of non-dermatophytes in test group has been increased, dermatophytes decreased keeping the candida species almost same in both groups. In study of Moumita Sarker *et al*¹⁰ the dermatophyte was 30 (48.38%) followed by yeast 21 (33.87%) and non-dermatophytic moulds were 15 (24.19%). Ravinder Kaure *et al*² obtained NDMs as most common isolates followed by dermatophytes and yeasts.

In present study no case was reported below 10 years and above 80 year of age both in test and control groups. Attar Farhana Iqbal *et al*⁹ got maximum number of patients 46.1% (36) in 21-40 years age group and Rupali S. Suryawanshi *et al*¹ found highest number of patients 36.98% (n=233) in 21-30 age group. Gebreabiezgi Teklebirhanet *et al*¹¹ found adults of age group 25-44 and 45-64 years each accounting for 32.5% of the cases. Our record showed that in 21-30 years, 31-40 years and 41-50 years age group the reported cases are 20 (21.74%), 19 (20.65%) and 21 (22.83%) respectively. From the studies it is evident that 21-50 years of age is most active part of life and maximum number of affected patients either susceptible or non-responders or recurrent are recorded in this period.

From age-sex distribution chart (Figure 2) it is evident that from 11-40 years age group male patients were more in number than female but reverse scenario was seen from 41-70 years. As the endocrinological and immunological factors were not studied so it is not possible to comment that peri- or post-menopausal females are more prone to develop onychomycosis.

In present study 71 (77.17%) patients had lesion in upper limb and 21 (22.83%) had in lower limbs. Among these patients the right hand was seen to be more affected (n=44) than left hand (n=24). Both hands were affected in 3 patients. In lower limb lesions left leg was seen to be more (n=12) affected than right (n=8). Both legs were seen to be affected in 1 patient. Priyanka Shukla *et al*¹⁴ commented that toe nail infection is not common in tropical countries presumably because of not using occlusive footwears and we also found that in our study lower limb infections were much less. Those who had the infection in toe nails had the habit of using covered shoes for several hours in a day. Moumita *et al*¹⁰ found in their study in same geographical area few years back the prevalence of finger nail involvement more in female patients but in our study no remarkable difference was noted between male and female group.

Considering the occupation (Table :2) highest number of patients reported were housewives (30.43%) followed by service holders (25%) engaged in official works, students (23.91%), farmers (5.43%), retired person & teachers (3.26% each), tailors (2.26%) and professor and labourer (1.1% each). The involvement of housewives in large number in all study groups might be due to their engagement in washing works, not getting

medicines in right time and right quantity or some other reason which was not identified in our study due to lack of follow up of the patients.

The next variable in this study was literacy level of the patients. To get cured the patients attended a tertiary care hospital repeatedly for more than 12 months in cases of toe nail infection and six months in finger nail infections and it appeared that they were motivated to have treatment. So, the literacy level was assessed from educational qualification. We found, out of 92 test group patients 3.26% were post graduate, 18.47% were graduate, 14.03% were under graduate but passed higher school examination, 22.83% were in school level or not crossing middle level school examination, 31.53% were drop out after class V and 9.78% were illiterate. Though maximum cases were in 'drop out after class V' group and minimum in post graduate students it cannot be concluded that literacy rate is directly related to success of treatment. Rather patients' compliance or readiness of the patients to follow the direction of physicians strictly was the important criterion. It was a retrospective study and true history from the patients was not available in all cases so we thought about the literacy level to consider. The more the patient is educated the more will be the adherence to directions of physicians but it was not evident in our study.

From table 4 it was seen that the culture positivity is strongly correlated with proper treatment with proper antifungals suggested by dermatologists. Those patients who used medicines irregularly, self-medicated with fixed drug combinations containing steroids purchased over the counter or suggested by physicians other than dermatologists appeared as clinically failure cases of onychomycosis. 15 out of 34 patients who strictly followed dermatologists' prescription developed non-response or recurrence whereas in rest 58 who deviated from that schedule 51 were culture positive at the time of study.

In present study among Dermatophytes *Trichophyton violaceum* was identified in 14.29% nail samples, *T. mentagrophytes var mentagrophytes* in 12.85%, *T. verrucosum* in 10%, *T. rubrum* in 8.57%, *T. schoenleinii* in 2.87% and *T. soudanense* in 1.43%. In control group among isolated dermatophytes *T. mentagrophytes var mentagrophytes* 25.87% were followed by *T. rubrum* 20%, *T. mentagrophytes var interdigitale* 14.3%, *T. verrucosum* 5.7%, *T. violaceum* and *T. schoenleinii* 2.9% each. In the study of Moumita *et al*¹⁰ *Trichophyton rubrum* was the most prevalent isolates followed by *T. tonsurans*, *T. soudanense*, *T. schoenleinii*, *T. mentagrophytes*, *T. verrucosum*, and *Epidermophyton spp*. Ravinder Kaur *et al*¹² found amongst the dermatophytes *T. verrucosum* as commonest followed by *T. rubrum*, *schoenleinii* and *T. violaceum* (1.8%). In a different geographical area Mashkoor Ahmed *et al*¹³ also found *T. rubrum* in highest prevalence. In that study next common fungus was *T. mentagrophytes* followed by *T. verrucosum*, *T. schoenleinii*, *T. tonsurans*, *T. violaceum* and *Epidermophyton floccosum*.

In our study test group patients used antifungal drugs for a considerable period and in them highest prevalent isolate was *T. violaceum* > *T. mentagrophytes* > *T. verrucosum* > *T. rubrum* > *T. schoenleinii* > *T. soudanense* in decreasing order.

While considering non-dermatophytic fungi as causative agents of onychomycosis we found these were equally responsible with dermatophytes. Among hyaline hyphae isolated (n=26) on two consecutive occasions from same patient, same sites *Fusarium solani* was most prevalent 8.57%, followed by *Aspergillus flavus* 4.29%, *A. fumigatus* 4.29%, *A. niger* 2.86%, *A. nidulans* 2.86%, *A. calidoustus*, *onychocolas spp.* and *Acremonium spp* 1.43% each. *Candida albicans* were commonest yeast 7.14% and *Candida parapsilosis* was isolated in one patient (1.43%) only. The phaeohyphomycetes are known to cause subcutaneous infections but now a days these are also being reported as the causative agents. Out of 9 phaeoid hyphae isolated *Alternaria spp* was 2 (2.86%), *Bipolaris* and *curvulariaspp* 3 (4.29) each & *Foncaeeaspp* 1 (1.43%). Poonam Sharma *et al*¹⁵ found the non-dermatophyte moulds were the most common pathogens isolated in 24 (53.33%) patients, followed by dermatophytes in 12 (26.66%) patients and *Candida spp.* in 9 (20%). In that study *Aspergillus flavus* was the most prevalent fungus. Suryawanshi R S *et al*¹ isolated yeasts in their study in 47.86% patients, dermatophytes in 30.71% and non dermatophytic fungi in 21.43%. That study demonstrated a shift in causative agents from dermatophytes to yeasts. *Fusarium spp* (10%) was the most common isolate followed by *Aspergillus spp* (5%). Phaeoid fungi namely *Cladosporium* (2.86%), *Curvularia* (2.14%), *Alternaria* (0.71%) were also isolated. Isolation rate of non-dermatophytic filamentous fungi was 21.43% of which *Fusarium* (10%) was the predominant isolate. Felix Bongoman *et al*¹⁶ mentioned in their work that *Aspergillus flavus*, *A. fumigatus*, *A. niger*, *A. nidulans*, and *A. versicolor* might be the cause of onychomycosis. Phangreichon Lungran *et al*¹⁷ also reported of *Onychocola canadensis* as a causative agent of onychomycosis and we got one isolates in a male patients. The dermatophytes were isolated from 17 male and 18 female patients but non-dermatophytes were seen more in male (19) than in female (16). The isolation of *Aspergillus spp.* from nail specimens may mean several things: causative agent, coloniser or contaminant. *Aspergillus spp.* isolated from nail specimens are not susceptible to most of the topical and systemic antifungals used to treat dermatophytes². Resistance to triazole antifungals occurs among the *Aspergilli*¹¹ and inadequate treatment may lead to resistance and recurrence of infection. Proper clinical diagnosis, laboratory workup and adequate antifungal therapy are three basic requirements¹⁶. *Aspergillus species* growing in nature often produces colourful pigments; therefore, an *Aspergillus* nail infection may well appear greenish, black, brown or various other shades¹⁸. The fungus will not, however,

spread to the surrounding skin like some other fungal causes of nail infection¹⁶. We also observed that colour of the finger and toe nails of a patient affected with *Aspergillus calidoustus*, which commonly shows Itraconazole resistant had same light brown colour [fig:3].

V. Conclusion

In the background of increasing number clinical failure of treatment of onychomycosis we found in our study that the patients who have applied fixed drug combinations containing steroids, antifungals and antibiotics or who had not followed the directions of dermatologists properly or had used medicines very irregularly and inappropriately were the major bulk of the study group. So proper therapeutic schedule is mostly needed to combat the situation. We have found along with dermatophytes, non-dermatophytes and *Candida spp* were also responsible for such conditions. So NDMs and yeasts should not be eliminated from the lists of causative agents. As the scope for antifungal susceptibility testing was not available in our laboratory we could not publish that but this is really needed to know whether drug resistance is the cause of clinical failure or improper use of antifungals and topical steroids are the culprits.

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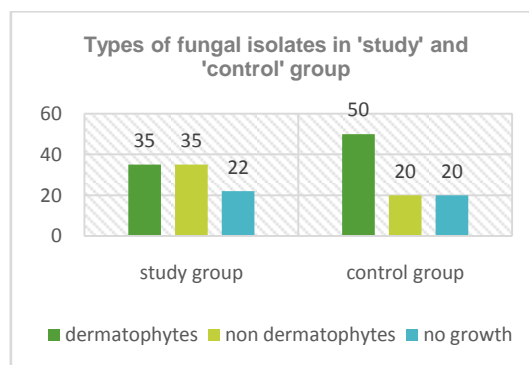


Figure:1 Fungal isolates in 'study' and 'control' group

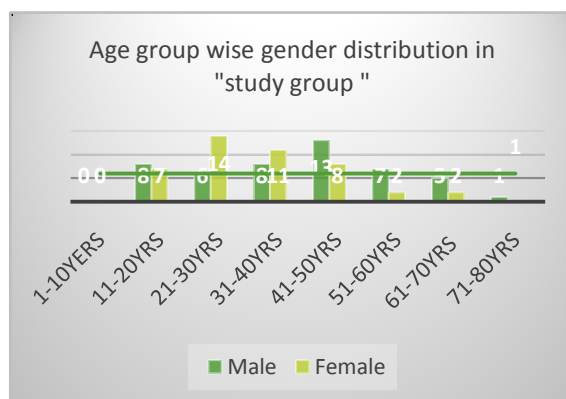


Figure : 2 Age wise gender distribution in “ study group”

Table:11 & 1a Site wise distribution of lesions in “ study group”

	Right hand	Left hand	Both hands	Right leg	Left leg	Both legs
1 finger	32	19				
2 fingers	5	2				
>2 fingers	7	3	2			
All fingers			1			
1 toe				3	7	
2 toes				1	2	
>2 toes				4	3	
All toes						1

Table:1a

	One hand	Both hands	One foot	Both feet
n	68	3	20	1
%	73.92	3.26	21.74	1.08

Table:2: Occupation of “study group”

occupation	Housewife	Students	Service	Retired	businessman	Teacher	Professor	Farmer	Tailor	Labour
number	28	23	22	3	4	3	1	5	2	1
percentage	30.43	25	23.91	3.26	4.35	3.26	1.1	5.43	2.17	1.1

Table: 3 Literacy level of “ study group”

Level of literacy	(n)=92	%
Post graduate	3	3.26
Graduate	17	18.47
Under graduate	13	14.03
School level	21	22.83
Drop out after class 5	29	31.53

Table: 4 The compliance of the patients in “study group” to advice of Dermatologists

	Culture positive	Culture negative	Total
Antifungals applied as per dermatologists' advice	19	15	34
Irregular use of antifungals Or application of steroid containing Fixed drug combinations	51	07	58
Total	70	22	92

Table:5Relation of direct microscopy of KOH mount and culture of samples from “study group”

	Culture “+”	Culture“-”	Total
KOH positive	68	7	75
KOH negative	2	15	17
Total	70	22	92

Table:6aTypes of Dermatophytes isolated in ‘ study group’

Name of fungi	No. of isolates	Percentage %	Male	Female
<i>Trichophytonviolaceum</i>	10	14.29	6	4
<i>T. mentagrophytes</i>	9	12.86	5	4
<i>T. verrucosum</i>	7	10	4	3
<i>T. rubrum</i>	6	8.57	1	5
<i>T.schoenleini</i>	2	2.86	nil	2
<i>T.soudanense</i>	1	1.43	1	nil

Table:6BTypes of non-dermatophyte fungi isolated in ‘ study group’

Name of fungi	No. of isolate(N=26)	Percentage %	Male	Female
<i>Fusariumsolani</i>	6	8.57	2	5
<i>Aspergillus flavus</i>	3	4.29	1	2
<i>A. fumigatus</i>	3	4.29	1	2
<i>Aspergillus niger</i>	2	2.86	1	1
<i>A.nidulans</i>	2	2.86	2	nil
<i>A.terreus</i>	1	1.43	1	nil
<i>A.calidoustus</i>	1	1.43	1	nil
<i>Onychocola spp.</i>	1	1.43	1	nil
<i>Acremonium spp.</i>	1	1.43	1	nil
<i>Candida albicans</i>	5	7.14	1	3
<i>Candida non- albicans</i>	1	1.43	1	nil

Table :6cTypes of Phaeoid fungi isolated in ‘study group’

Name of fungi	No. of isolates(n=8)	Percentage %	Male	Female
<i>Alternariaspp</i>	2	2.86	2	nil
<i>Bipolarispp</i>	3	4.29	1	2
<i>Curvulariaspp</i>	3	4.29	3	nil
<i>Foncaeceaspp</i>	1	1.43	nil	1

Table :7 Types of fungal isolates in “control group”

Name of fungus	number	%
<i>Trichophytonmentagrophytesvarmentagrophytes</i>	18	25.7
<i>Trichophytonrubrum</i>	14	20
<i>T. mentagrophytevarinterdigitale</i>	10	14.3
<i>Trichophytonverrucosum</i>	4	5.7
<i>Trichophytonviolaceum</i>	2	2.9
<i>Trichophytoschoenleini</i>	2	2.9
<i>Candida spp</i>	12	17
<i>Aspergillus fumigatus</i>	6	8.6
<i>Fusariumspp</i>	2	2.9
	70	100

Table : 8 comorbid conditions in “study group”

	No. of patients	percentage
Diabetes	1	1.09
Psoriasis	2	2.17
Immuno compromised	nil	0
Other superficial mycosis	nil	0



Fig:3 Onychomycosis of toenail having light brown discoloration of nails.



Fig: 3a colony of *Aspergillus calidoustus* isolated from the nails of patient in fig:3 having same light brown colour.

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