Study on Prevalence , Identification and Antifungal Susceptibility pattern of Dermatophytosis

INTRODUCTION

Dermatophytosis is a superficial fungal infection of keratinized tissue caused by a group of filamentous fungi such as Trichophyton, *Epidermophyton,* Microsporum.Theyareagroupoftaxonomicallyrelatedfungithatutilizekeratinasa source of nutrients and colonize keratinized tissues including stratum corneum of epidermis, nail, and hair[1.] Even though it's a superficial infection, dermatophytes do evoke inflammatory responses like scaling, vesiculation, pustulation, and abscess formation sometimes, because of their metabolic activities. Thus, the clinical infectionoccursiffungipenetratethehost'sprotectivebarrier.Dermatophytosisisby farthemostcommonfungaldiseaseinhumansandsometimesitbecomes invasive.

Multiple factors may affect the incidence of this fungal infection within a population. These include geographical area, climate, immunocompetence of the host, pathogenicity of the agent, and availability of the treatment. The growing numberofimmunocompromisedpatientsduetochemotherapy,transplant,HIVhas led to an increased incidence of dermatophytosis.These infections are both endemic and epidemic spreading easily and rapidly,especiallyinlowereconomicclasses,andthereforerequireearlyandsafe therapy. Epidemics of dermatophytosis have also been reported in the area of overcrowding and poor hygienic conditions.

The typical infections of dermatophytes are generally referred to as ringworm infections due to their ring-like appearance[2]. These infections are also knownas'tineainfections'andarenamedaccordingtothelocationofthelesionsof the body example- tinea capitis refers to the ringworm infection of the head region. Since these infections are often confused with other skin disorders, it is, therefore necessary to make early laboratory diagnosis for the better management of the condition. Dermatophytosisareprevalentgloballybuttheyarecommonintropics and may reach epidemic proportions in geographical areas with higher humidity[1].This can be also due to overpopulation and poor hygienic living conditions, urbanization, shared accommodation such as living in hostels, the use of occlusive footwear,tight-fittingclothes,communityshowers,andsportsactivities.Thehotand humid climate of India makes dermatophytosis a very common superficial fungal infectionoftheskin.Thedistribution,frequency,andcausativeagentsinvolvedvary from place to place depending upon the climatic, socioeconomic conditions, and population density, age, climatic variations[5]. Remissions and exacerbations , and chronicity mark in the course of the disease if left untreated ,and remains as a challenge[6.]

With an increasing armamentarium of drugs potentially available for the treatmentofdermatophytosis,thereistheneedforareference*invitro*susceptibility test method and the evaluation of more clinical isolates using different antifungal evaluation techniques.They are most often treated with topical antifungal drugs such as ketoconazole,terbinafinewhichexhibit*in-vitro*antifungalactivity.However the most severe dermatophytosis tinea capitis, and tinea unguium, often require the administration of systemic antifungal drugs such as griseofulvin, terbinafine, and

itraconazole[3]. Some new systemic antifungal drugs such as Posaconazole also appear to be effective *in-vitro* against dermatophytes and are currently being evaluatedinthetreatmentofdermatophytosis.Treatmentofdermatophyteinfections is usually based on clinical presentation, fungal element detection, and identification of the causative agents. Only a few reports have addressed drug resistance mechanisms in dermatophytes, and most of these were described for Trichophyton rubrum such as modifications of target enzymes in squalene epoxidase leading to resistance to terbinafine.

Thisstudywascarriedouttofindoutprevalenceofdermatophytesinfection as well as prevalence of drug resistance to fungal isolates . For Antifungal susceptibility testing, the agar-based disk diffusion susceptibility method for dermatophytes is being the focus of interest of many researchers, since its simple, and inexpensive and does not require specialized training[7].

MATERIALS & METHODS

This is a Prospective study conducted over 24 months in the Department of Microbiology in association with Department of Dermatology, venerology & Leprosy (DVL), in a tertiary care hospital.The sample size was 100 patients who are clinically suspected cases of Dermatophytosis attending Dermatology, venerology & Leprosy (DVL) OPD. The subjects fulfilling the inclusion criteria of the study were included in the study. Patientsofallagegroupsandbothsexeshavingsuspected Dermatophytosis were included in the study.HIVpatients,andthosewhoarealreadydiagnosedwithDermatophytosis were excluded. Demographicdataandhistorywereobtainedfromthepatient.Patientswereexplained about the study procedure. Ethical clearance for the study was obtained from the Institutional Ethics Committee prior to commencement. Informed written consent was taken from all study participants or their legal guardians, and all procedures were conducted in accordance with the principles of the Declaration of Helsinki. In the form, the patient has given consent for his/her images and other clinical information to be reported.

The clinical conditions were diagnosed by the clinician himself while examining the patients and the same were processed.Relevant samples like skin scrapings, nail clippings, hair stubs from the scalp were collected from those who are clinically diagnosed with Dermatophytosis.
Theinfectedareaiscleanedwith70%alcohol,andallowedtodry.Skinwasscraped from active margins of lesions with the help of a sterile blunt scalpel, nails were collected by clipping and hairs were plucked with sterile forceps, collected in sterile brownpaperpacketsandlabelled.Onepartofthesamplewasdirectlyobservedunder microscope by potassium hydroxide (KOH) mount. Another part of the sample was inoculated on Sabouraud's Dextrose Agar (SDA) with chloramphenicol (0.05mg/ml) and cycloheximide (0.5mg/ml) and also on Dermatophyte Test medium (DTM).

The information about the applications of antifungal therapy was obtained through an inquiry from the patients and outpatient chit if any treatment was taken duringthepast2-3months.Also,theotherinformationregardingimmunosuppressive/immunocompromised state including diabetes and other hormonal diseases was recorded. In addition, the age and sex of infected patients were noted down. The samples were transported to and processed at the Microbiology laboratory.A small quantity of sample (skin, hair) was placed in a drop of 10% KOH solution on a clean glass slide, preparation was kept aside for 30 minutes, then observed microscopically(40X) for presenceof fungal

elements.Nailsampleswereplaced in 20% KOH solution with 40% Dimethyl sulfoxide (DMSO) and observed under high power of microscope. In case of very thick nail specimens, preparation was kept in a moist chamber and observed next day.

The samples (skin, hair, nails) were cut into small pieces approximately 1- 2mminsizeand incubatedonSDAslantswithchloramphenicolandcycloheximide irrespective of their KOH positivity and incubated at 25℃ for 4 weeks.Tubes were observed for growth at least twice during first week, and once a week thereafter,foratotalof4weeks.Colonymorphologyandrateofgrowth, onobverse and pigment production on reverse of the test tube were observed. if there was no growth in the test tubes after four weeks, it was taken as negative for fungal growth. The growth obtained were examined microscopically by Lactophenol cotton blue (LPCB) mount. Size, shape, arrangement of microconidia and macroconidia, type of hyphae, any special structures like favic chandelier, spiral hyphae etc were noted, in order to identify the dermatophytes.Other tests like Slide culture technique, Dermatophyte test media (DTM), Hair perforation test, Biochemical tests like urease test were performed when necessary.

DermatophyteTestMedium(DTM)isusefultoisolateanddistinguish dermatophytes from fungal and bacterial contaminants.DTMwasequilibratedtoroomtemperaturepriortosample Inoculation and made sure that the agar surface is dry.Placedthesamplecentrallyonthesurfaceofthemediumandpressed it gently to ensure firm contact.Allowedthecaponthetubetoremainloosetoensuregaseous exchange during incubation.Incubatedat25℃forupto2weeksinambient air.The colour change from yellow to red indicates the growth of dermatophytes.ThereleaseofalkalinemetabolitesraisesthepHand changes the colour of phenol red in the medium. But there are more chances of false-positive and false-negative results.

Physiologicaltestsforspeciesidentification

a) Urease test – This test is done on Christensen's urea agar medium for the distinctionbetween*Trichophytonrubrum*and*Trichophytonmentagrophytes*. Ureaseproducedby*Trichophytonmentagrophytes*splitsureaintoammonia whichraisestheP^H.Thischangesthecolourofmediafromambertopinkish red due to the phenol red indicator.
b) Invitrohairperforationtest–

- Hair cut in to short pieces of approximate size 1cmarekeptinsterile distilled water in a suitable vial inoculated with small fragment of test fungus. Incubatedatroomtemperature.Individualhairsareremovedatintervalsupto4week sandexamined microscopically in Lactophenol cotton blue.The test is taken as positive when the patient shows wedge-shaped perforationsinthehair.Itispositivein*Trichophytonmentagrophytes* with localised area of pitting and marked erosion and negative in *Trichophyton rubrum*.

ANTIFUNGALSUSCEPTIBILTYTESTING

Recently CLSI (Clinical and Laboratory standards institute) has approved a microbroth dilution methods for antifungal susceptibility testing of mouldsbutthesetestsaredifficulttobeperformed

routinelaboratorysetup. The agar-based disk diffusion is an easy method to determine the antifungal susceptibility of dermatophytes. The application of *invitro* antifungal susceptibility testing for guidance of antifungal therapy has been limited dueto uncertain correlation between *invitro* and *in vivo* action of the drugs.

Antifungal susceptibility testing of the isolated dermatophytes was performed by agar-based disc diffusion method for 5 antifungal drugs. The antifungal disc was procured in readymade form. They are as follows: Ketoconazole (KT), Fluconazole (FLC), Itraconazole (IT), Nystatin (NS). Griseofulvin commercially available in powdered form not readymade as disk and stock solution was prepared in dimethyl sulfoxide as 1.25 mg/ml. Blank discs of 6mm were loaded with 20 microliters of prepared stock solution to obtain the desireddrugconcentrationperdisc.Theisolatesweresub culturedonPotato Dextrose agar (PDA) at 28°C for 7 days to enhance sporulation. The growth was harvested in sterile saline and the suspension was adjusted to 1 x 10^6/ ml. Plates of Muller Hinton Agar (MHA) plate of 4mm depth and Sabouraud's Dextrose agar (SDA) were inoculated. The surface of the plates was streaked in 4 different directions(90degree) to cover the entire surface, then kept aside for few minutes for drying and discs were applied using sterile forceps. The plates were incubated for 5-10 days. After sufficient growth occurred, the diameters of zones of inhibition surrounding the antifungal discs were measured and results interpreted. The zone of inhibition varied from 10-32 mmfor Fluconazole,17-36mmforItraconazole,21-22.3mmforketoconazole, nystatin 1.04± 20mm, Griseofulvin with mean ± SD of 22.6 ± 4.2, 27.3 ± 6.2,32 ±6.1and35.9±4.9respectively.Statistical analysiswasdoneby Regression analysis.

RESULTS

TABLENo:1.PREVALENCEOFDERMATOPHYTOSIS

TOTALSAMPLESCOLLECTED	**TOTALCULTUREPOSITIVE**
100	**52**

TabledepictsthePrevalenceofdermatophytosisinthepresentstudy.Thestudygroupconsistsof100patient samples,collectedfrompatientswho were clinically diagnosed with dermatophytosis.Outofthetotal100 samples,52wereculturepositiveshowingthePrevalence of dermatophytosis as 52% in the present study.

AGE	MALES (n=37)	PREVALENCE (%)	FEMALES (n=15)	PREVALENCE (%)	TOTAL (n =52)	PREVALENCE (%)
1-15 years	00	00	00	00	00	00
16-31 years	21	56.7%	07	46.6%	28	53.8

32-47 Years	03	8.1%	04	26.6%	07	13.4
48-63 years	11	29.7%	03	20%	14	26.9
64– 79 years	02	5.5%	01	6.8%	03	5.9
TOTAL	37	100	15	100	52	100

TABLE NO 2: AGEWISE DISTRIBUTION

Table no. 2 depicts the Age-wise distribution of 52 culture Positive cases. A high prevalence of dermatophytosis was observed in the age group 16-31yrs (53.8%)followedby26.9%in48-63yrsand13.4%in32-47years,5.9%in64-79years.Meanagegroupis35.79 years.

TABLENo.3.GENDER-WISEDISTRIBUTIONOFCASES

TOTAL	MALES	PREVALENCEIN MALES	FEMALES	PREVALENCE IN FEMALES
n = 52	37	71.1%	15	28.9%

Tableno.3depictstheGender-wisedistributionof52culturepositive cases.Out ofthetotal52culturepositivesamples, 37weremales(71.1%) &15were females (28.9%). Males outnumbered females in this study.MALE: FEMALEratio=2.4:1

TABLE NO 4: DISTRIBUTIONOFCASESACCORDING TO SOCIO-ECONOMICSTATUS

ECONOMICSTATUS	TOTAL NO OF CULTURE POSITIVES(52)	PERCENTAGE (%)

LOW SOCIO-ECONOMICSTATUS	36	69.2
MIDDLEECONOMIC STATUS	16	30.8
HIGHECONOMIC STATUS	00	00
TOTAL	52	100

TableNo4depictsthedistributionofcasesaccordingtothesocio-economic status.Outofthetotal 52culturepositivesamples,36casesbelongstoLow- socioeconomic status,16 belongs to Middle socio-economic status .

. **TABLENO:5.ASSOCIATEDSYSTEMICDISORDERS**

SL.NO	SYSTEMICDISORDERS	No of Patients in the total Culture PositiveSamples	Prevalence (%)
1	DiabetesMellitus	18	34
2	Hypothyroidism/Thyroid disorders	10	18
3	Hypertension	08	16
4	BronchialAsthma	07	13
5	ChronicObstructive PulmonaryDisease	06	12.5
6	ChronicKidneyDisease	03	6.5

OBSERVEDINDERMATOPHYTOSIS

TableNo5depictstheco-morbiditiesassociatedwithDermatophytosis.
Themostcommonco-morbidityassociatedwithdermatophytosisisDiabetes Mellitus, followed by Thyroid disorders.ThereisalsoassociationofHypertension,Bronchialasthma,Chronic Obstructive Pulmonary disease and chronic kidney disease.Afewcasesareassociatedwithmorethanoneco-

morbidity.

TABLENO:6.RISKFACTORASSESSED

RISKFACTOR	**TOTALNUMBER**
Changeundergarmentsdaily	46
Sharingof towel	45
Bath daily	44
Tightclothes	31
Sharingof clothes	24
Sharingof footwear	21
Seasonalexacerbation	21
Familyhistoryofdermatophytosis	16

TableNo6depictstheriskfactorsassociatedwith Dermatophytosis.Theunhygienicconditionsareclosely associatedwithdermatophytosis.Maintenanceofpersonalhygieneisessentialtopreventthecondition.

TABLENO:7.MORPHOLOGYOFLESIONS

TYPEOFLESION	**PERCENTAGE**
Classicallesion	91.5%
Pustular	3
Eczematous	2
Bullous	2
Pityriasisrosealike	0.9
Papulosquamous	0.6

TableNo7depictsthevariousMorphologyoflesions.ThemostcommonlesionobservedisClassical typelesion91.5%,followedby pustular 3%, Eczematous 2%, Bullous 2%.

❖ **TABLENO:8.TOTALBODYSURFACEAREAINVOLVED**

TOTALBODYSURFACEAREAINVOLVED(%)	**PERCENTAGE**
1-5	78.8
5-10	12.4

>10	8.8

TableNo8depictsthetotalbodysurfaceareainvolvedin dermatophytosis.1-5percentagebodysurfaceareainvolvedin78.8%andin12.4%,5-10 percentage body surface area involved, whereas in 8.8% more than 10 percentage body surface area involved.

❖ **TABLENO:9.VARIOUSTYPESOFSAMPLES COLLECTED**

TYPEOFSAMPLE	**TOTALNUMBEROF SAMPLESCOLLECTED**	**TOTALCULTURE POSITIVE**
SKINLESION	86	49
HAIRSTUBS	03	02
NAIL	11	01

TableNo9depictsthevarioustypeofsamples collected.Outoftotal100samples,86wereskinlesions,03werehairstubs,11were nail. Out of the total 86 skin lesions, culture was positive in 49, culture was positive in 02 out of 03 hair stubs, and 01 out of total 11 nail samples were positive.

❖ **TABLENO:10.DISTRIBUTIONOFCLINICALTYPESOF DERMATOPHYTOSISINTHETOTALCULTURE POSITIVE SAMPLES**

SL.NO	**Clinicaltype**	Males	Females	Prevalence (%)
1	Tinea corporis	28	12	76
2	Tineacruris	03	02	10
3	Tineafaciei	02	01	06
4	Tineacruris+ Tinea corporis	02	00	04
5	Tineacapitis	02	00	04

ThetableNo10depicts,thedistributionofclinicaltypeof dermatophytes in the 52 culture positive samples.ThemostcommonclinicaltypeisTineacorporis(76%),andTinea cruris (10%).TineacrurisandTineacorporisaretogetherfoundinfew patients.

TABLENO:10a.DISTRIBUTIONOFTINEACORPORISIN VARIOUS PARTS OF BODY

SL.NO	Tineacorporis=40	Number	PERCENTAGE
1	Trunk	17	42.5
2	Neck	11	27.0
3	Arms	10	25.5
4	Legs	02	5.0

TableNo10adepictsthedistributionofTineacorporisinvariousbody parts.

- Themostcommondistributionisaroundtrunk-17,followedbyneck,arms, legs.

❖ **TABLENO:11.KOHMOUNT&CULTUREGROWTHCOMPARISON**

TOTAL KOH MOUNT POSITIVE: 49

TOTALKOHMOUNTNEGATIVE:51

KOHMount	CULTURE	TOTAL
NEGATIVE	NEGATIVE	48
NEGATIVE	POSITIVE	03
POSITIVE	NEGATIVE	00
POSITIVE	POSITIVE	49

TableNo11depictscomparisonofKOHmountwithculture growth.

- 49sampleswereKOHmountandculture positive.
- 48sampleswereKOHmountandculturenegative,whereas03sampleswere KOH mount negative and Culture Positive.

TABLENO:11a.PERCENTAGEOFDERMATOPHYTES ISOLATEDINTHESTUDYPOPULATION

TOTAL SAMPLES PROCESSED	TOTALKOH POSITIVE	PERCENTAGE OF KOH POSITIVITY	TOTAL CULTURE POSITIVE	PERCENTAGE OF CULTURE POSITIVITY
100	49	49%	52	52%

TableNo11adepictspercentageofdermatophytesinKOHmountand culture.InKOHmountthepercentageis49%,andinculturethepercentageis 52%.

❖ **TABLENO:12.DERMATOPHYTESISOLATEDINTHE CULTURESAMPLE**

SL.NO	**Agent**	**NoofSamples positive**	**Prevalence(%)**
1	*Trichophytonrubrum*	28	53.8
2	*Trichophytonmentagrophytes*	14	26.9
3	*Trichophytontonsurans*	5	9.6
4	*Microsporumgypseum*	3	5.9
5	*Epidermophytonfloccosum*	2	3.8
TOTAL		**52**	**100**

TableNo12depictsthevariousdermatophytesisolatedinclinicalsamples.

- *Trichophytonrubrum*wasthemostcommonagent-28,followedby *Trichophytonmentagrophytes*-14.

TABLENO:13a.PERCENTAGEOFTRICHOPHYTONRUBRUM ISOLATEDWITHCLINICALSAMPLES

CLINICAL TYPES	Prevalencein %	*Trichophyton rubrum*	Total Prevalence (%)
Tineacorporis	76	22	28.9%
Tineacruris	10	04	40%
Tineafaciei	6	01	16.6%
Tineacruris+Tinea corporis	4	01	25%
Tineacapitis	4	00	0%

Table no 13a depicts the percentage of trichophyton rubrumisolated among the clinical samples.

- The table shows the prevalence of trichophyton rubrum in Tinea corporisas28.9%,Tineacrurisas40%,Tineafacieias16.6%,Tinea cruris + Tinea corporis as 25%, Tinea capitis as 0%.

TABLENO:13b.PERCENTAGEOFTRICHOPHYTONMENTAGROPHYTESISOLATEDWITH CLINICAL SAMPLES

CLINICAL TYPES	Prevalencein %	*Trichophyton mentagrophytes*	Total Prevalence (%)
Tineacorporis	76	11	14.4%
Tineacruris	10	03	30%
Tineafaciei	6	00	0%
Tineacruris+Tinea corporis	4	01	25%
Tineacapitis	4	00	0%

- Tableno13bdepictsthepercentageoftrichophytonmentagrophytes isolated among the clinical samples
- The table shows the prevalence of trichophyton mentagrophytes in Tineacorporisas14.4%,Tineacrurisas30%,Tineafacieias0%, Tinea cruris + Tinea corporis as 25%, Tinea capitis as 0%.

TABLENO:13c.PERCENTAGEOFTRICHOPHYTONTONSURANS ISOLATEDWITHCLINICALSAMPLES

CLINICAL TYPES	Prevalencein %	*Trichophyton tonsurans*	Total Prevalence (%)
Tineacorporis	76	04	5.2%
Tineacruris	10	00	0%
Tineafaciei	6	00	0%
Tineacruris+Tinea corporis	4	00	0%
Tineacapitis	4	01	25%

Tableno13cdepictsthepercentageoftrichophytontonsuransisolated among the clinical samples

- The table shows the prevalence of trichophyton tonsurans in Tinea corporisas5.2%,Tineacrurisas0%,Tineafacieias0%,Tineacruris +Tineacorporisas0%,Tineacapitisas25%.

TABLENO:13d.PERCENTAGEOFMICROSPORUMGYPSEUM ISOLATED WITH CLINICAL SAMPLES

CLINICAL TYPES	Prevalence in %	*Microsporumgypseum*	Total Prevalence (%)
Tineacorporis	76	02	2.6%
Tineacruris	10	00	0%
Tineafaciei	6	00	0%
Tineacruris+Tinea corporis	4	00	0%
Tineacapitis	4	01	25%

- Tableno13ddepictsthepercentageofMicrosporumgypseumisolated among the clinical samples

- ThetableshowstheprevalenceofMicrosporumgypseuminTinea corporis as 2.6% %, Tinea cruris as 0 %, Tinea faciei as 0%, Tinea cruris + Tinea corporis as %, Tinea capitis as 25%.

TABLENO:13e.PERCENTAGEOFEPIDERMOPHYTON FLOCCOSUM ISOLATED WITH CLINICAL SAMPLES

CLINICAL TYPES	**PREVALENCE in** (%)	***Epidermophyton floccosum***	**Total Prevalence (%)**
Tineacorporis	76	02	2.6%
Tineacruris	10	00	0%
Tineafaciei	6	00	0%
Tineacruris+ Tineacorporis	3	00	0%
Tineacapitis	3	00	0%

Tableno13edepictsthepercentageofEpidermophytonfloccusum isolatedamong the clinical samples

- ThetableshowstheprevalenceofEpidermophytonfloccusuminTinea corporisas2.6%,Tineacrurisas0%,Tineafacieias0%,Tineacruris +Tineacorporisas%,Tineacapitisas0%.

❖ **TABLENO.14.ANTIFUNGALSUSCEPTIBILITYPATTERN OFTHEDRUGSINDISKDIFFUSIONTEST**

NAMEOFTHEDRUG	PERCENTAGEOFSENSITIVITY
Itraconazole	97.04%
Fluconazole	70.3%
Ketoconazole	55.5%
Nystatin	32.98%
Griseofulvin	30.84%

- TableNo14depictstheAntifungalsusceptibilitypatternofvariousdrugsin disk diffusion test.
- MostoftheisolatesweresensitivetoItraconazole-97.04%,followedby Fluconazole - 70.3%.
- TheleastsensitivedrugwasGriseofulvin– 30.84%

TABLENO.14a.ANTIFUNGALSUSCEPTIBILITYPATTERNOF TRICHOPHYTON RUBRUM

NAMEOFTHEDRUG	*Trichophytonrubrum (28)*
Fluconazole	89.2%
Ketoconazole	85.7%
Itraconazole	92.4%
Nystatin	67.8%
Griseofulvin	64.2%

- TheabovetableshowsAntifungalsusceptibilitypatternoftrichophyton rubrum.
- Thesensitivityismaximumtoitraconazole(92.4%)andleasttogriseofulvin 64.2%.

TABLENO.14b.ANTIFUNGALSUSCEPTIBILITYPATTERNOF TRICHOPHYTON MENTAGROPHYTES

NAMEOFTHEDRUG	*Trichophytonmentagrophytes(14)*
Fluconazole	85.7%
Ketoconazole	78.5%
Itraconazole	92.8%
Nystatin	57.1%
Griseofulvin	50%

- TheabovetableshowsAntifungalsusceptibilitypatternoftrichophyton mentagrophytes.
- Thesensitivityismaximumtoitraconazole(92.8%)andleasttogriseofulvin 50%

TABLENO.14c.ANTIFUNGALSUSCEPTIBILITYPATTERNOF TRICHOPHYTON TONSURANS

NAMEOFTHEDRUG	*Trichophytontonsurans (5)*
Fluconazole	60%
Ketoconazole	80%
Itraconazole	100%

Nystatin	40%
Griseofulvin	40%

- TheabovetableshowsAntifungalsusceptibilitypatternoftrichophyton tonsurans
- Thesensitivityismaximumtoitraconazole(100%)andleasttonystatin, griseofulvin 40%.

TABLENO.14d.ANTIFUNGALSUSCEPTIBILITYPATTERNOF MICROSPORUM GYPSEUM

NAMEOFTHEDRUG	*Microsporumgypseum (3)*
Fluconazole	66.6%
Ketoconazole	33.3%
Itraconazole	100%
Nystatin	0%
Griseofulvin	0%

- TheabovetableshowsAntifungalsusceptibilitypatternofmicrosporum gypseum.
    - Thesensitivityismaximumtoitraconazole(100%)andleastsensitivityto nystatin , griseofulvin 0%.

TABLENO.14e.ANTIFUNGALSUSCEPTIBILITYPATTERNOF EPIDERMOPHYTON FLOCCUSUM

NAMEOFTHEDRUG	*Epidermophytonfloccusum(2)*
Fluconazole	50%
Ketoconazole	0%
Itraconazole	100%
Nystatin	0%
Griseofulvin	0%

- TheabovetableshowsAntifungalsusceptibilitypatternofEpidermophyton floccosum
- ThesensitivityismaximumtoItraconazole(100%)andleasttonystatin, griseofulvin , ketoconazole 0%

DISCUSSION

Dermatophytosis is a common superficial mycosis causing significant cutaneous morbidity. Itching is severe and disabling lesions on the genital and other areas cause social embarrassment and impair quality of life. The incidence of dermatophytosis is increasing in recent times especially in the young age group. The rising prevalence of dermatophytosis has been attributed to many factors including tropical climate, overcrowding, urbanization, shared accommodation such as living in hostels, use of occlusive footwear, tight-fitting clothes, community showers,andsportsactivityhavebeenproposedbuttheexactreasonhasnotbeen elucidated.Thepresentstudyshowsaprevalenceof52%whichisco-relatedwith Sudip das et al (2020, 53.4%).Thisisrelatedtovariousfactorsincludingseasonalvariations,personal hygiene, hot & humidity, family history etc.

Theyoungestpatientwas15yearsoldandtheoldestpatientwas72yearsold.Theprevalenceof dermatophytesismorecommoninagegroupof16-31 years, this can be due to

a) Increasedphysicalandsports activities.
b) Sharingofclothes,footwears.
c) Increasedsweating.
d) Poorhygienicpractices.
e) The increased incidence of dermatophytosis in this age group 15-30 maybebecausethispopulationgrouptakespartinmaximumoutdoor activities such as agriculture and manual labour, which predispose to acquire infection from environmental exposure. However, Bindu *et al* observed a higher prevalence in the age group of 11- 20 years.
f) In the present study, there are an observation of sharing towels and footwear, and clothes in our patients. This could contribute to the spread of infection.
g) Objects such as clothing, bedsheets, and towel harbour the fungal pathogenandarecapableoftransmittingthediseaseamongthefamily members.

In addition, fungal spores remain viable for months in household dust leading to recurrent episodes of clinical diseases. Asymptomatic carriers among family members may also be another cause for recurrence.A third of patients wore tight clothes such as jeans, and woollen undergarments in winters, which were often unwashed for weeks creating a damp environment favourable for the proliferation of

dermatophytes.Dermatophytes are the most commonly implicated etiological agents, particularly *Trichophyton rubrum*and *Trichophyton mentagrophytes* var *interdigitale, followed*bycandidaspeciesandnondermatophyticmouldsinimmunocompromised patients. Dermatophytes account for approximately 90% of the toenail, and 50% in the fingernail. Dermatophyte invasion of the nail plate is termed tinea unguium.Diabetesandotherimmunocompromisedconditionsmakethepatientsmoreprone to the disease.

The increased prevalence in males may be due to the occupational hazards related to their nature of work and increased risk of exposure to infections, Furthermore, the lower incidence in females may also be due to the nonreportingoffemalepatientstohospitalsduetotheprevailingsocialstigma in the rural population of India.

Direct examination using KOH is still a fast and simple technique for dermatophytesdiagnosis.Moreover,KOHresultscorrespondedwith reference standard cultures.Non visualization of hyphae on direct microscopy could be due to a severe inflammatoryreactionthatobscuresthem.ThreesampleswereKOHnegative but culture positive. ThelimitationofKOHmounttestingisthatitcannotidentifythespecificgenus and species of fungi. Therefore, standard culture and identification are important to confirm the etiological agents and speciation of dermatophytes.

- OutofthetotalTineacorporis,themostcommondistributionwasobservedin the trunk followed by the neck, legs, and arms. This could be related to the above-specified reasons such as increased sweating, wearing tight clothes, etc.

- Besides the climatic conditions favorable for the growth of dermatophytes, other factors such as migration of laborers, workers, and tourists frequently visitingthisregion,overcrowding,unhygieniclifestyleofthecommunitywith low socioeconomic background might contribute to the development of dermatophytes.

Trichophyton rubrum grew relatively slower (10-15 days), the growth is powdery to velvety with a reddish tinge on the obverse and rusty brown to deep red on the reverse.Well,septate,pencil-shapedhyphaewithnumerousspericalmicroconidia along with macroconidia were visible on microscopic examination. As *Trichophyton rubrum* is a slow-growing organism, there is a possibility that other dermatophytes species might overgrow or mask the growth while attempting isolation.

Rarely do these pathogens cause a more aggressive and invasive form of infection.

thatmaypresentasa)Majocchi'sgranuloma(nodulargranulomatousperifolliculitis)

isaninfectionofdermalandsubcutaneoustissuerelatedtodisruptionofhairfollicles and spillage of fungi into the dermis, which produces a granulomatous inflammation. Both immunocompromised and immunocompetent patients may be affected by this type of infection b) In deep or invasive disease, invasion is limited mainly to the extremities and there is subcutaneous involvement without the involvement of other internal organs. Patients with this syndrome are usually immunocompromised hosts.
c) In exceptional instances, generalized invasive disseminated infection with dermatophyteshasbeenreported.PCRamplificationdirectlyfromthesamplescould be a better tool to prove this. In patients who have a superficial infection with dermatophytes, culture from subcutaneous tissue may be contaminated and thus lead to misdiagnosis of invasive infection. Some authors have suggested thatspecific T-cell immunity plays a role here, but virulence factors of the specific pathogen may also be important.

- Mostclinicaltypesofdermatophytosisrespondwelltotopicalantifungal therapy, while Tinea unguium, Tinea capitis and extensive type of dermatophytosis require systemic therapy (Priyam Basak et al, 2019).

- Differentdermatophytestrainsmayhavedifferentantifungalsusceptibility patterns which may vary geographically also.

- Somestrainsofdermatophytesresistanttoparticularantifungalagenthave been reported.

- Recently there has been a rise in antifungal resistant strains of fungi. Therefore,earlyinitiationofcorrectantifungaltherapyisessentialforproper treatment and prevention of spread of disease.

- This makes testing of the susceptibility of dermatophytes more important whichmayhelpinsurveillanceandepidemiologicalstudyofresistantstrain. (Prabhat Kiran khatri *et al*, 2017).

CONCLUSION

Superficialfungalinfectionsareanimportantpublichealthproblem,especially dermatophytosis infections. Dermatophytosis is a superficial fungal infectionof keratinized tissue of the skin, hair, and nails which are rich in keratin (a predisposing factor and nutritional requirements of filamentous fungi) caused mainly by *Trichophyton, Epidermophyton, Microsporum.*Tocausedisease,dermatophytesmustadheretoasurfacesuchasepithelial cells, and then obtain nutrients for growth from these cells.Dermatophytessecretekeratinasesandotherproteaseswhicharethoughtto play a role during infection, however, the temporal expression of these proteases appears to vary between species. studyaimedtodetectthePrevalenceandIdentifythefungalcauseof Dermatophytosis and evaluate the Antifungal Susceptibility pattern.Inthestudy,theMaleswereaffectedmorecommonthanfemales,andthe most commonly affected age group was 16-31 years.Unhygienic conditions among the low socio-economic group, frequent migrationoflaborers,workersmaybesomeofthecontributingepidemiological factors for the higher prevalence.Diabetes Mellitus, Thyroid disorders, Hypertension, Bronchial asthma were the most frequent systemic association noted in this study. Other systemic conditionslikeChronicobstructivepulmonarydisease,chronickidneydisease also observed.

Tinea corporis was the most common clinical pattern observed in the study. Varioustineaconditionsinthepresentstudyworediagnosedbytheclinician itself based on the clinical presentation.

Tinea conditions are a consequence of exhaustive physical work and prolonged exposure to the sun leading to excessive sweating. In addition, the tightfittingsandsyntheticclothingparticularlyinmalesprovidedamp,sweaty, and warm skin conditions factors that favor the growth of dermatophytes or may exaggerate the disease condition.Tinea pedis and Tinea unguium might result from wearing socks and shoes foralongperiodprovidingdampconditions,especiallyininter-digitalspaces.Themostcommonfungalisolatewas*Trichophytonrubrum*with*Trichophyton mentagrophytes* being the second commonest one.Injudicioususeoftopicalsteroidapplicationwasfoundinalarmingnumbers both in OTC and prescribed by practitioners.It has been suggested that treatment for deep invasive infection with *Trichophyton*shouldincludeeitheritraconazole,andinsomeseverecases, surgical debridement is also required.The most potent antimycotic agent against the dermatophytes was itraconazoleintheAntifungalsusceptibilitytestingwithdiskdiffusionandalso *Trichophyton rubrum* was

sensitive to itraconazole the most.Incomparisontootherdrugs,Griseofulvinwasfoundtobeless active.Topicalsteroidapplicationcanalsoenhancethepenetrationoffungustothe dermis which can lead to treatment failure.A high incidence of intrafamilial tinea infections, misuse of corticosteroids containing topical antifungal preparations, poor compliance to treatment, and poorpersonalhygienewereassociatedwithrecurrencesandpoorresponses to treatment.Recurrences may also be due to reinfection from family members or the environment,andmostofthepatientsstoptreatmentassoonastheyget partial relief.

Dermatophyte organisms are likely becoming more virulent with a gradual increase in resistance to commonly used antifungal drugs as a result of varioushost,environmental,andtreatmentfactorsposingagreatemerging health hazard to the community.

Although the present study focuses primarily on the prevalence of different dermatophyte species, and its Anti-fungal susceptibility pattern, a more systemicstudycoveringalargerpopulationandoveralongerperiodwould give a better insight into the epidemiology

BIBLIOGRAPHY

1. Vikesh Kumar Bhatia, and Prakash Chand Sharma et al:Epidemiological studies on Dermatophytosis in human patients in Himachal Pradesh, India, doi:10.1186/2193-1801-3-134 Cite this article as: Bhatia and Sharma: EpidemiologicalstudiesonDermatophytosisinhumanpatientsinHimachal Pradesh, India. Springer Plus 2014 3:134.

2. JahanT,FarhanaA,KanthF.Prevalenceandspectrumofdermatophytesin patients attending a tertiary care hospital Srinagar, Kashmir. Int J Res Med Sci 2021; 9:1064-70.

3. JAGPALSINGH,MUHAMMADZAMAN&ADITYAK.GUPTA,Mycology Section, Mediprobe Research Inc., London, Ontario, and Division of Dermatology, 2007, Department of Medicine, Sunnybrook Health Sciences Center,andtheUniversityofToronto,Toronto,Ontario,Canada.Evaluationof microdilutionanddiskdiffusionmethodsforantifungalsusceptibilitytestingfor dermatophytes.

4. WatcharamatMuangkaew,ThanwaWongsuk,NatthanejLuplertlopetal ,2017:Commondermatophytesandinvitroanti-fungalsusceptibilitytesting in patients attending the Dermatological Clinic at the Hospital for Tropical

Medicine, Bangkok.

5. Noronha TM, Tophakhane RS, Nadiger S. Clinico-microbiological study of dermatophytosisinatertiarycarehospitalinNorthKarnataka.IndianDermatol Online J 2016; 7:264-71.

6. Pathania S, Rudramurthy SM, Narang T, Saikia UN, Dogra S.A prospective studyoftheepidemiologicalandclinicalpatternsofrecurrentdermatophytosis at a tertiary care hospital in India. Indian J Dermatol Venereol Leprol 2018:84:678-684.

7. Basak P, Mallick B, Pattanaik S. Prevalence of dermatophytic infections includingantifungalsusceptibilitypatternofdermatophytesinatertiarycare hospital. Int J Res Med Sci 2019;7:xxx-xx.

8. PrabhatKiranKhatri,DileepKachhawa,VinodMaurya,SarojMeena,Archana Bora, Laxmi Rathore, K.L. Seervi and Shivani Khullar. 2017. Antifungal Resistance Pattern among Dermatophytes in Western Rajasthan. Int.J.Curr.Microbiol.App.Sci. 6(7): 499-509. doi: https://doi.org/10.20546/ijcmas.2017.607.06.

9. Deepasri,A.,P.K.UmaMaheswariandMangayarkarasi,V.2018.Clinicaland Species Profile of Dermatophytosis in Tertiary Healthcare Centre. Int.J.Curr.Microbiol.App.Sci. 7(05): 2221- 2225. doi: https://doi.org/10.20546/ijcmas.2018.705.25.

10. SharmaR,AdhikariL,SharmaRL.Recurrentdermatophytosis:Arising problem in Sikkim, a Himalayan stateofIndia.IndianJPatholMicrobiol[serialonline]2017[cited2022Jan 22]; 60:541-5. Available from:https://www.ijpmonline.org/text.asp?2017/60/4/541/222997.

11. VineethaM,SheejaS,CelineMI,SadeepMS,PalackalS,ShanimolePE, DasSS.Profileofdermatophytosisinatertiarycarecenterin Kerala,India. Indian J Dermatol [serial online] 2019 [cited 2022 Jan 22]; 64:266-71. Available from: https://www.e-ijd.org/text.asp?2019/64/4/266/265814.

12. Bhagra S, Ganju SA, Kanga A, Sharma NL, Guleria RC, Mycological pattern ofdermatophytosisinandaroundShimlahills.IndianJDermatol2014:59:268- 70B.

13. SurendranK,BhatRM,BoloorR,NandakishoreB,SukumarD.Aclinicaland mycological study of dermatophytic infections. Indian J Dermatol 2014; 59:262-7.

14. RanNir-Paz,HilaElinav,GeraldE.Pierard,DavidWalker,AlexanderMaly, Mervyn Shapiro, Richard C. Barton, Itzhack Polacheck JClinMicrobiol.2003Nov;41(11):5298–5301.doi:10.1128/JCM.41.11.5298-5301.2003

15. E.I. Nweze and I.E. Eke Department of Microbiology, University of Nigeria, Nsukka, Enugu State, Nigeria,2017, Dermatophytes and dermatophytosis in theeasternandsouthernpartsofAfricaE.I.Nweze∗ andI.E.EkeDepartment of Microbiology, University of Nigeria, Nsukka, Enugu State, Nigeria.

16. M.A.Ghannoum,V.Chaturvedi,A.Espinel-Ingroffetal,Intraand Interlaboratory study of a method for testing the Antifungal susceptibility of Dermatophytes, 2004. American Society for MicrobiologyJournal of Clinical MicrobiologyVolume 44, Issue 12, December 2006,Pages4353-435 https://doi.org/10.1128/JCM.00688-06.

17. Shambel Araya, Betelhem Tesfaye, Desalegn Fente, Epidemiology of Dermatophyte and Non-Dermatophyte Fungi Infection in Ethiopia, 2020, Clinical, Cosmetic and Investigational Dermatology.

18. SundarKhadka,1,2JeevanBahadurSherchand,2DineshBinodPokhareletal: Clinicomycological Characterization of Superficial Mycoses from a Tertiary CareHospitalinNepalHindawiPublishingCorporationDermatologyResearch and Practice Volume 2016, Article ID 9509705, 7 pages http://dx.doi.org/10.1155/2016/9509705.

19. Sudip Das, Abhishek De, Rajdeep Saha, Nidhi Sharma, Monika Khemka, Sonal Singh, Abu Hena Hesanoor Reja, Purushottam Kumar IndianJDermatol.2020Mar-Apr;65(2):11-122.doi: 10.4103/ijd.IJD_203_19.

20. PietroNenoff,ShyamB.verma,Reshamvasanietal,2018:ThecurrentIndian epidemic of superficial dermatophytosis due to Trichophyton mentagrophytes-A molecular study,https://doi.org/10.1111/myc.12878.

21. BashayerAliAlshehriAishaM.Alamri,AliA.Rabaanetal:Epidemiology ofDermatophytesIsolatedfromClinicalSamplesinaHospitalinEastern SaudiArabia:A20-YearSurvey,JournalofEpidemiologyandGlobalHealth (2021) 11:405–412 https://doi.org/10.1007/s44197-021-00005-5.

22. Salama A. Ouf, Tarek A. Moussa, Alshimaa M. Abd-Elmegeed, Samar R. Eltahlawy et al: Dermatophytosis in special patient populations, doi: 10.12980/jclm.4.2016J5-237©2016bytheJournalofCoastalLifeMedicine.

23. KDinesh, Chitralekha Saikumar,A Study on the Dermatophytic Pattern in DiabeticandNon-DiabeticPatient,JResMedDentSci,2021,9(6):101-106.

24. SinghS,BeenaPM.ProfileofdermatophyteinfectionsinBaroda.IndianJ Dermatol venereal Lerol 2003;69:281-283.

25. Shivam, Goel S, Agrahari S, Maddali GK. The clinical type and etiological agentsofsuperficialdermatophytosis:Acrosssectionalstudy.IPIndianJClin Exp Dermatol 2021;7(4):331-336.

26. R.K.Agarwal*,S.Gupta1,G.Mittal,F.Khan,S.Roy,AntifungalSusceptibility TestingofDermatophytesbyAgarBasedDiskDiffusionMethod,2015ISSN: 2319-7706 Volume 4 Number 3 (2015) pp. 430-436 http://www.ijcmas.com.

27. MichaelM.Nelson,AnnG.Martin,MichealP,Hefferman,Superficial Fungal infection, Fitz patrick's Dermatology in General Medicine VI edition, McGraw Hill; P1989 – 2004.

28. Wingfield A.B. Fernandez A.C. et al Treatment of tinee imbricater : a randomizedclinicaltrialusinggriseofilirin,Terbinefine,intraconezole and fluconazole. Br. J. Derm 2004: 150: 119 – 126.

29. SvejgaardE,JakobgerB,HLAstudiesinchronicdermatophytosiscaused by T.rubrum. Acta Derm venereal 1983; 63 (3): 254 – 5.

30. HayRJ,GeneticsusceptibilitytodermatophytosisEurJ.Epidemiol1992 May; 8 (3): 346-9.

31. NielserPG.Hereditarypalmoplantarkeratodermaanddermatophytosisin the northern most country of Sweden. Acta dermato venerol Suppl (stock 4) 1994; 188: 1-60.

32. DahlMV,Dermatophytosisandtheimmuneresponse.JAmAcad Dermatol, 1994 Sep; 31 (3 pt 2) : S34 – 41.

33. Maryam Ebrahimi, Hossein Zarrinfar, Ali Naseri, Mohammad Javad Najafzadeh, Abdolmajid Fata, Mahmoud Parian, Imaneh Khorsand, Monika NovakBabičCurrMedMycol.2019Jun;5(2):121.doi:10.18502/cmm.5.2.11 PMCID: MC6626711;Epidemiology of dermatophytosis in northeastern Iran; A subtropical region.

34. RipponJW.Cutaneousinfections,dermatophytosisanddermatomycosis In : Medical Mycology. The Pathogenic fungi and the pathogenic actinomycetes. Ed III W.B. Saunders, Philadelphia 1988, 169 – 275.

35. Senthamil Selvi G, Chronic dermatophytosis – a clinical and aetiopathologicalstudy.Ph.D.Thesis,MadrasUniversity,1995.

36. JanardhanB,VaniG.Clinicomycologicalstudyofdermatophytosis.IntJRes Med Sci 2017; 5:31-9.

37. PoluriLV,IndugulaJP,KondapaneniSL.Clinicomycologicalstudyof dermatophytosis in South India. J Lab Physicians 2015; 7:84-9.

38. Reena Goyal, Geeta Tinna, Anjali Gupta and B P Sharma:Epidemio Clinico - MicrobiologicalStudyofDermatophytosisinNorthWestRegionofRajasthan, India;Original Research Article, ISSN: 2319-7706 Volume 4 Number 11 (2015) pp. 394-398http://www.ijcmas.com.

39. Gebreabiezgi, Teklebirhan and Adane Bitew; Prevalence of Dermatophytic Infection and the Spectrum of Dermatophytes in Patients Attending a Tertiary Hospital in Addis Ababa, Ethiopia, International Journal of Microbiology Volume 2015, Article ID 653419,5 pag.http://dx.doi.org/10.1155/2015/653419

40. SudhaM,RamaniCP,HeberAnandan:PrevalenceofDermatophytosisin Patients in A Tertiary Care Centre;International Journal of Contemporary Medical Research ISSN(Online): 2393-915X; (Print):2454-7379 | ICV: 50.43|Volume3|Issue8|August2016

.

41. Channe N,TankhiwaleSS.Studyofdermatophytosisinatertiarycarecentre in Central India. J Evolution Med Dent Sci 2021;10(08):484-487, DOI: 10.14260/jemds/2021/10.

42. ReenaRayGhosh,RathindranathRay,TamalKantiGhoshandArghaPrasun Ghos: Clinico- mycological profile of Dermatophytosis in a Tertiary Care Hospital in West Bengal an Indian scenario; Original Research Article, ISSN: 2319-7706 Volume 3 Number 9 (2014) pp. 655-666, http://www.ijcmas.com.

43. Kucheria M, Gupta SK Chhina DK,Gupta V, Hans D and Singh K ClinicoMycologicalProfileofDermatophyticInfectionsatATertiaryCare Hospital in North India..IntJ Com Health and Med Res 2016;2(2):17-22.

44. DrRashmi P Mahale, Dr M Raghavendra Rao, Dr Tejashree A et al, Clinicomycological profile of Dermatophytosis in a teaching hospital; ISSN (Online):2319–6718,ISSN(Print):2319–670Xwww.ijpsi.orgVolume3Issue 8‖August2014‖PP.43-46.

45. SenSS,RasulES.DermatophytosisinAssam.IndianJMedMicrobiol.2006 Jan;24(1):77- 8. doi: 10.4103/0255-0857.19907. PMID: 16505568.

46. MycologicalstudyofDermatophytosisinruralpopulationMadhaviS,RamaRao and Jyothsna K, Scholars Research Library Annals of Biological Research, 2011, 2 (3) :88-93 (http://scholarsresearchlibrary.com/archive.html)

47. DipakBhargava,SumanKumarHalder,KeshabChandraMondal,SanjayKar DepartmentofMicrobiology,NationalMedicalCollegeandTeachingHospital, Parsa, Birgunj-2018, NepaL;incidence and predominance ofdermatophytes among the patients with superficial skininfection in a tertiary care centre.

48. Khurana A, Sardana K, Chowdhary A, Sethia K. Clinical implications of antifungaldrugsusceptibilitytestingofdermatophytes.IndianDermatolOnline J 2019; 10:737-8.

49. Ltcolsgokhale,msjktshaideretal;dermatophytosisanddermatomycosisin pune 2017 Jun 26.doi: 10.1016/S0377-1237(17)30303-9.

50. Lakshmanan A, Ganeshkumar P, Mohan SR, Hemamalini M, Madhavan R. Epidemiologicalandclinicalpatternofdermatomycosesinrural India.IndianJ Med Microbiol. 2015 Feb;33 Suppl:134-6. doi: 10.4103/0255-0857.150922. PMID: 25657132.

51. MahajanS,TilakR,KaushalSK,MishraRN,PandeySS.Clinico-mycological study of dermatophytic infections and their sensitivity to antifungal drugs in a tertiary care center. Indian J Dermatol Venereol Leprol. 2017 Jul-Aug;83(4):436-440. doi: 10.4103/ijdvl.IJDVL_519_16. PMID: 28540871.

52. Khan SA, Shamsuzzaman SM, Rahman AKMS, Ashekin NAK, Mahmud R, Sharmin R,Siddique MRU,Khan MA,Sultana S,Haque F.Isolation and Identification of Dermatophytes Causing Dermatophytosis at a tertiary care hospital in Bangladesh.Archives of Clinical and Biomedical Research 5(2021): 437-451.

53. TiggaRA,DasS,BhattacharyaSN,SahaR,PandhiD,DattS,RaiG.Burdenof Chronic Dermatophytosis in a Tertiary Care Hospital: Interaction of Fungal Virulence and Host Immunity. Mycopathologia. 2018 Dec;183(6):951-959. doi: 10.1007/s11046-018-0303-4. Epub 2018 Nov 1. PMID: 30386967.

54. Ankita tuknayat, Mala bhalla,amrit kaur and Shimona garg, MDDepartment of Dermatology, Venereology and Leprosy, Government Medical College and Hospital in Chandigarh, India. Familial Dermatophytosis in India: A Study of the Possible ContributingRiskFactorsJClinAesthetDermatol.2020;13(2):58–60.

55. RamarajV,VijayaramanRS,RangarajanS,KindoAJ.Incidenceandprevalence of dermatophytosis in and around Chennai, Tamilnadu, India. Int J Res Med Sci 2016; 4:695- 700.

56. PoluriLV,IndugulaJP,KondapaneniSL.Clinicomycologicalstudyof dermatophytosis in South India. J Lab Physicians 2015; 7:84-9.

57. RudramurthySM,ShawD.Overviewandupdateonthelaboratorydiagnosisof Dermatophytosis, Clin Dermatol Rev 2017;1: S3-11.

58. AlAboudAM,CraneJS.TineaCapitis.[Updated2021Aug11].In:StatPearls Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK536909/.

59. BishnoiA,VinayK,DograS.EmergenceofrecalcitrantdermatophytosisinIndia. Lancet Infect Dis. 2018 Mar;18(3):250-251. doi: 10.1016/S1473-3099(18)30079-3.PMID:29485088.

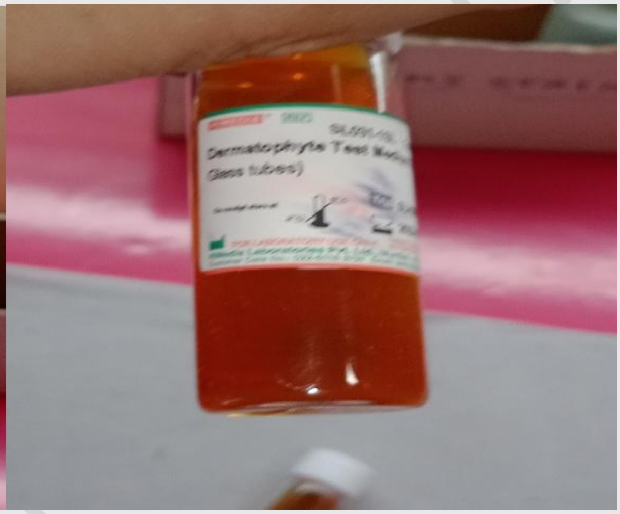
60. Barryl.hainer,Dermatophyticinfections,MedicalUniversityofSouth Carolina,Charleston,SouthCarolina*AmFamPhysician.*2003Jan1;67(1):101- 109.

61. Sahai S, Mishra D. Change in spectrum of dermatophytes isolated from superficialmycosescases:FirstreportfromCentralIndia.IndianJDermatol Venereol Leprol 2011; 77:335-336.

62. A. Naglot, D. D. Shrimali, B. K. Nath *et al,* Original Research Article; Recent Trends of Dermatophytosis in Northeast India (Assam) and Interpretation with Published Studies,ISSN: 2319-7706 Volume 4 Number 11 (2015) pp. 111-120 http://www.ijcmas.com.

IMAGES

1.DERMATOPHYTETESTMEDIUM



Trichophytonrubrum

Trichophyton mentagrophytes

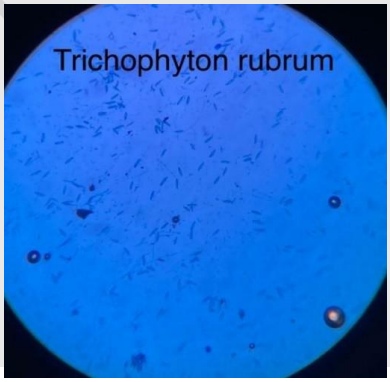
2.SDASLANTS-FUNGALCULTUREOF

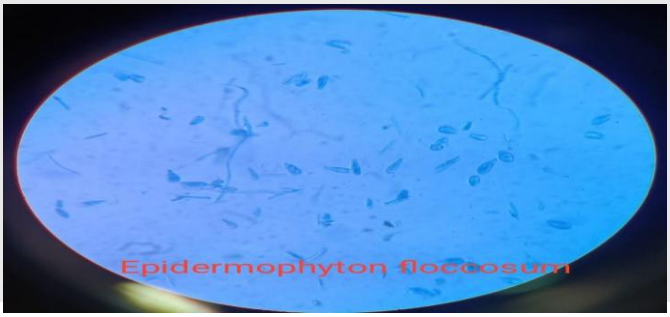
DERMATOPHYTES

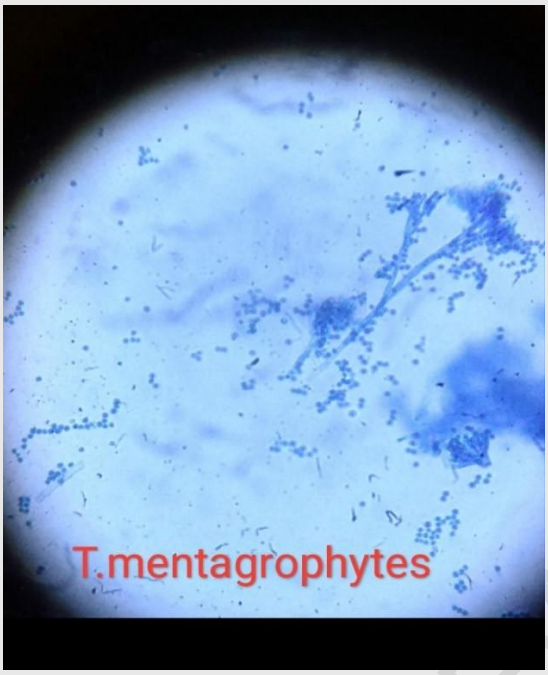
Microsporumgypseum

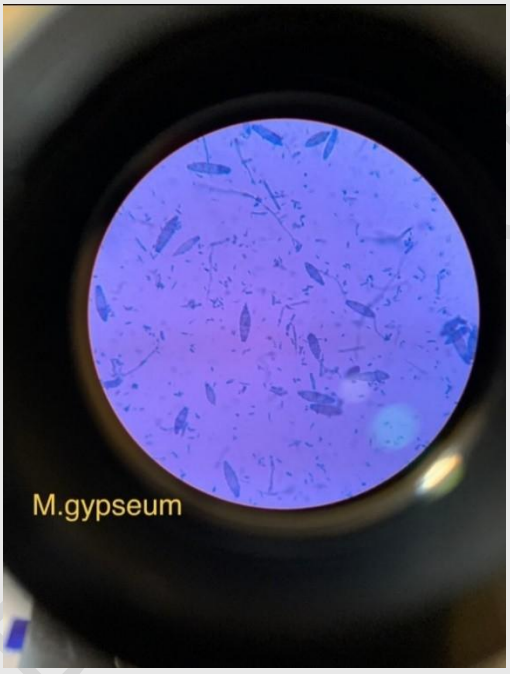
Trichophytontonsurans

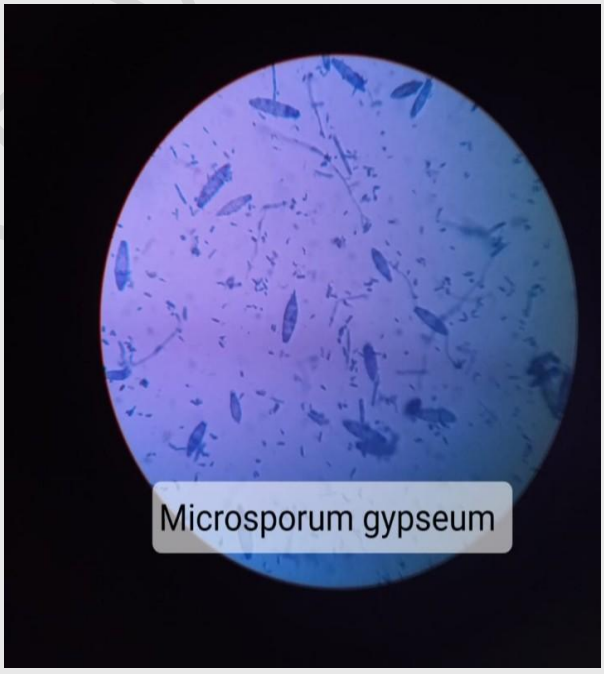
3-LPCBMOUNTOFTRICHOPHYTONRUBRUM

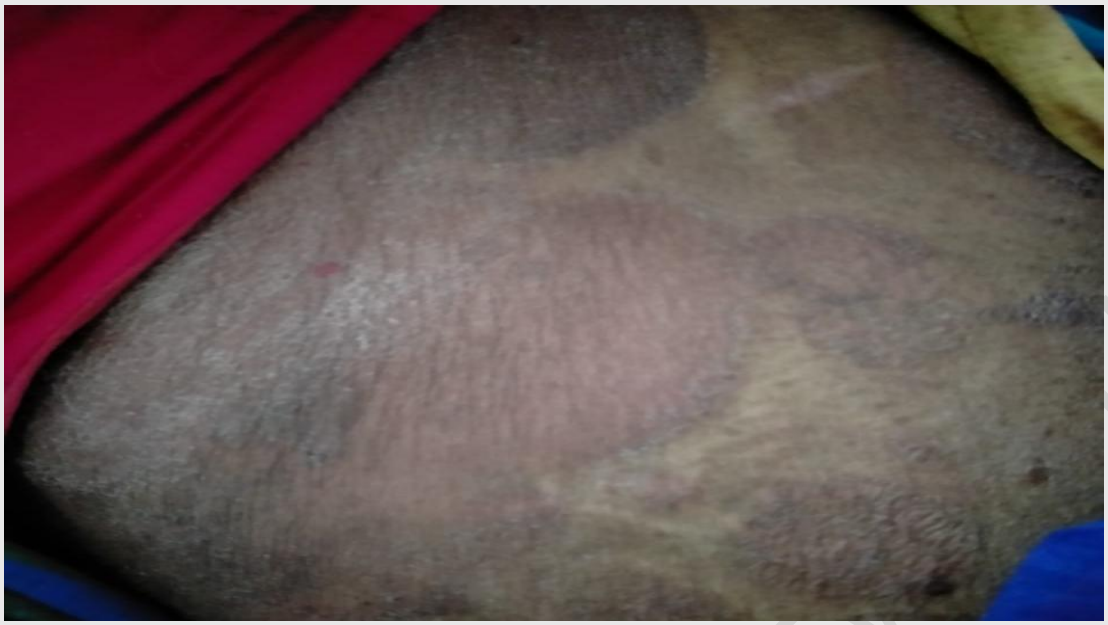




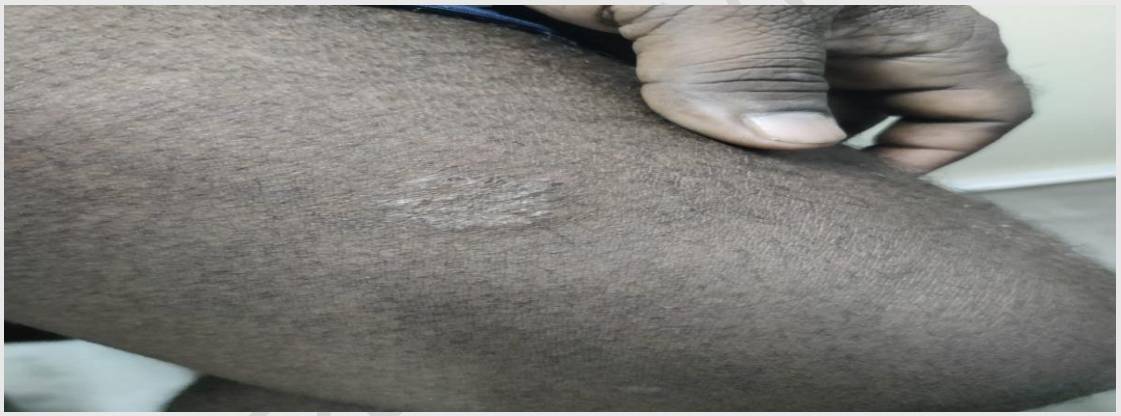








4.TINEACORPORIS



5.TINEA CAPITIS